Automation and control
Soft starters and variable speed drives

Catalogue
September

04

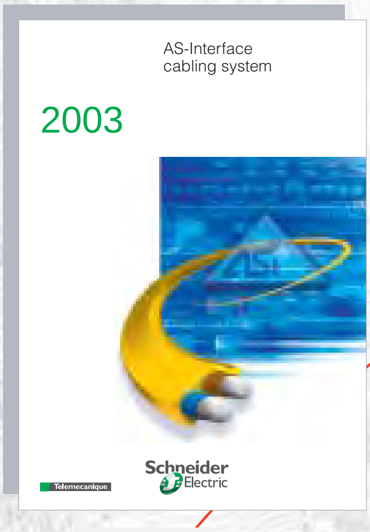
a brand of
Schneider
Electric

Telemecanique

An overview of the product range

Control and protection,
Detection,
Automation,
Human/Machine dialogue,
Communication,
Supervision,
Panel-building and cabling accessories

Art. 55053 - MKTED203041EN

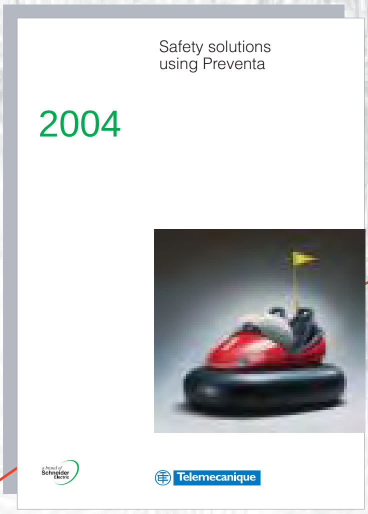


AS-Interface
cabling system

2003

Control and Protection,
Detection,
Automation,
Human/Machine dialogue,
Communication

Art. 67341 - MKTED203111EN

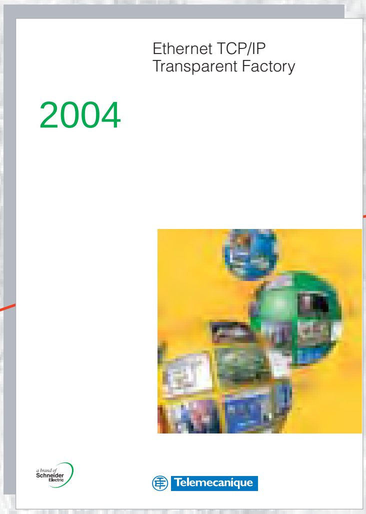


Safety solutions
using Preventa

2004

Control and Protection,
Detection,
Automation,
Human/Machine dialogue

Art. 802731 - MKTED204073EN



Ethernet TCP/IP
Transparent Factory

2004

Human/Machine dialogue
Communication

Control and signalling units
Art. 28697 - MKTED299014EN

Terminals and display units
Art. 96949 - MKTED2040401EN

Telemecanique
Components for
Human-Machine interfaces

2001

Automation and control
Human/Machine interfaces

2004

Human/Machine dialogue
Supervision

To be issued

Art. 70263 - MKTED203113EN

Art. 70455 - MKTED204011EN

Automation and control
Mounting systems

2004

Automation and control
Interfaces, I/O splitter boxes
and power supplies

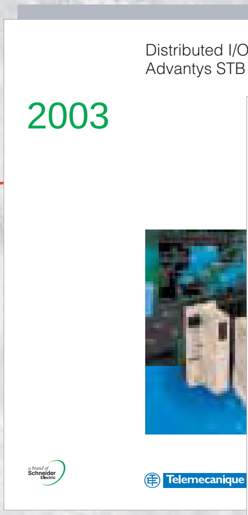
2003

Automation and control
Automation and relay functions

2003

Panel-building and cabling accessories
Automation

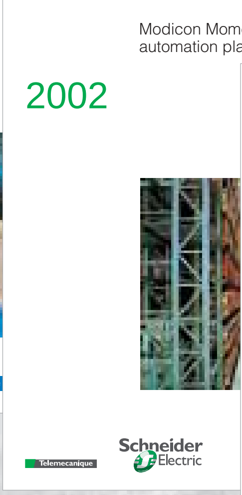
AUTC201108140EN



Distributed I/O
Advantys STB

2003

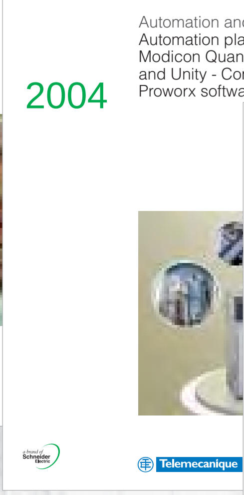
AUTC201104124EN



Modicon Momentum
automation platform

2002

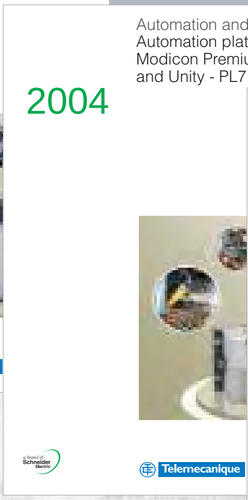
Art. 802621 - MKTED204071EN



Automation and control
Automation platform
Modicon Quantum
and Unity - Concept
Proworx software

2004

Art. 802625 - MKTED204072EN



Automation and control
Automation platform
Modicon Premium
and Unity - PL7 software

2004

Art. 70984 - MKTED204012EN

Automation platform
Modicon TSX Micro
and PL7 software

2004

Automation, Communication

Art. 960015 - DIA1ED2040506EN

Automation and control
Telemecanique
The essential

2004

Art. 66692 - DIA7ED20310006EN

Motion control
Lexium

2004

Art. 61233 - DIA7ED2030902EN

Twin Line
Motion control

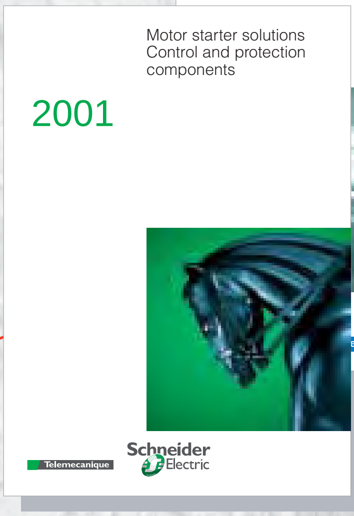
2003

Art. 802660 - MKTED204091EN

Soft starters and
variable speed drives

2004

Art. 27501 - MKTED201001EN



Motor starter solutions
Control and protection
components

2001

Control and protection

Art. 54752 - MKTED203031EN

Global Detection
Electronic and
electromechanical sensors

2003

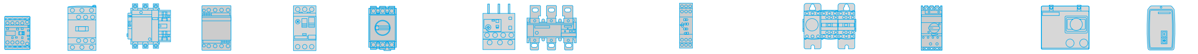
Detection

Automation solutions

An overview of the product range

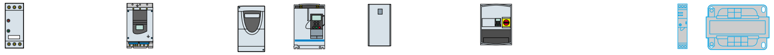
Products listed in this catalogue
Product listed in other catalogues (see previous pages)

Control and protection



Contactors from 6 to 16A
Contactors from 9 to 150 A
Contactors from 185 to 800 A
Modular contactors
Circuit-breakers
Rotary switch disconnector
Thermal overload relays
Measurement and control relays
Motor starters open version
Contactor and reversing contactor breakers
Direct on-line starters, enclosed version
Star-delta starters, enclosed version

Control and protection

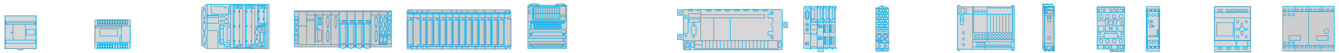


Soft starters open and enclosed version
Soft start-soft stop units for asynchronous motors
Variable speed drives for asynchronous motors
Ready-assembled variable speed drives
Power supplies and transformers

Detection

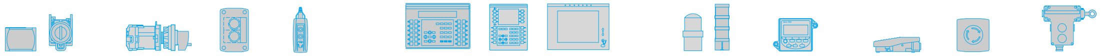
Photo-electric detectors
Inductive, capacitive, magnet and ultrasonic proximity sensors
Limit switches
Limit switches for safety applications
Electromechanical pressure and vacuum switches
Electronic pressure and vacuum switches
Connectors
Encoders
Inductive identification system

Automation



Twido programmable controllers
Nano programmable controllers
Micro automation platform
Premium automation platform
Quantum automation platform
Momentum automation platform
TBX distributed I/O
Advantys STB distributed I/O
IP 67 splitter boxes
Telefast® 2 pre-wired system
Interfaces
Control relays
Electronic timing relays
Zelio Logic smart relays
Preventa safety modules

Human-Machine dialogue



Control and signalling units
Cam switches
Control stations
Pendant control stations
Magelis operator dialogue terminals
Illuminated beacons and indicator banks
Totalising timers and counters
Foot switches
Emergency stop stations
Emergency stop trip wire switches

Communication

Modbus TCP/X-Way communication architecture: TCP/IP Ethernet network, Modbus Plus network, Fipway network, CANopen bus, AS-Interface cabling system, Fipio bus, INTERBUS bus, Profibus DP, Modbus serial link, Uni-Telway serial link, Jnet serial link, asynchronous serial links
FactoryCast Web solutions
FactoryCast HMI Web solutions
Web and Internet technologies

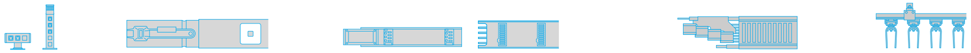
Supervision

Magelis *i*PC industrial PC
Vijeo Look supervisory software
Monitor Pro supervisory software

Panel building and cabling accessories

Wall-mounted enclosures
Floor-standing enclosures
Uprights, mounting plates, mounting rail, cable ducting and cable clips
Prefabricated busbar systems and power distribution systems
Tego Dial
Tego Power
Profil front panel
Terminal blocks
Cable ends
Marking accessories
Tools

Power distribution



Prefadis service poles and posts, lighting poles
Canalis busbar trunking for lighting distribution
Canalis busbar trunking for low and medium power distribution
Canalis busbar trunking for high power distribution
Mobile distribution: Canalis track section and cable carriers

Services

Product reference index
Technical information
Schneider Electric worldwide

Soft starters and variable speed drives

1 – Soft starters for asynchronous motors

2 – Variable speed drives for asynchronous motors

3 – PowerSuite software workshop

4 – Communication

5 – Technical appendices and substitution

6 – Services

1 - Soft starters for asynchronous motors

Soft starters for asynchronous motors

Applications		**Starting simple machines**	**Soft starting and deceleration of simple machines**
			
Power range for 50…60 Hz supply (kW)		**0.37…5.5**	**0.75…75**
	Single phase 110…230 V (kW)	0.37…1.5	–
	3-phase 200…240 V (kW)	–	0.75…7.5
	3-phase 200…480 V (kW)	0.37…5.5	–
	3-phase 230…415 V (kW)	–	–
	3-phase 208…690 V (kW)	–	–
	3-phase 230…690 V (kW)	–	7.5…75
	3-phase 380…415 V (kW)	–	1.5…15
	3-phase 400 V (kW)	–	22…45
Drive	Output frequency	–	
	Type of control	–	
	Transient overtorque	–	
Functions Number of functions		1	
Number of preset speeds		–	
Number of I/O	Analog inputs	–	
	Logic inputs	–	
	Analog outputs	–	
	Logic outputs	–	
	Relay outputs	–	
Communication	Integrated	–	
	Available as an option	Combined with TeSys model U controller-starter	
Standards and certifications		IEC/EN 60947-4/2 C-TICK, CSA, UL, CE, CCC	
References		**ATS 01N1●●FT**	**ATS 01N2●●●●**
Pages		1/8	

Soft starting and deceleration of pumping and ventilation machines

3…900

–	–
–	–
–	–
3…710	–
–	3…900
–	–
–	–
–	–

–

TCS (Torque Control System)

–

36

–

1 PTC probe

4

1

2

3

Modbus

Fipio, Profibus DP, DeviceNet, Ethernet TCP/IP

IEC/EN 60947-4-2, EMC class A and B
DNV, C-TICK, GOST, CCIB, NOM, UL, CE, CCC, CSA

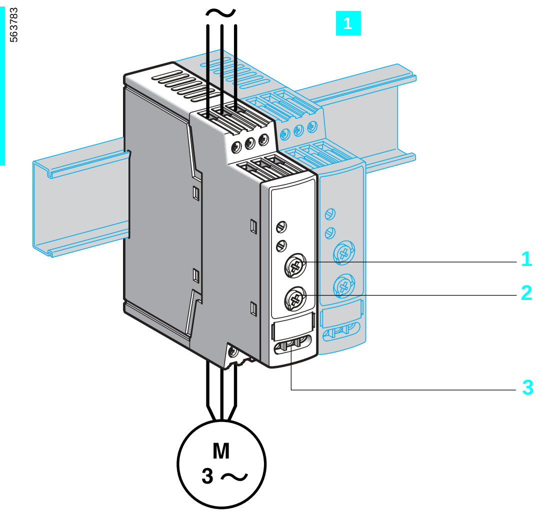
ATS 48●●●Q	**ATS 48●●●Y**

1/40 to 1/43

Soft starters for asynchronous motors

Altistart 01

1



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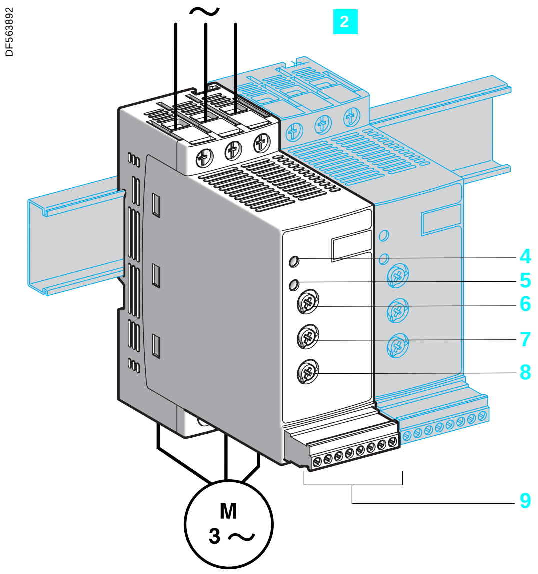


Presentation

The Altistart 01 soft starter operates either as a torque limiter on starting or as a soft start/soft stop unit for asynchronous motors.

Using the Altistart 01 starter enhances the starting performance of asynchronous motors by allowing the motor to start gradually and smoothly in a controlled manner.

Using it can also prevent mechanical shocks, which lead to wear and tear, maintenance work and production downtime.

The Altistart 01 limits the starting torque and current peaks on starting on machines which do not require a high starting torque.

These starters are designed for the following simple applications:

- conveyors
- conveyor belts
- pumps
- fans
- compressors
- automatic doors
- small cranes
- belt-drive machines, etc.

The Altistart 01 is compact, easy to install and can be mounted horizontally next to another unit, complies with standards IEC/EN 60947-4-2, UL and CSA certifications, and has CE marking.

The Altistart 01 soft starter offer comprises 3 product ranges:

- **1 ATS 01N1●●● soft starters**
  - Control one phase of the motor power supply (single phase or 3-phase) to limit the starting torque.
  - Internal Bypass relay
  - Motor power ratings range from 0.37 kW to 5.5 kW.
  - Motor supply voltages range from 110 V to 480 V, 50/60 Hz. An external power supply is required for controlling the starter.

A contactor is always required to switch off the motor.

- **2 ATS 01N2●●● soft start/soft stop units**
  - Control two phases of the motor power supply to limit the starting current and for deceleration.
  - Internal Bypass relay
  - Motor power ratings range from 0.75 kW to 75 kW.
  - The motor supply voltages are as follows: 230 V, 400 V, 480 V and 690 V, 50/60 Hz.

The use of a line contactor is not necessary on machines where electrical isolation is not required.

- **ATSU 01N2●●● soft start/soft stop units**

See pages 1/20 to 1/27.

Description

- Altistart 01 soft starters (ATS 01N1●●●) are equipped with:
  - a potentiometer 1 for controlling the starting time
  - a potentiometer 2 for adjusting the start voltage threshold according to the motor load
  - 2 inputs 3:
    - 1 ≂ 24 V input or 1 ∼ 110…240 V input for powering the control part that controls the motor

- Altistart 01 soft start/soft stop units (ATS 01N2●●●) are equipped with:
  - a potentiometer 6 for controlling the starting time
  - a potentiometer 8 for controlling the deceleration time
  - a potentiometer 7 for adjusting the start voltage threshold according to the motor load
  - 1 green indicator LED 4: device switched on
  - 1 yellow indicator LED 5: motor powered at nominal voltage
  - a connector 9:
    - 2 logic inputs for Run/Stop commands
    - 1 logic input for the BOOST function
    - 1 logic output to indicate the end of starting
    - 1 relay output to indicate the starter has a power supply fault or the motor has reached a standstill at the end of the deceleration stage.

Characteristics:
pages 1/6 and 1/7

References:
page 1/8

Dimensions:
page 1/9

Schemes:
pages 1/10 to 1/17

Soft starters for asynchronous motors

Altistart 01

Functions

Description *(continued)*

Equivalence table for contact reference

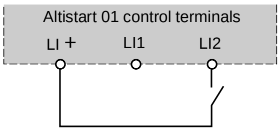
Functions	ATS 01N2●●LU/QN/RT	ATS 01N2●●LY	ATS 01N2●●Q
Relay outputs	R1A	04	04
	R1C	05	05
0 V external power supply	C0M	–	–
Stop command	LI1	02	02
Run command	LI2	03	03
Control power supply	LI + (+ 24 V positive logic)	01 (0 V negative logic)	01 (0 V negative logic)
BOOST	BOOST	–	–
End of starting	LO1	–	–
115 V external power supply	–	06	–
	–	07	–

Functions

- 2-wire control:

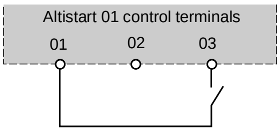
The run and stop commands are controlled by a single logic input. State 1 of logic input LI2 controls the run process and state 0 controls the stop process.

ATS 01N2●●LU/QN/RT



Wiring diagram for 2-wire control

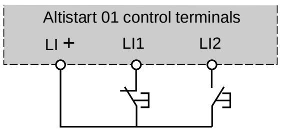
ATS 01N2●●LY/Q



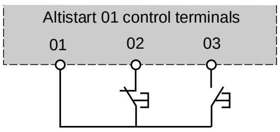
Wiring diagram for 2-wire control

- 3-wire control:

The run and stop commands are controlled by 2 different logic inputs.
Stopping is achieved when logic input LI1 opens (state 0).
The pulse on input LI2 is stored until input LI1 opens.



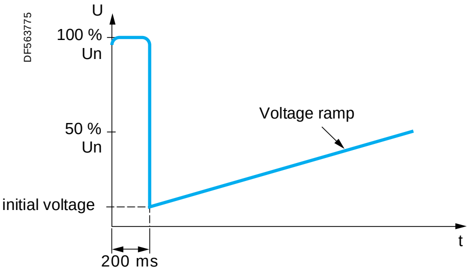
Wiring diagram for 3-wire control



Wiring diagram for 3-wire control

- Starting time

Controlling the starting time means that the time of the voltage ramp applied to the motor can be adjusted and a gradual starting time achieved, which is dependent on the motor load.



Application of a voltage BOOST equal to 100% of the nominal motor voltage

- Voltage BOOST function via logic input:

Activating the BOOST logic input enables the function for supplying a starting overtorque capable of overcoming any mechanical friction.
When the input is at state 1, the function is active (input connected to the + 24 V) and the starter supplies a fixed voltage to the motor for a limited time before starting.

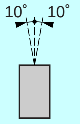
- End of starting

☐ Application function via logic output LO1
Soft start/soft stop units ATS 01N206●● to ATS 01N232●● are equipped with an open collector logic output LO, which indicates the end of starting when the motor has reached nominal speed.
☐ Application function via an option
For ATS01N2●●LY/Q soft start/soft stop units end of starting information can be obtained by adding the option LAD 8N11 with N/O+N/C contacts.
The option can be easily connected to the bypass contactor of the electronic(s) unit without dismantling the product.

- Fault relay

Soft start/soft stop units ATS 01N206●● to ATS 01N232●● have a relay which opens when a fault is detected.
Relay contact R1A-R1C (04-05 for ATS 01N2●●LY/Q) closes with the LI2 command (02-03 for ATS 01N2●●LY/Q) and opens when the motor voltage is around 0 with a decelerated stop or stop immediately on a fault.
This information can be used for controlling the line contactor and achieving deceleration (by maintaining the line contactor until the motor has stopped).

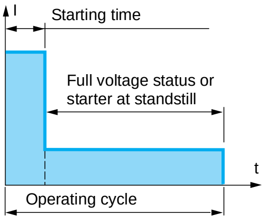
Environment characteristics

Type of starter			**ATS 01N1●●FT, ATS 01N2●●LU** *(1)*, **ATS 01N2●●QN, ATS 01N2●●RT**	**ATS 01N2●●LY and ATS 01N2●●Q**
Conforming to standards			Altistart 01 electronic starters have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular standard IEC/EN 60947-4-2	
Electromagnetic compatibility EMC	Conducted and radiated emissions		CISPR 11 level B, IEC 60947-4-2, level B	CISPR 11 level B (only with Bypass), IEC 60947-4-2, level B
	Harmonics		IEC 1000-3-2, IEC 1000-3-4	
	EMC immunity		EN 50082-2, EN 50082-1	
	Electrostatic discharge		IEC 61000-4-2 level 3	
	Immunity to radiated radio-electrical interference		IEC 61000-4-3 level 3	
	Immunity to electrical transients		IEC 61000-4-4 level 4	
	Voltage/current impulse		IEC 61000-4-5 level 3	
	Immunity to conducted interference caused by radio-electrical fields		IEC 61000-4-6 level 3	
	Micro-cuts and voltage fluctuation		IEC 61000-4-11	
	Damped oscillating waves		IEC 61000-4-12 level 3	
CE marking			Bear CE marking in accordance with the European low voltage directives IEC/EN 60947-4-2	
Product certifications			UL, CSA and C-Tick B44.1-96/ASME A17.5 for starter wired to the motor delta terminal	
Degree of protection			IP 20	IP 20 on front panel
Degree of pollution			2 conforming to IEC/EN 60947-4-2	3 conforming to IEC 60664-1 and UL 508
Vibration resistance			1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz conforming to IEC/EN 60068-2-6	2 gn
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27	8 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity			5...95% without condensation or dripping water, conforming to IEC/EN 60068-2-3	
Ambient air temperature around the device	Storage	°C	- 25…+ 70 conforming to IEC/EN 60947-4-2	- 25…+ 70 conforming to IEC/EN 60947-4-2
	Operation	°C	- 10…+ 40 without derating, up to 50°C with current derating of 2% per °C above 40°C	0…+ 55
Maximum operating altitude		m	1000 without derating (above this, derate the current by 2.2% per additional 100 m)	2000 without derating (above this, derate the current by 0.5% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position				

Electrical characteristics

Type of starter	**ATS**		**01N1●●FT**	**01N2●●LU**	**01N2●●QN**	**01N2●●RT**	**01N2●●LY**	**01N2●●Q**
Category of use	Conforming to IEC 60947-4-2		Ac-53b					
Rated operating voltage	Three-phase voltage	V	110 - 15% to 480 + 10%	200 - 15% to 240 + 10%	380 - 15% to 415 + 10%	440 - 15% to 480 + 10%	230 - 15% to 690 + 10%	400 -15…+ 10%
Frequency		Hz	50 - 5% to 60 + 5%					
Output voltage			Maximum 3-phase voltage equal to line supply voltage.					
Control power supply voltage		V	~ 110...220 ± 10% ≂ 24 ± 10%	Built into the starter			~ 110 ± 10%	Built into the starter
Rated operating current		A	3...12	6...32			32...85	
Adjustable starting time		s	1...5	1...10			1...25	
Adjustable deceleration time		s	–	1...10			1...25	
Starting torque		%	30...80% of starting torque of motor connected directly on the line supply					

(1) For the 230...415 V range, ATS 01N2●●LV starters can be connected to the motor delta terminals to reduce the starter rating.

Type of starter	**ATS**		**01N206●● to 01N222●●**		**01N232●●**		**01N2●●LY/01N2●●Q**	
Use 	Starting time	s	1	5	1	5	1	12
	Maximum number of cycles per hour		310	20	180	10	360	30

Electrical characteristics *(continued)*

Type of starter	**ATS 01N1**		**03FT**	**06FT**	**09FT/12FT**	
Control power supply consumption			≂ 24 V, 25 mA, ∿ 110 V, 30 mA ∿ 240 V, 65 mA		≂ 24 V, 30 mA, ∿ 110 V, 35 mA, ∿ 240 V, 80 mA	
Power dissipated	At full load at end of starting	**W**	4	1	1	1
	In transient state	**W**	19	31	46	61
Current at nominal load *(1)*		**A**	15	30	45	60

Type of starter	**ATS 01N2**		**06LU/QN/RT**	**09LU/QN/RT**	**12LU/QN/RT**	**22LU/QN/RT**	**32LU/QN/RT**
Power dissipated	At full load at end of starting	**W**	4	4	4	4.5	4.5
	In transient state	**W**	64	94	124	224.5	324.5
Current at nominal load *(1)*		**A**	30	45	60	110	160

Type of starter	**ATS 01N2**		**30LY/Q**	**44LY/Q**	**72LY/Q**	**85LY/Q**
Power dissipated	At full load at end of starting	**W**	22	22	23	23
	In transient state	**W**	184	268	436	514
Current at nominal load *(1)*		**A**	90	132	216	255

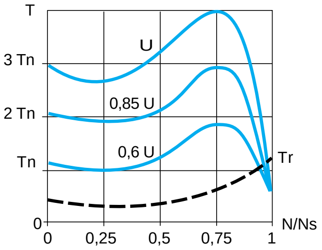
Type of starter	**ATS 01N2**		**●●LU/QN/RT**	**●●LY/Q**
Logic input power supply: For LI1, LI2 and BOOST only (electrically isolated between power and control) **LI +, COM**			24 V power supply Max. current available 10 mA. No short-circuit and overload protection	–
Logic inputs **LI1, LI2, BOOST (01, 02, 03 for ATS 01N2●● LY/Q)** Stop, run and boost on start-up functions			Logic inputs with impedance 27 kΩ 24 V power supply (U max. 40 V) Max. current consumption 8 mA State 0 if U < 5 V and I < 0.2 mA State 1 if U > 13 V and I > 0.5 mA	Input with internal control relay, internal 24 V power supply Max. current 8 mA State 0 if I < = 3 mA State 1 if I > = 10 mA
Logic output LO1 End of starting signal			Open collector logic output External 24 V power supply (min. 6 V, max. 30 V) Max. current 200 mA	–
Relay outputs **R1A R1C (04, 05 for ATS 01N2●● LY/Q)**			Normally open (N/O) contact (contact open in fault mode) Minimum switching capacity: 10 mA for ⎓ 6 V Max. switching capacity on inductive load (cos φ = 0.5 and L/R = 20 ms): 2 A for ∿ 250 V or ⎓ 30 V (AC-15) Max. operating voltage 440 V	Operating category AC-15: Ie 3 A, Ue 250 V, DC-13: Ie 2 A, Ue 24 V, Minimum switching capacity: 10 mA for ⎓ 17 V Maximum operating voltage 250 V
LED signalling	Green LED		Starter powered up	
	Yellow LED		Nominal voltage reached	

(1) Acceleration current complying with the maximum conditions of use (see page 1/6).

Connections (Maximum connection capacity and tightening torque)

Type of starter	**ATS**		**01N103FT, 01N106FT**	**01N109FT, 01N112FT, 01N206●● to 01N232●●**	**01N2●●LY and 01N2●●Q**
Power circuit			Cage type connector	Connection via Ø 4 mm screw clamp	
Flexible wire without cable end	1 conductor	**mm²**	2.5 14 AWG	1.5…10 8 AWG	6...25
	2 conductors	**mm²**	1 17 AWG	1.5…6 10 AWG	6...25
Flexible wire with cable end	1 conductor	**mm²**	2.5 14 AWG	1…6 10 AWG	4...25
	2 conductors	**mm²**	0.75 18 AWG	1…6 10 AWG	4...16
Rigid wire	1 conductor	**mm²**	2.5 14 AWG	1…10 8 AWG	6...35
	2 conductors	**mm²**	1 17 AWG	1…6 10 AWG	6...25
Tightening torque		**N.m**	0.8	1.9…2.5	5
Control circuit			Cage type connector	Screw connector	
Flexible wire without cable end	1 conductor	**mm²**	2.5 14 AWG	0.5…2.5 14 AWG	0.75...1.5
	2 conductors	**mm²**	1 17 AWG	0.5…1.5 16 AWG	0.75...1.5
Flexible wire with cable end	1 conductor	**mm²**	2.5 14 AWG	0.5…1.5 16 AWG	0.75...1.5
	2 conductors	**mm²**	0.75 18 AWG	0.5…1.5 16 AWG	0.75...1.5
Rigid wire	1 conductor	**mm²**	2.5 14 AWG	0.5…2.5 14 AWG	0.75...1.5
	2 conductors	**mm²**	1 17 AWG	0.5…1 17 AWG	0.75...1.5
Earth connection			–	–	Tinned connector. Fixed using Ø 6 screws
Tightening torque		**N.m**	0.8	0.5	0.7

Torque characteristics (typical curves)



The diagram opposite shows the torque/speed characteristic of a cage motor in relation to the supply voltage.
The torque varies in line with the square of the voltage at a fixed frequency.
The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Soft starters for asynchronous motors

Altistart 01

ATS 01N103FT

ATS 01N212QN

ATS 01N230LY

Soft starter for 0.37 to 5.5 kW motor

Motor						Starter		
Motor power *(1)*						Nominal current	Reference	Weight
Single phase	3-phase							
230 V	210 V	230 V	230 V	400 V	460 V			
kW	*HP*	kW	*HP*	kW	*HP*	A		kg
Single phase 110…230 V or 3-phase 110…480 V supply voltage, 50/60 Hz								
0.37	– –	0.37 0.55	*0.5* –	1.1 –	*0.5* *1.5*	3	**ATS 01N103FT**	0.160
0.75	*0.5* –	0.75 1.1	*1* *1.5*	2.2 3	*2* *3*	6	**ATS 01N106FT**	0.160
1.1	*1*	1.5	*2*	4	*5*	9	**ATS 01N109FT**	0.280
1.5	*1.5*	2.2	*3*	5.5	*7.5*	12	**ATS 01N112FT**	0.280

Soft start/soft stop unit for 0.75 to 15 kW motor

Motor		Starter		
Motor power *(1)*		Nominal current	Reference	Weight
kW	*HP*	A		kg
3-phase supply voltage: 200…240 V 50/60 Hz				
0.75/1.1	*1/1.5*	6	**ATS 01N206LU**	0.420
1.5	*2*	9	**ATS 01N209LU**	0.420
2.2/3	*3/–*	12	**ATS 01N212LU**	0.420
4/5.5	*5/7.5*	22	**ATS 01N222LU**	0.560
7.5	*10*	32	**ATS 01N232LU**	0.560
3-phase supply voltage: 380…415 V 50/60 Hz				
1.5/2.2/3	–	6	**ATS 01N206QN**	0.420
4	–	9	**ATS 01N209QN**	0.420
5.5	–	12	**ATS 01N212QN**	0.420
7.5/11	–	22	**ATS 01N222QN**	0.560
15	–	32	**ATS 01N232QN**	0.560
3-phase supply voltage: 440…480 V 50/60 Hz				
–	*2/3*	6	**ATS 01N206RT**	0.420
–	*5*	9	**ATS 01N209RT**	0.420
–	*7.5*	12	**ATS 01N212RT**	0.420
–	*10/15*	22	**ATS 01N222RT**	0.560
–	*20*	32	**ATS 01N232RT**	0.560

Soft start/soft stop unit for 15 to 75 kW motor

3-phase supply voltage: 230…690 V 50/60 Hz

Motor							Starter		
Motor power *(1)*							Nominal current	Reference	Weight
230 V	230 V	400 V	400 V	460 V	575 V	690 V			
kW	*HP*	kW	*HP*	*HP*	*HP*	kW	A		kg
7.5	*10*	15	*15*	*20*	*30*	30	32	**ATS 01N230LY**	2.400
11	*15*	22	*25*	*30*	*40*	37	44	**ATS 01N244LY**	2.400
18.5	*25*	37	*40*	*50*	*60*	55	72	**ATS 01N272LY**	3.800
22	*30*	45	*50*	*60*	*75*	75	85	**ATS 01N285LY**	3.800

3-phase supply voltage: 400 V 50/60 Hz

Motor		Starter		
Motor power *(1)*		Nominal current	Reference	Weight
kW	*HP*	A		kg
22	*25*	44	**ATS 01N244Q**	2.400
37	*40*	72	**ATS 01N272Q**	3.800
45	*50*	85	**ATS 01N285Q**	3.800

Accessories

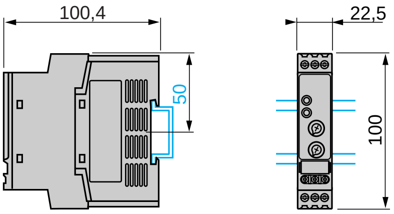
Description	Used for starter	Reference	Weight kg
Plate for quick mounting on DIN rail	ATS 01N230LY, ATS 01N244●	**VY1 H4101**	–
Adaptor for mounting on ⊔ DZ5 MB rail	ATS 01N103FT, ATS 01N106FT	**RHZ 66**	0.005
Auxiliary contact, provides information that the motor is at full voltage	ATS 01N2●●●LY, ATS 01N2●●●Q	**LAD 8N11**	–

(1) Standard power ratings of motors, HP power ratings indicated according to standard UL 508.

Soft starters for asynchronous motors
Altistart 01

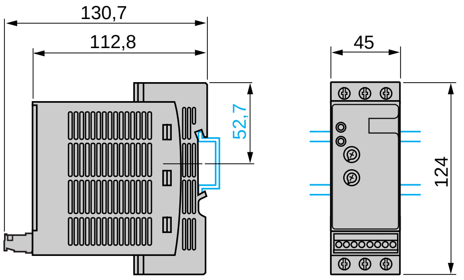
ATS 01N103FT, ATS 01N106FT

Mounting on ‾|_|‾ (35 mm) rail or ⊔ rail with adaptor RHZ 66

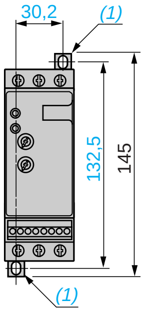


ATS 01N109FT, ATS 01N112FT

Mounting on ‾|_|‾ (35 mm) rail



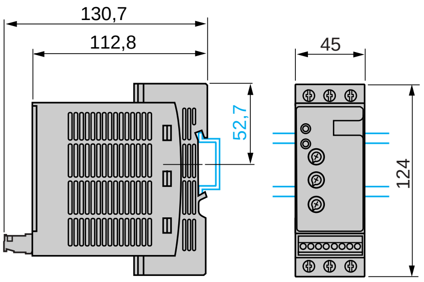
Screw fixing



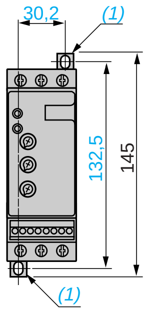
(1) Retractable fixings

ATS 01N206●● to ATS 01N212●●

Mounting on ‾|_|‾ (35 mm) rail



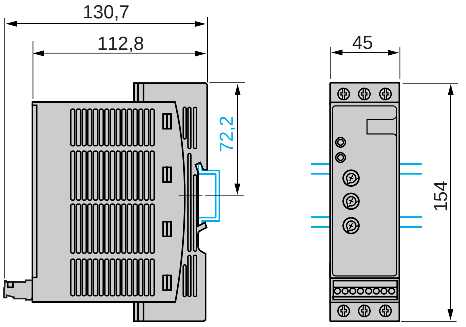
Screw fixing



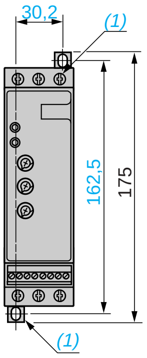
(1) Retractable fixings

ATS 01N222●● to ATS 01N232●●

Mounting on ‾|_|‾ (35 mm) rail



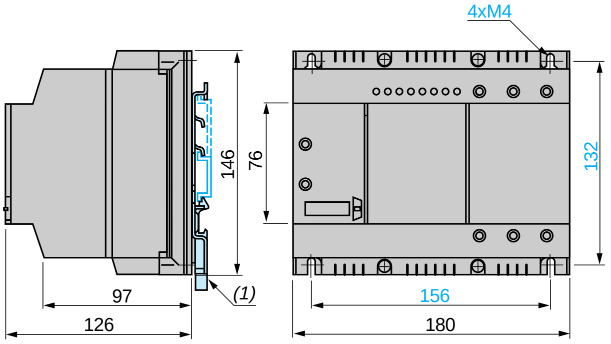
Screw fixing



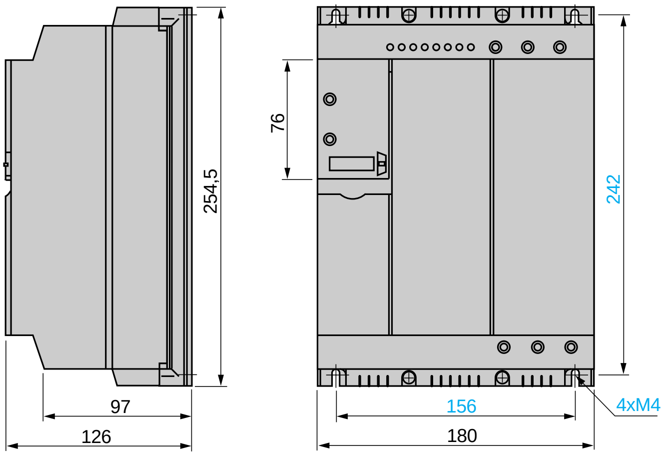
(1) Retractable fixings

ATS 01N230LY, ATS 01N244LY, ATS 01N244Q

Quick mounting on ‾|_|‾ rail (35 or 70 mm) using plate VY1 H4101 *(1)*

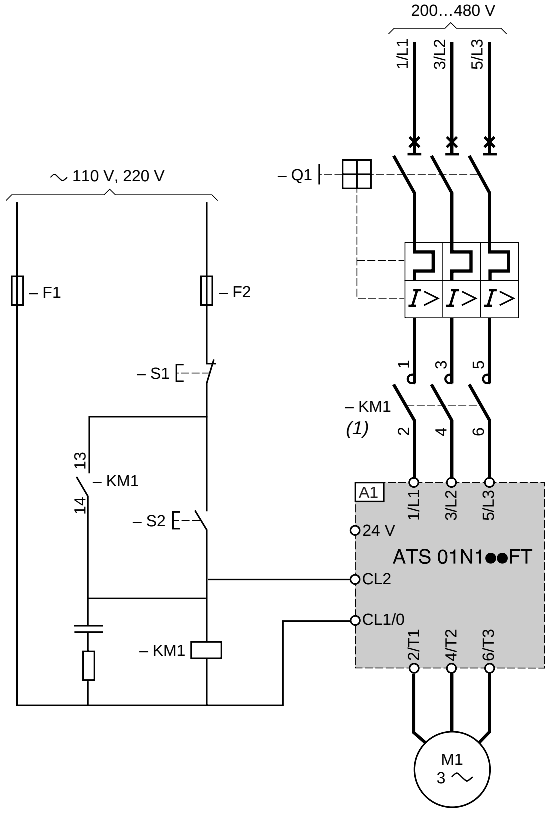


ATS 01N272LY, ATS 01N285LY, ATS 01N272Q, ATS 01N285Q



ATS 01N1●●FT soft starters

Single-phase or 3-phase power supply



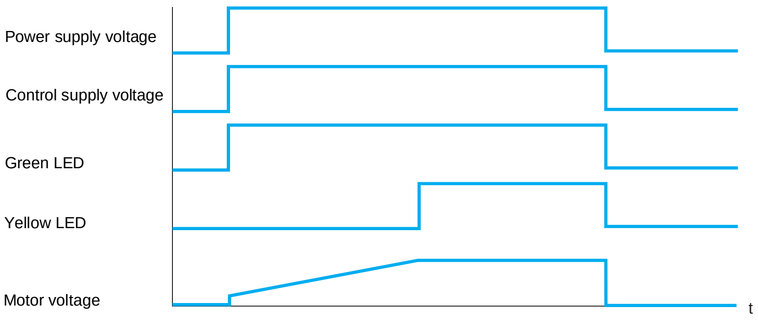
Note : *For single-phase motors, use the ATS 01N1●●FT without connecting the 2nd phase 3/L2, 4/T2.*
Wait 5 seconds after switching the soft starter off before switching it on again.

(1) A line contactor must be used in the sequence.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

Code	Description
A1	Soft starter
Q1	GV2 ME circuit-breaker
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
S1, S2	XB4 B or XB5 B pushbuttons

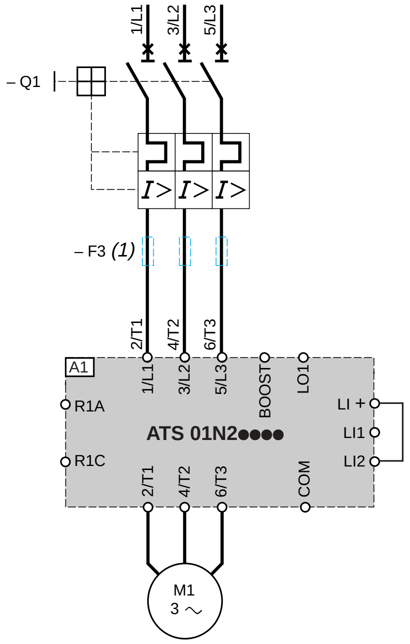
Function chart



ATS 01N2●●LU/QN/RT soft start/soft stop units

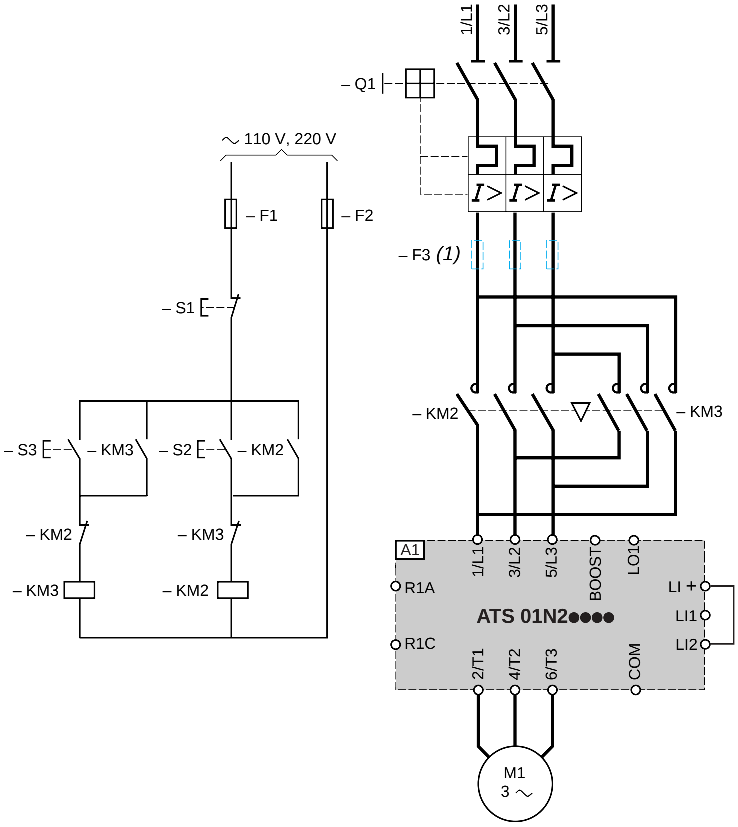
Manual control without deceleration (freewheel), with GV2 and GV3 motor circuit-breaker

ATS 01N206●● to ATS 01N232●●



Automatic control with reversal of operating direction, without deceleration (freewheel)

ATS 01N206●● to ATS 01N232●●



(1) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

Code	Description
A1	Soft start/soft stop unit
Q1	GV2 ME circuit-breaker
KM1, KM2, KM3	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2, S3	XB4 B or XB5 B pushbuttons

Presentation:
pages 1/4 and 1/5

Characteristics:
pages 1/6 and 1/7

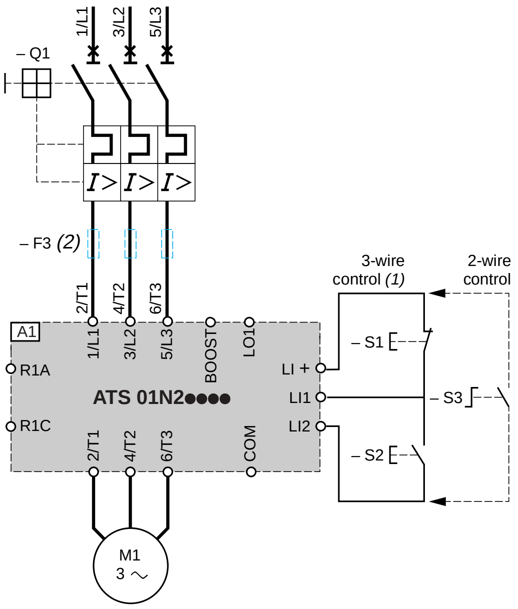
References:
page 1/8

Dimensions:
page 1/9

ATS 01N2●●LU/QN/RT soft start/soft stop units

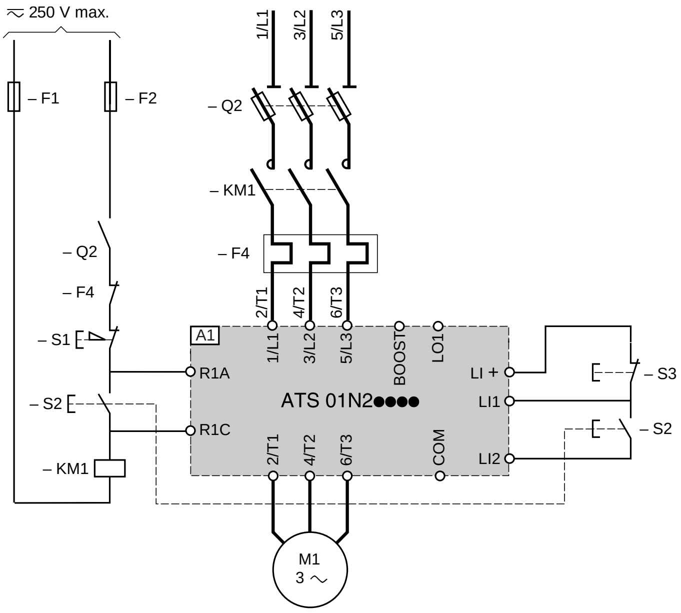
Automatic control with or without deceleration (freewheel), without contactor

ATS 01N206●● to ATS 01N232●●



Automatic control with or without deceleration (freewheel), with contactor

ATS 01N206●● to ATS 01N232●●



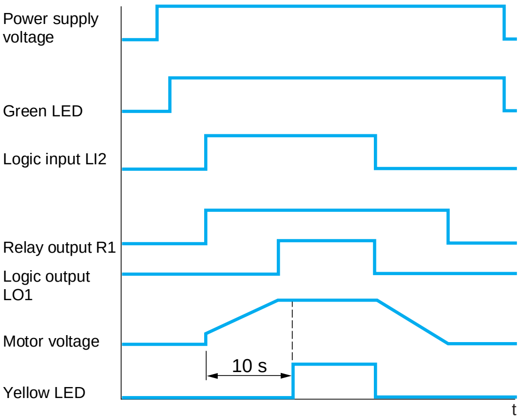
(1) Use shielded wires above 1 m.
(2) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

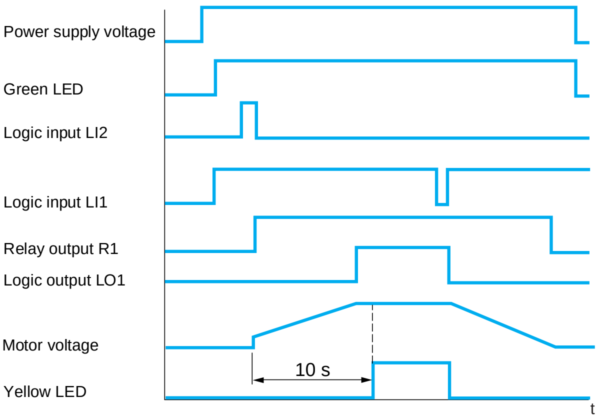
Code	Description
A1	Soft start/soft stop unit
Q1	GV2 ME circuit-breaker
Q2	Fuse switches
F4	Thermal overload relay
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2, S3	XB4 B or XB5 B pushbuttons

Function charts

2-wire control with deceleration



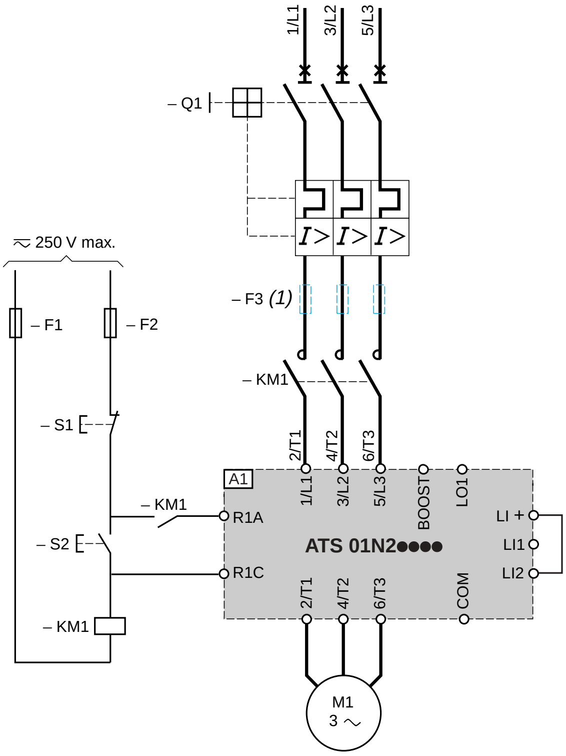
3-wire control with deceleration



ATS 01N2●●LU/QN/RT soft start/soft stop units

Automatic control without deceleration (freewheel), with a maintaining function

ATS 01N206●● to ATS 01N232●●



(1) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

Code	Description
A1	Soft start/soft stop unit
Q1	GV2 ME circuit-breaker
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors

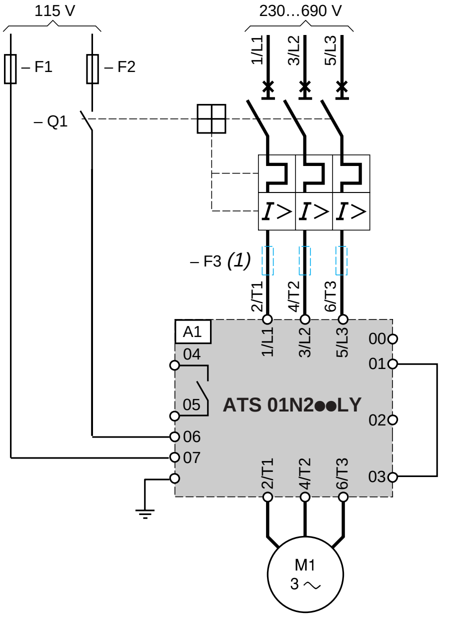
Altistart 01

For 15 to 75 kW motors

ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units (compatible components, see page 1/15)

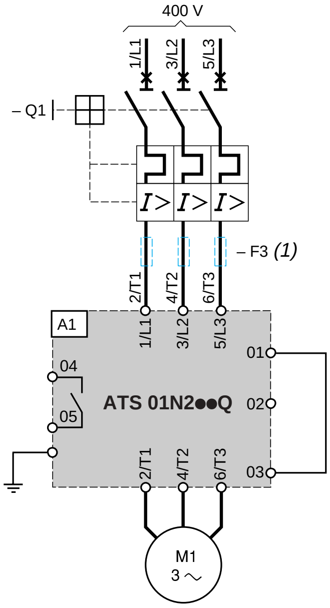
Manual control without deceleration (freewheel), with GV3 and GV7 motor circuit-breaker

ATS 01N230LY to ATS 01N285LY



(1) For type 2 coordination.

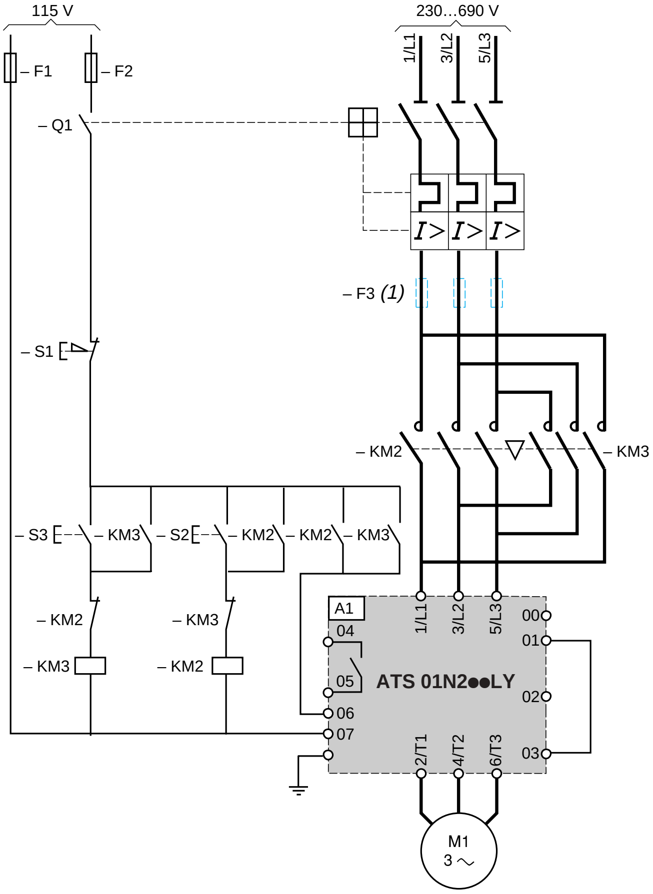
ATS 01N244Q to ATS 01N285Q



(1) For type 2 coordination.

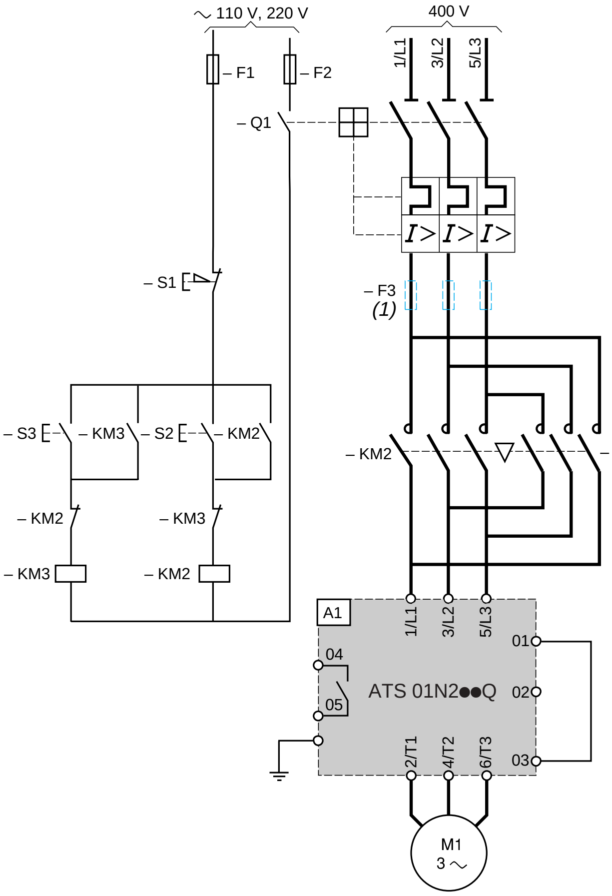
Automatic control with reversal of operating direction, without deceleration (freewheel)

ATS 01N230LY to ATS 01N285LY



(1) For type 2 coordination.

ATS 01N244Q to ATS 01N285Q

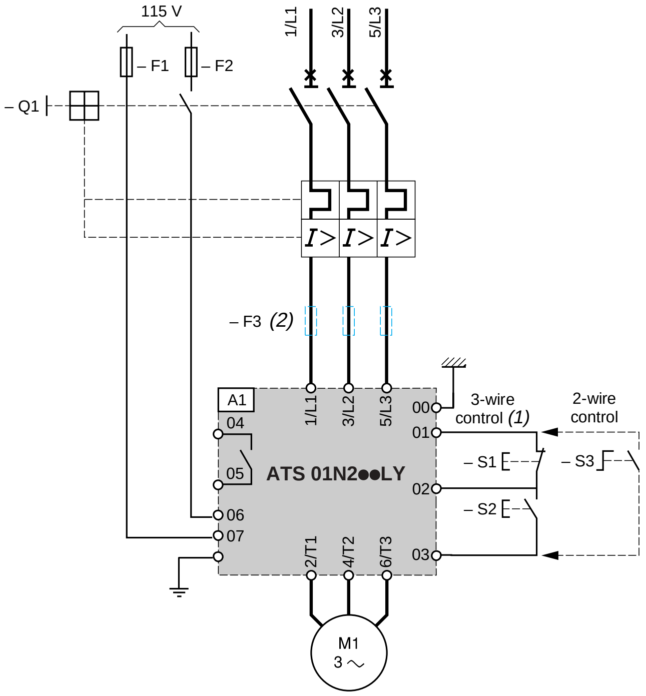


(1) For type 2 coordination.

ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units

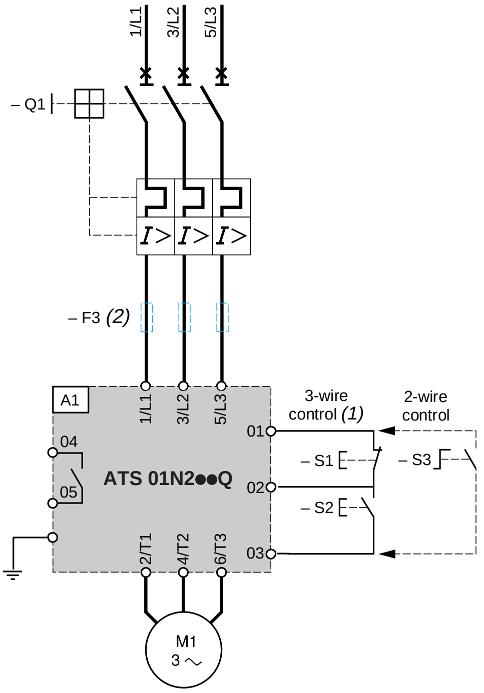
Automatic control with or without deceleration (freewheel), without contactor

ATS 01N230LY to ATS 01N285LY



(1) Use shielded wires above 1 m.
(2) For type 2 coordination.

ATS 01N244Q to ATS 01N285Q



(1) Use shielded wires above 1 m.
(2) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

Code	Description
A1	Soft start/soft stop unit
Q1	GV3 or GV7 circuit-breaker
KM2, KM3	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2, S3	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors

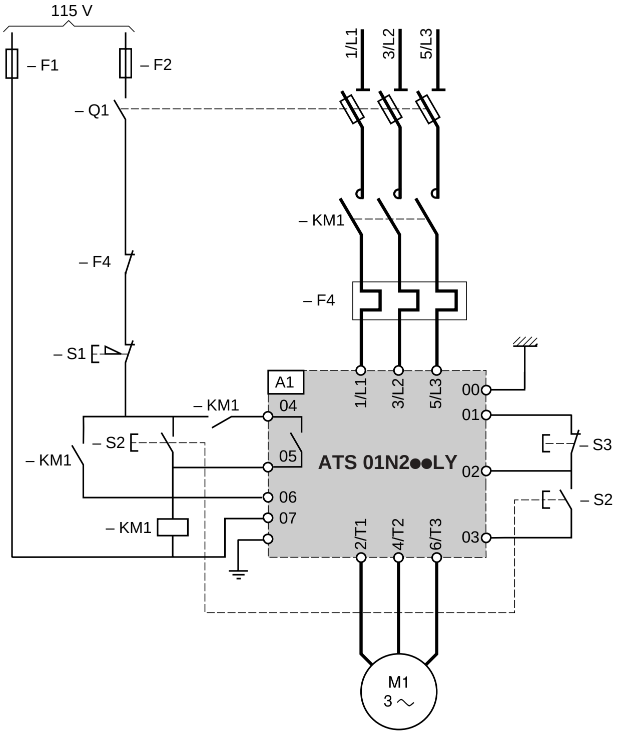
Altistart 01

For 15 to 75 kW motors

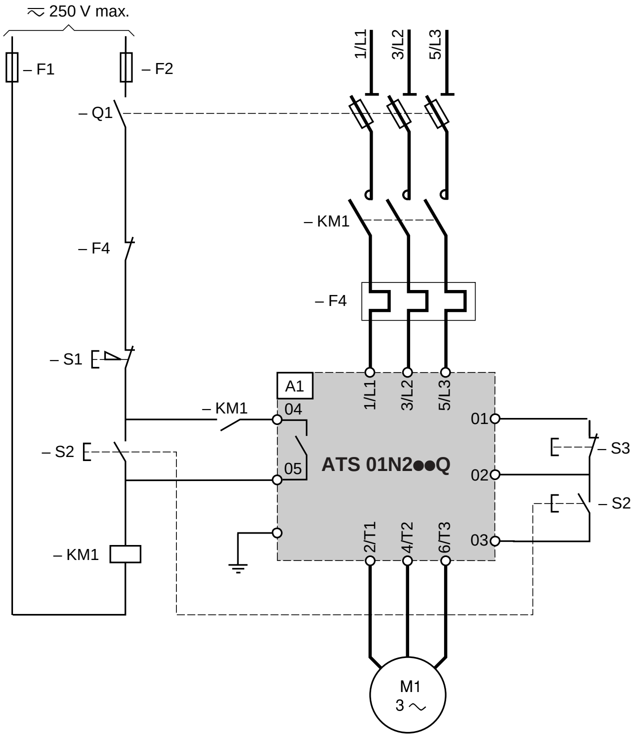
ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units *(continued)*

Automatic control with or without deceleration (freewheel), with contactor

ATS 01N230LY to ATS 01N285LY



ATS 01N244Q to ATS 01N285Q



Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

Code	Description
A1	Soft start/soft stop unit
Q1	GK1 disconnector
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F4	LR2 D thermal overload relay
S1, S2, S3	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors

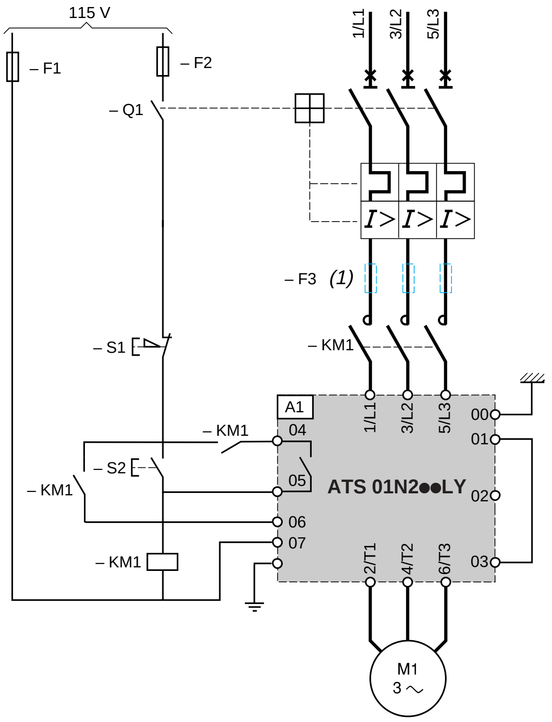
Altistart 01

For 15 to 75 kW motors

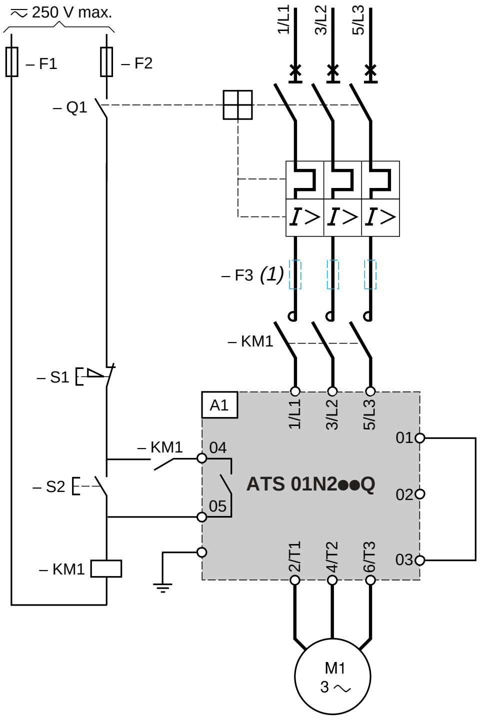
ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units *(continued)*

Automatic control without deceleration (freewheel), with a maintaining function

ATS 01N230LY to ATS 01N285LY



ATS 01N244Q to ATS 01N285Q



(1) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

Code	Description
A1	Soft starter
Q1	GV3 circuit-breaker
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors

Altistart 01

400 V power supply, type 1 coordination

Components to be combined in accordance with standards IEC 60947-1 and IEC 60947-4-2

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		Starter	Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (base unit)	Am fuses		I^2t	Thermal overload relay
		Class 10	Telemecanique	Rating			Reference	Rating		
kW	A			A				A	A^2 s	
M1		A1	Q1		KM1, KM2, KM3	Q2				F4
0.37	0.98	**ATS 01N103FT**	**GV2 ME05**	1	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA02**	2	265	**LR2 K0306** **LRD 05**
0.55	1.5	**ATS 01N103FT**	**GV2 ME06**	1.6	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA02**	2	265	**LR2 K0307** **LRD 06**
0.75	2	**ATS 01N103FT**	**GV2 ME07**	2.5	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA02**	2	265	**LR2 K0308** **LRD 07**
1.1	2.5	**ATS 01N103FT**	**GV2 ME08**	4	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA04**	4	265	**LR2 K0308** **LRD 08**
		ATS 01N206QN	**GV2 ME08**	4	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA04**	4	265	**LR2 K0308** **LRD 08**
1.5	3.5	**ATS 01N106FT**	**GV2 ME08**	4	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA06**	6	265	**LR2 K0310** **LRD 08**
		ATS 01N206QN	**GV2 ME08**	4	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA06**	6	265	**LR2 K0310** **LRD 08**
2.2	5	**ATS 01N106FT**	**GV2 ME10**	6.3	**LC1 K06** or **LC1 D09**	**LS1 D2531**	**DF2 CA08**	8	265	**LR2 K0312** **LRD 10**
		ATS 01N206QN	**GV2 ME10**	6.3	**LC1 K09** or **LC1 D09**	**LS1 D2531**	**DF2 CA08**	8	265	**LR2 K0312** **LRD 10**
3	6.5	**ATS 01N106FT**	**GV2 ME14**	9	**LC1 K09** or **LC1 D09**	**LS1 D2531**	**DF2 CA12**	12	265	**LR2 K0314** **LRD 12**
		ATS 01N206QN	**GV2 ME14**	9	**LC1 K09** or **LC1 D09**	**LS1 D2531**	**DF2 CA12**	12	265	**LR2 K0314** **LRD 12**
4	8.4	**ATS 01N109FT**	**GV2 ME14**	9	**LC1 K09** or **LC1 D09**	**LS1 D2531**	**DF2 CA12**	12	610	**LR2 K0316** **LRD 14**
		ATS 01N209QN	**GV2 ME14**	9	**LC1 K09** or **LC1 D09**	**LS1 D2531**	**DF2 CA12**	12	610	**LR2 K0316** **LRD 14**
5.5	11	**ATS 01N112FT**	**GV2 ME16**	13	**LC1 K12** or **LC1 D12**	**LS1 D2531**	**DF2 CA16**	16	610	**LR2 K0321** **LRD 16**
		ATS 01N212QN	**GV2 ME16**	13	**LC1 K12** or **LC1 D12**	**LS1 D2531**	**DF2 CA16**	16	610	**LR2 K0321** **LRD 16**
7.5	14.8	**ATS 01N222QN**	**GV2 ME20**	17	**LC1 D18**	**LS1 D2531**	**DF2 CA20**	20	6050	**LRD 21**
9	18.1	**ATS 01N222QN**	**GV2 ME21**	21	**LC1 D25**	**LS1 D2531**	**DF2 CA25**	25	6050	**LRD 21**
11	21	**ATS 01N222QN**	**GV2 ME22**	23	**LC1 D25**	**LS1 D2531**	**DF2 CA25**	25	6050	**LRD 22**
15	28.5	**ATS 01N232QN**	**GV2 ME32**	32	**LC1 D32**	**GK1 EM**	**DF2 EA40**	40	7200	**LR2 D3353**
18.5	35	**ATS 01N244Q**	**GV3 ME40**	40	**LC1 D38**	**GK1 EM**	**DF2 EA40**	40	8000	**LR2 D3355**
22	42	**ATS 01N244Q**	**GV3 ME63**	63	**LC1 D50**	**GK1 FM**	**DF2 FA63**	63	8000	**LR2 D3357**
30	57	**ATS 01N272Q**	**GV3 ME63**	63	**LC1 D65**	**GK1 FM**	**DF2 FA63**	63	9000	**LR2 D3359**
37	69	**ATS 01N272Q**	**GV3 ME80**	80	**LC1 D80**	**GK1 FM**	**DF2 FA80**	80	9000	**LR2 D3363**
45	81	**ATS 01N285Q**	**GV7 RE100**	100	**LC1 D95**	**GK1 FM**	**DF2 FA100**	100	9000	**LR2 D3365**

Soft starters for asynchronous motors

Altistart 01

690 V power supply, type 1 coordination

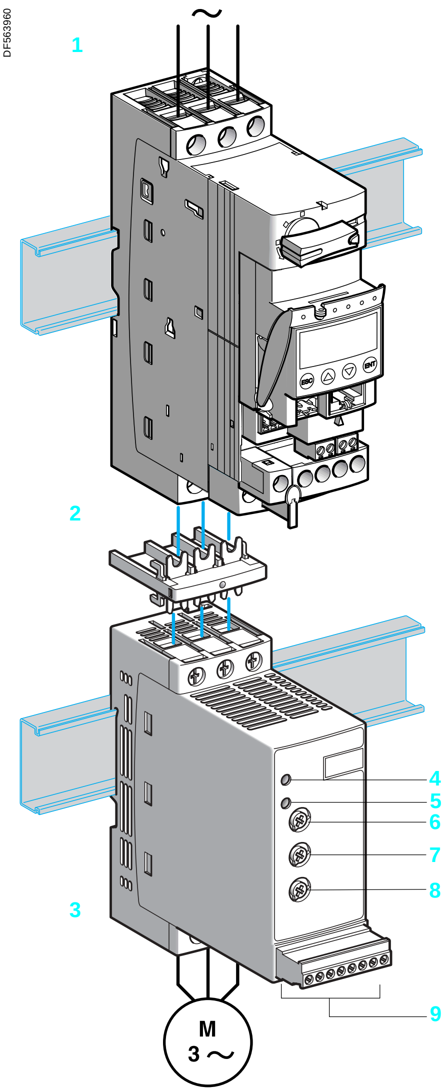
Components to be combined in accordance with standards IEC 60947-1 and IEC 60947-4-2

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		**Starter**	**Type of circuit-breaker**		**Type of contactor**	**Type of switch or switch disconnector (base unit)**	**Am fuses**		**I^2t**	**Thermal overload relay**
		Class 10	**Telemecanique**	**Rating**			**Reference**	**Rating**		
kW	**A**			**A**				**A**	**A^2 s**	
M1		A1	Q1		KM1	Q2				F4
30	33	**ATS 01N230LY**	**GV3 ME40 +** **GV3 A01**	25…40	**LC1 D50**	**GK1 EM**	**DF2 EA40**	40	7200	**LR2 D3355**
37	40	**ATS 01N244LY**	**GV3 ME63 +** **GV3 A01**	40…63	**LC1 D65**	**GK1 FM**	**DF2 FA63**	63	8000	**LR2 D3359**
55	58	**ATS 01N272LY**	**GV3 ME80 +** **GV3 A01**	56…80	**LC1 D115**	**GK1 FM**	**DF2 FA80**	80	9000	**LR2 D3363**
75	75.7	**ATS 01N285LY**	**GV7 RE100 +** **GV7 A11**	60…100	**LC1 D150**	**GK1 FM**	**DF2 FA100**	100	9000	**LR2 D3365**

Soft starters for asynchronous motors

Altistart U01 and TeSys model U



Presentation

The Altistart U01 is a soft start/soft stop unit for asynchronous motors. It is designed primarily for combinations with **TeSys model U** controller-starters.

When combined with a **TeSys model U** 1 controller by means of a connector 2, the Altistart U01 3 is a power option which provides the "Soft start/soft stop" function. The result is a unique, innovative motor starter.

Using the Altistart U01 starter enhances the starting performance of asynchronous motors by allowing the motor to start gradually, smoothly and in a controlled manner. It can also prevent mechanical shocks which lead to wear and tear, and limits the amount of maintenance work and production downtime.
The Altistart U01 limits the starting torque and current peaks on starting, on machines which do not require a high starting torque.

The Altistart U01 is designed for the following simple applications:

- conveyors
- conveyor belts
- pumps
- fans
- compressors
- automatic doors
- small cranes
- belt-driven machines, etc.

The Altistart U01 is compact, easy to install and complies with standards IEC/EN 60947-4-2, with UL, CSA and C-Tick certifications, and has CE marking.

- **ATSU 01N2●●LT** soft start/soft stop units

☐ Control two phases of the motor power supply to limit the starting current and for deceleration.
☐ Internal Bypass relay.
☐ Motor power ratings range from 0.75 kW to 15 kW.
☐ Motor supply voltages range from 200 V to 480 V, 50/60 Hz.
An external power supply is required for controlling the starter.

Description

- Altistart U01 soft start/soft stop units are equipped with:

☐ a potentiometer for controlling the starting time 6
☐ a potentiometer for controlling the deceleration time 8
☐ a potentiometer for adjusting the start voltage threshold according to the motor load 7
☐ 1 green indicator LED 4: device switched on
☐ 1 yellow indicator LED 5: motor powered at nominal voltage
☐ a connector 9:
  - 2 logic inputs for Run/Stop commands
  - 1 logic input for the BOOST function
  - 1 logic output to indicate the end of starting
  - 1 relay output to indicate the starter has a power supply fault or the motor has stopped at the end of the deceleration ramp.

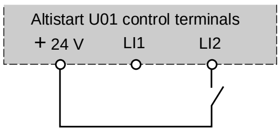
Soft starters for asynchronous motors
Altistart U01 and TeSys model U

Description of a TeSys model U controller-starter

Please consult our “TeSys model U Starters-open version” specialist catalogue.

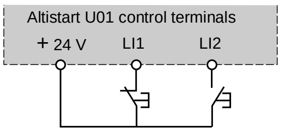
ATSU 01N2●●LT soft start unit functions

■ 2-wire control:
The run and stop commands are controlled by a single logic input. State 1 of logic input LI2 controls the run process and state 0 controls the stop process.



Wiring diagram for 2-wire control

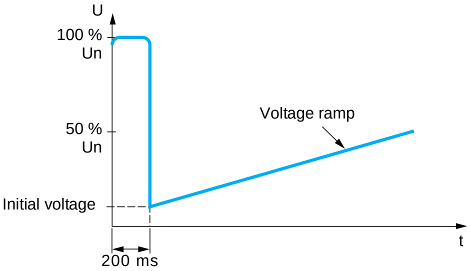
■ 3-wire control:
The run and stop commands are controlled by 2 different logic inputs.
Stopping is achieved when logic input LI1 opens (state 0).
The pulse on input LI2 is maintained until input LI1 opens.



Wiring diagram for 3-wire control

■ Starting time
The starting time setting can be used to adjust the voltage ramp time applied to the motor and to obtain a gradual starting time depending on the motor load.

■ Voltage BOOST function via logic input:
Activating the BOOST logic input enables the function for supplying a starting overtorque capable of overcoming any mechanical friction.
When the input is at state 1, the function is active (input connected to the + 24 V) and the starter supplies a fixed voltage to the motor for a limited time before starting.



Application of a voltage BOOST equal to 100% of the nominal motor voltage

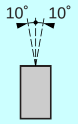
■ End of starting
□ Logic output LO1 application function
ATSU 01N2●●LT soft start/soft stop units are equipped with an open collector logic output LO, which indicates the end of starting when the motor has reached nominal speed.

■ Fault relay
ATSU 01N2●●LT soft start/soft stop units have a relay which opens when a fault is detected.
The contact of relay R1A-R1C closes when the LI2 run command is sent and opens when the motor voltage approaches 0V on a decelerated stop or instantly in the event of a fault.
This information can be used for controlling the line contactor and achieving motor deceleration (by maintaining the line contactor until the motor has stopped).

Soft starters for asynchronous motors

Altistart U01 and TeSys model U

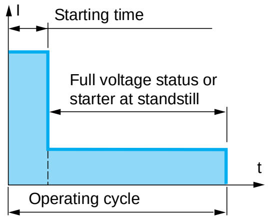
Environment characteristics

Type of starter			**ATSU 01N2●●LT**
Conforming to standards			Altistart U01 electronic starters have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular standard IEC/EN 60947-4-2.
Electromagnetic compatibility EMC	Conducted and radiated emissions		CISPR 11 level B, IEC 60947-4-2, level B
	Harmonics		IEC 1000-3-2, IEC 1000-3-4
	EMC immunity		EN 50082-2, EN 50082-1
	Electrostatic discharge		IEC 61000-4-2 level 3
	Immunity to radiated radio-electrical interference		IEC 61000-4-3 level 3
	Immunity to electrical transients		IEC 61000-4-4 level 4
	Voltage/current impulse		IEC 61000-4-5 level 3
	Conducted and radiated emissions		IEC 61000-4-6 level 3
	Immunity to conducted interference caused by radio-electrical fields		IEC 61000-4-11
	Damped oscillating waves		IEC 61000-4-12 level 3
CE marking			The starters bear CE marking in accordance with the European low voltage directives IEC/EN 60947-4-2.
Product certification			UL, CSA and C-Tick
Degree of protection			IP 20
Degree of pollution			2 conforming to IEC/EN 60947-4-2
Vibration resistance			1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz conforming to IEC/EN 60068-2-6
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity			5...95% without condensation or dripping water, conforming to IEC/EN 60068-2-3
Ambient temperature around the unit	Storage	**°C**	- 25…+ 70 conforming to IEC/EN 60947-4-2
	Operation	**°C**	- 10…+ 40 without derating, up to 50°C with current derating of 2% per °C above 40°C
Maximum operating altitude		**m**	1000 without derating (above this, derate the current by 2.2% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Electrical characteristics

Type of starter			**ATSU 01N2●●LT**
Category of use	Conforming to IEC 60947-4-2		Ac-53b
Rated operating voltage	3-phase ∼ voltage	**V**	200 - 15% to 480 + 10%
Frequency		**Hz**	50 - 5% to 60 + 5%
Output voltage			Maximum 3-phase voltage equal to line supply voltage.
Control supply voltage			⎓ 24 V, 100 mA ± 10%
Rated operating current		**A**	6...32
Adjustable starting time		**s**	1...10
Adjustable deceleration time		**s**	1...10
Starting torque		**%**	30...80% of starting torque of motor connected directly on the line supply

Type of starter	**ATSU**		**01N206LT**	**01N209LT**	**01N212LT**	**01N222LT**	**01N232LT**
Control power supply consumption			⎓ 24 V, 65 mA			⎓ 24 V, 100 mA	
Power dissipated	At full load at end of starting	**W**	1.5	1.5	1.5	2.5	2.5
	In transient state at 5 times the rated operating current	**W**	61.5	91.5	121.5	222.5	322.5

Type of starter			**ATSU 01N206LT to ATSU 01N222LT**		**ATSU 01N232LT**	
Use 	Starting time	**s**	1	5	1	5
	Maximum number of cycles per hour		310	20	180	10

Presentation:
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Dimensions:
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Soft starters for asynchronous motors
Altistart U01 and TeSys model U

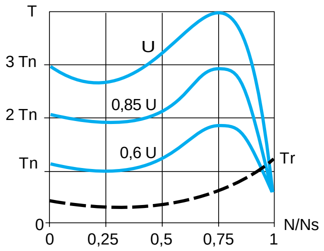
Electrical characteristics (continued)

Logic input power supply (electrically isolated between power and control) **+ 24 V, COM**			24 V ±10% Isolated Max. current 100 mA
Logic inputs **LI1, LI2, BOOST** Stop, run and boost on start-up functions			Logic inputs with impedance 27 kΩ ; 24 V power supply (U max 40 V) Max current 8 mA State 0 if U < 5 V and I < 0.2 mA State 1 if U > 13 V and I > 0.5 mA
Logic output LO1 End of starting signal			Open collector logic output External 24 V power supply (minimum 6 V maximum 30 V) Max current 200 mA
Relay output **R1A R1C**			Normally open (N/O) contact (contact open in fault mode) Minimum switching capacity: 10 mA for ⎓ 6 V Max. switching capacity on inductive load (cos φ = 0.5 and L/R = 20 ms): 2 A for ∼ 250 V or ⎓ 30 V (AC-15) Max. operating voltage 440 V
LED signalling	Green LED		Starter powered up
	Yellow LED		Nominal voltage reached

Connections (maximum connection capacity and tightening torque)

Power circuit			Connection onto Ø 4 mm screw terminals	
Flexible wire without cable end	1 conductor	**mm²**	1.5…10	8 AWG
	2 conductors	**mm²**	1.5…6	10 AWG
Flexible wire with cable end	1 conductor	**mm²**	1…6	10 AWG
	2 conductors	**mm²**	1…6	10 AWG
Rigid wire	1 conductor	**mm²**	1…10	8 AWG
	2 conductors	**mm²**	1…6	10 AWG
Tightening torque		**N.m**	1.9…2.5	
Control circuit			Screw connector	
Flexible wire without cable end	1 conductor	**mm²**	0.5…2.5	14 AWG
	2 conductors	**mm²**	0.5…1.5	16 AWG
Flexible wire with cable end	1 conductor	**mm²**	0.5…1.5	16 AWG
	2 conductors	**mm²**	0.5…1.5	16 AWG
Rigid wire	1 conductor	**mm²**	0.5…2.5	14 AWG
	2 conductors	**mm²**	0.5…1	17 AWG
Tightening torque		**N.m**	0.5	

Torque characteristics (typical curves)



The diagram opposite shows the torque/speed characteristic of a cage motor in relation to the supply voltage.
The torque varies in line with the square of the voltage at a fixed frequency. The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Soft starters for asynchronous motors

Altistart U01 and TeSys model U

ATSU 01N222LT

Soft start/soft stop unit for 0.75 to 15 kW motors

(can be combined with the TeSys model U starter)

Motor				Starter		
Motor power *(1)*				Nominal current	Reference	Weight
230 V	230 V	400 V	460 V			
kW	*HP*	kW	*HP*	A		kg
3-phase supply voltage: 200…480 V 50/60 Hz						
0.75 1.1	*1* *1.5*	1.5 2.2 3	*2* *3*	6	**ATSU 01N206LT**	0.340
1.5 –	*2* –	– 4	*5* –	9	**ATSU 01N209LT**	0.340
2.2 3	*3* –	5.5 –	*7.5* –	12	**ATSU 01N212LT**	0.340
4 5.5	*5* *7.5*	7.5 11	*10* *15*	22	**ATSU 01N222LT**	0.490
7.5	*10*	15	*20*	32	**ATSU 01N232LT**	0.490

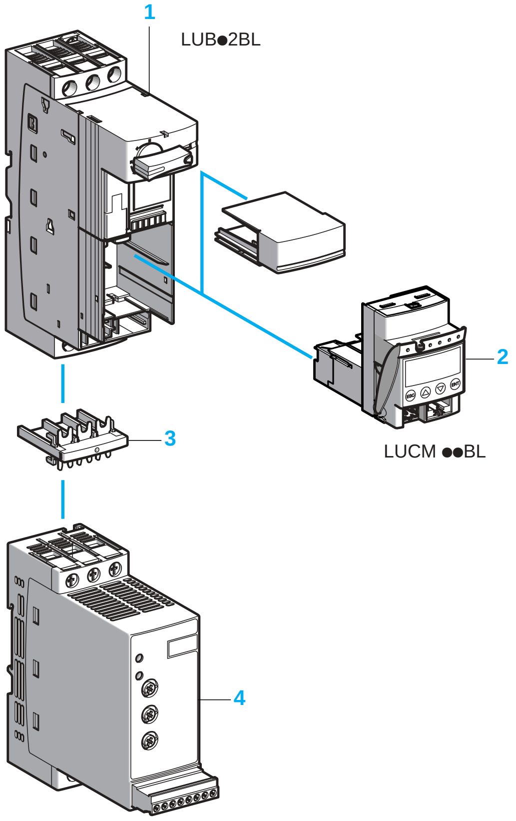
Accessorie

Description	Used for starter	Reference	Weight kg
Power connector between ATSU 01N2●●LT and TeSys model U	ATSU 01N2●●LT	**VW3 G4104**	0.020

TeSys model U starter and soft start unit combinations

Numerous possibilities for combinations and options are offered.
Please consult the “TeSys model U Starters-open version” specialist catalogue.

Motor power			Soft starter	TeSys model U	
Voltage				Power base	Control unit *(2)*
230 V kW/*HP*	400 V kW	460 V *HP*			
0.75/*1*	1.5	*2*	ATSU 01N206LT	LUB 12	LUC● 05BL
1.1/*1.5*	2.2/3	*3*	ATSU 01N206LT	LUB 12	LUC● 12BL
1.5/*2*	–	–	ATSU 01N209LT	LUB 12	LUC● 12BL
–	4	*5*	ATSU 01N209LT	LUB 12	LUC● 12BL
2.2/*3*	–	–	ATSU 01N212LT	LUB 12	LUC● 12BL
3/–	5.5	*7.5*	ATSU 01N212LT	LUB 32	LUC● 18BL
4/*5*	7.5	*10*	ATSU 01N222LT	LUB 32	LUC● 18BL
5.5/*7.5*	11	*15*	ATSU 01N222LT	LUB 32	LUC● 32BL
7.5/*10*	15	*20*	ATSU 01N232LT	LUB 32	LUC● 32BL



ATSU 01N2●●LT

Example of a starter-motor combination with:
1 non-reversing power base for DOL starting (LUB●2BL)
2 control unit (LUCM ●●BL)
3 power connector (VW3 G4104)
4 Altistart U01soft start/soft stop unit (ATSU 01N2●●LT)

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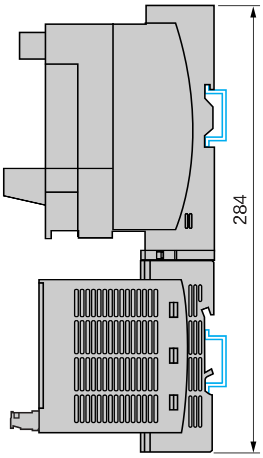
(1) Standard motor power ratings, HP power ratings indicated according to standard UL 508.
(2) Depending on the configuration of the chosen TeSys model U starter, replace the ● with A for standard, B for expandable, and M for multifunction.

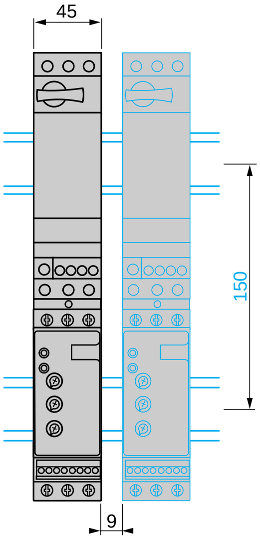
Soft starters for asynchronous motors

Altistart U01 and TeSys model U

TeSys model U combination (non-reversing power base) and ATSU 01N206LT to ATSU 01N212LT

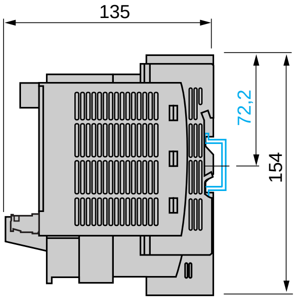
Mounting on ⌴ (35 mm) rail with VW3 G4104 connector

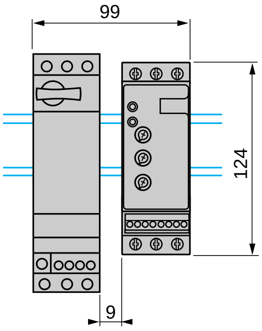




TeSys model U combination (non-reversing or reversing power base) and ATSU 01N206LT to ATSU 01N212LT

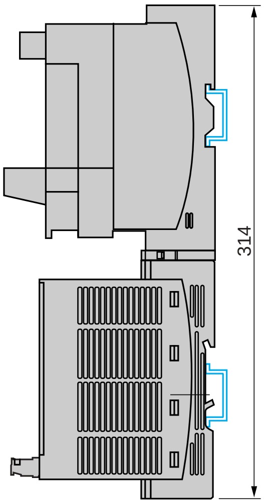
Side by side mounting

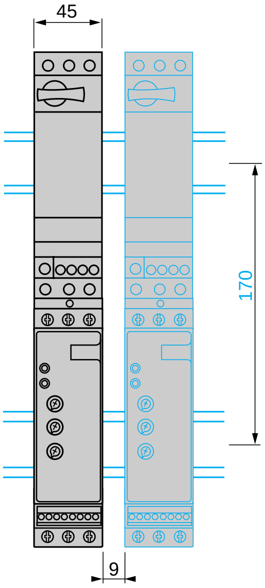




TeSys model U combination (non-reversing power base) and ATSU 01N222LT to ATSU 01N232LT

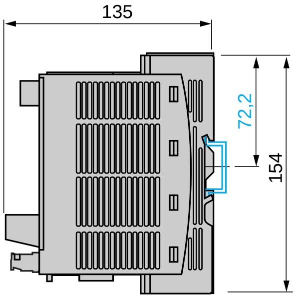
Mounting on ⌴ (35 mm) rail with VW3 G4104 connector

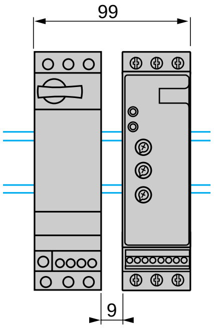




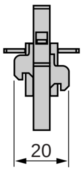
TeSys model U combination (non-reversing or reversing power base) and ATSU 01N222LT to ATSU 01N232LT

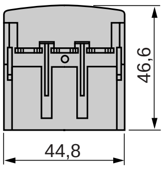
Side by side mounting

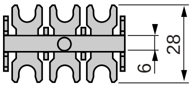




VW3 G4104 connector







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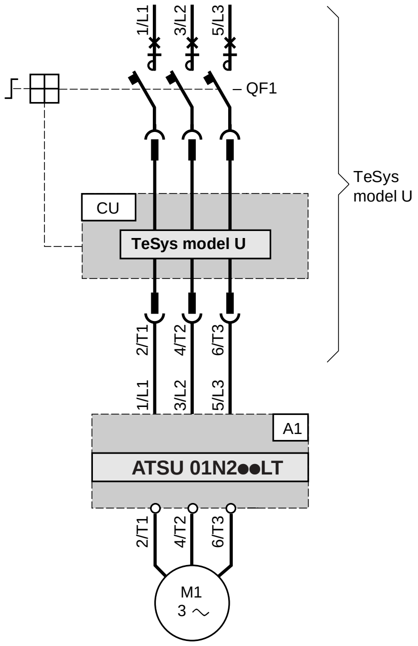
Soft starters for asynchronous motors

Altistart U01 and TeSys model U

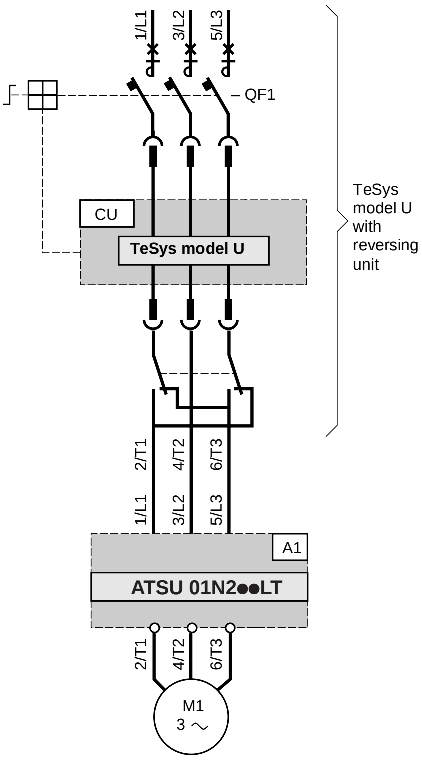
For 0.75 to 15 kW motors

ATSU 01N2●●LT soft start/soft stop units

Power wiring



Power wiring with reversing unit



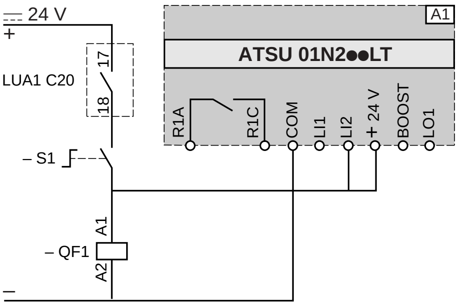
Compatible components (For full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”)

Code	Description
A1	Soft start/soft stop unit
QF1	TeSys model U controller-starter
CU	TeSys model U control unit

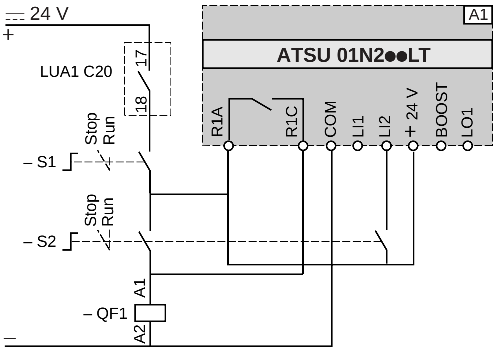
ATSU 01N2●●LT soft start/soft stop units *(continued)*

Automatic 2-wire control

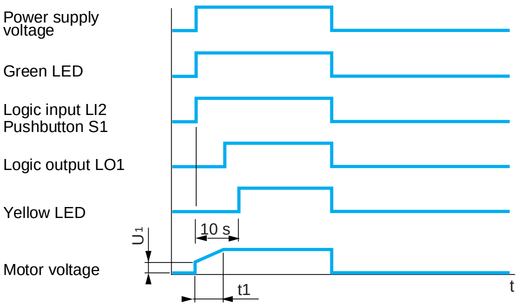
Without deceleration

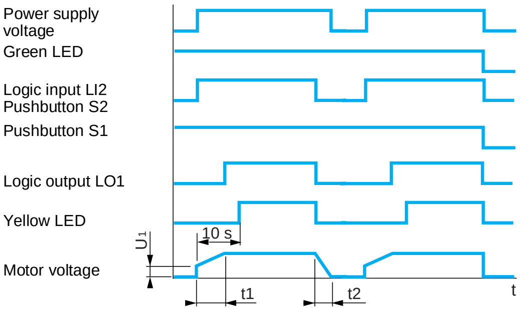


With and without deceleration



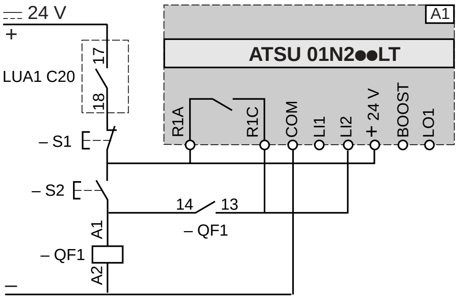
Functional diagrams



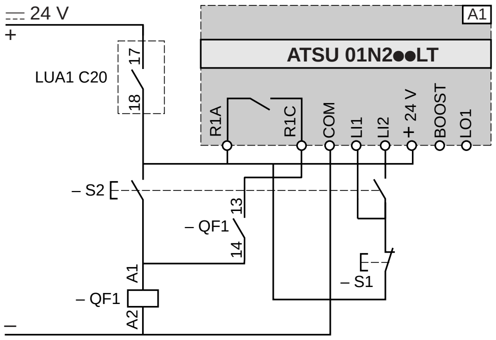


Automatic 3-wire control

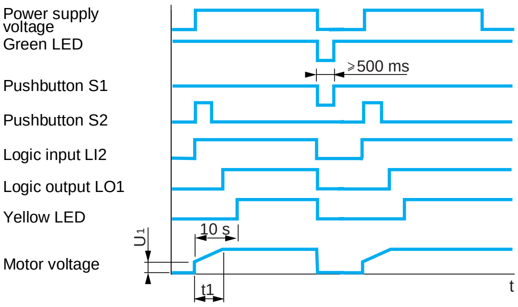
Without deceleration

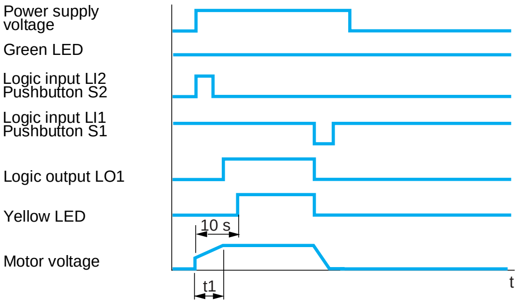


With deceleration



Functional diagrams





A1: Soft start/soft stop unit
S1, S2: XB4 B or XB5 B pushbuttons
QF1: TeSys model U controller-starter
t1: Acceleration time can be controlled by a potentiometer
t2: Deceleration time can be controlled by a potentiometer
U_1: Starting time can be controlled by a potentiometer

Presentation:
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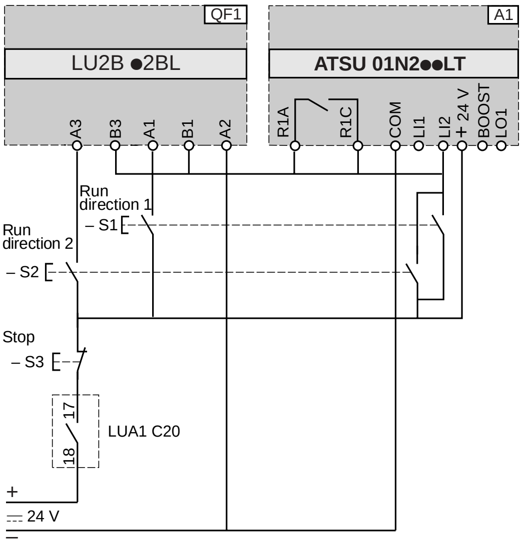
ATSU 01N2●●LT soft start/soft stop units *(continued)*

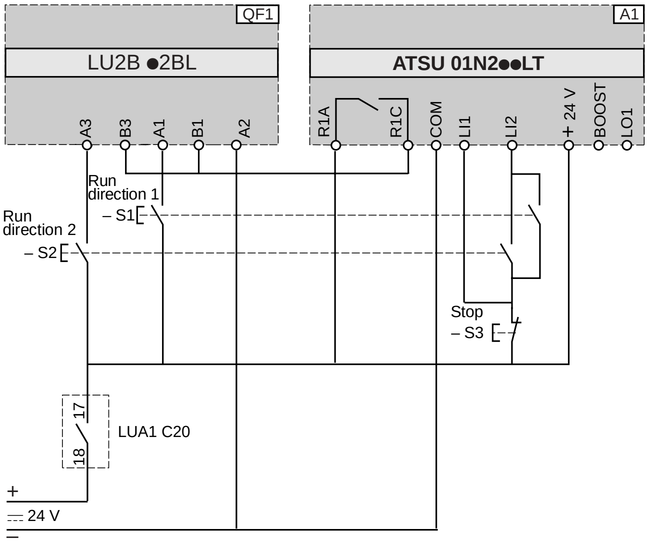
Automatic 3-wire control, with reversing unit

Without deceleration



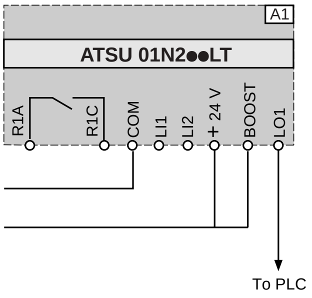
QF1: TeSys model U controller-starter with reversing unit
A1: Soft start/soft stop unit
S1, S2, S3: XB4 B or XB5 B pushbuttons
S3: minimum depression time 500 ms

With deceleration



QF1: TeSys model U controller-starter with reversing unit
A1: Soft start/soft stop unit
S1, S2, S3: XB4 B or XB5 B pushbuttons

Boost on starting and end of starting signal



A1: Soft start/soft stop unit

Soft starters for asynchronous motors

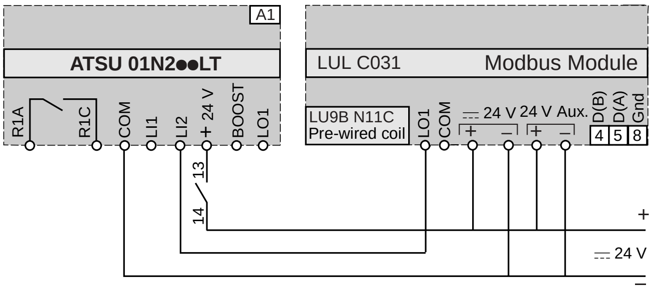
Altistart U01 and TeSys model U

For 0.75 to 15 kW motors

ATSU 01N2●●LT soft start/soft stop units *(continued)*

Automatic control with Modbus communication module, with and without deceleration

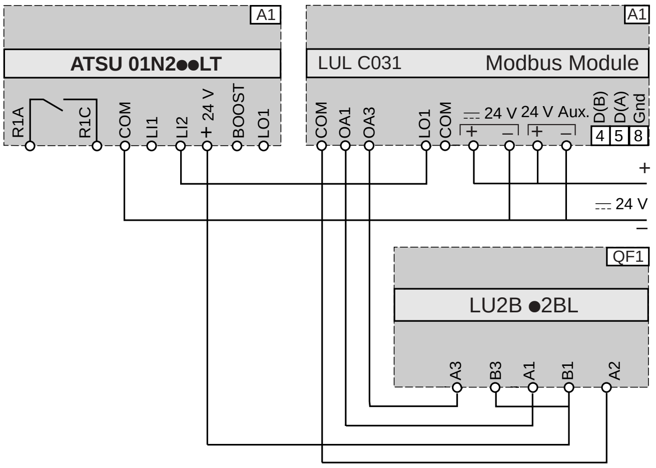
Without reversing unit



Function	Register	Bit	Value
Powering down TeSys U and ATSU			
–	704	0	0
Automatic control without deceleration			
Run	700	0	1
Stop	704	0	0
Automatic control with deceleration			
Run	700	0	1
Soft stop	700	0	0

A1: Soft start/soft stop unit

With reversing unit

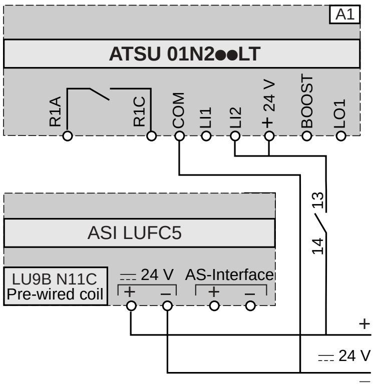


Function	Register	Bit	Value
Powering up TeSys U and ATSU			
Forward	704	0	1
Reverse	704	1	1
Powering down TeSys U and ATSU			
Forward	704	0	0
Reverse	704	1	0
Automatic control without deceleration			
Run	700	0	1
Stop forward	704	0	0
Stop reverse	704	1	0
Automatic control with deceleration (forward or reverse)			
Run	700	0	1
Soft stop	700	0	0

A1: Soft start/soft stop unit
QF1: TeSys model U controller-starter with reversing unit

Automatic control with AS-Interface communication module, without deceleration

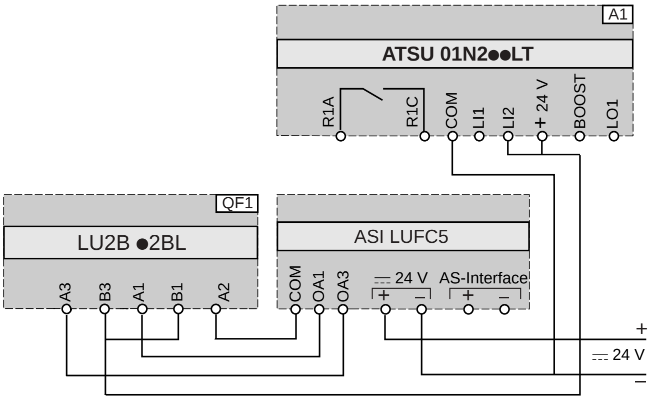
Without reversing unit



Function	Bit	Value
Power-up and automatic control without deceleration		
Run	D0	1
Stop	D0	0

A1: Soft start/soft stop unit

With reversing unit



Function	Bit	Value
Power-up and automatic control without deceleration		
Run forward	D0	1
Stop	D0	0
Run reverse	D1	1
Stop	D1	0

A1: Soft start/soft stop unit
QF1: TeSys model U controller-starter with reversing unit

Presentation:
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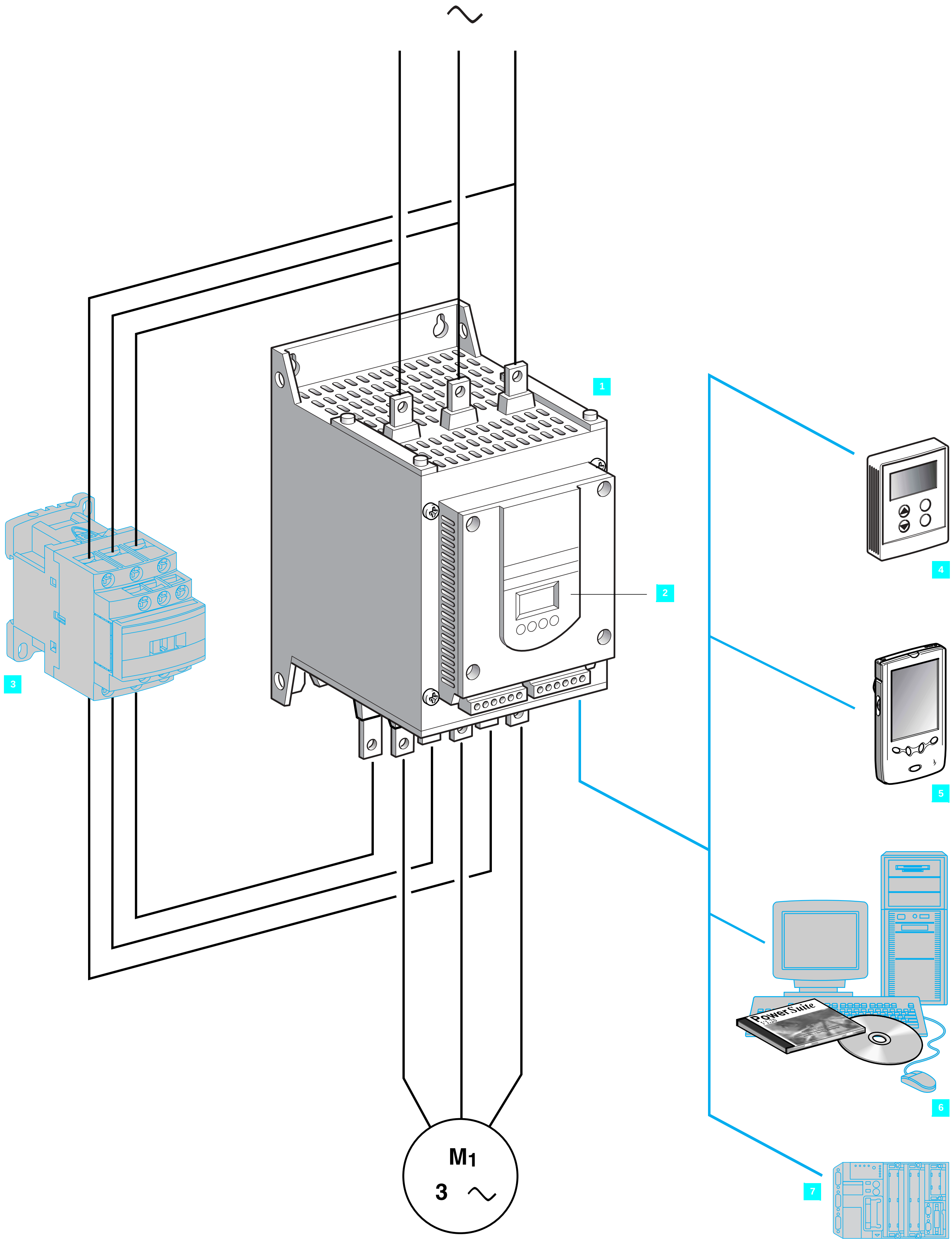
Soft starters

Altistart 48 soft start - soft stop units



Soft starters

Altistart 48 soft start - soft stop units

Applications

The Altistart 48 soft start - soft stop unit is a controller with 6 thyristors which is used for the torque-controlled soft starting and stopping of three-phase squirrel cage asynchronous motors in the power range between 4 and 1200 kW.

It offers soft starting and deceleration functions along with machine and motor protection functions as well as functions for communicating with control systems. These functions are designed for use in state-of-the-art applications in centrifugal machines, pumps, fans, compressors and conveyors, which are primarily to be found in the construction, food and beverages and chemical industries. The high-performance algorithms of the Altistart 48 contribute significantly to its robustness, safety and ease of setup.

The Altistart 48 soft start - soft stop unit is a cost-effective solution which can:
- ■ reduce machine operating costs by reducing mechanical stress and improving machine availability,
- ■ reduce the stress placed on the electrical distribution system by reducing line current peaks and voltage drops during motor starts.

The Altistart soft start - soft stop unit offer comprises 2 ranges:
- ■ three-phase voltages 230 to 415 V, 50/60 Hz,
- ■ three-phase voltages 208 to 690 V, 50/60 Hz.

In each voltage range, the Altistart soft start - soft stop units are dimensioned for standard and severe applications.

Functions

The Altistart 48 soft start - soft stop unit (1) is supplied ready for use in a standard application with motor protection class 10 (see page 1/71).
It comprises a built-in terminal (2) which can be used to modify programming, adjustment or monitoring functions in order to adapt and customise the application to meet individual customer requirements.

■ **Drive performance functions**:
- ☐ exclusive Altistart torque control (patented by Schneider Electric),
- ☐ constant control of the torque supplied to the motor during acceleration and deceleration periods (significantly reducing pressure surges),
- ☐ facility for adjusting the ramp and the starting torque,
- ☐ the starter can be bypassed using a contactor (3) at the end of the starting period whilst maintaining electronic protection (by-pass function),
- ☐ wide frequency tolerance for generator set power supplies,
- ☐ the starter can be connected to the motor delta terminals in series with each winding.

■ **Machine and motor protection functions**:
- ☐ built-in motor thermal protection,
- ☐ processing of information from PTC thermal probes,
- ☐ monitoring of the starting time,
- ☐ motor preheating function,
- ☐ protection against underloads and overcurrents during continuous operation.

■ **Functions facilitating the integration of the unit into control systems**:
- ☐ 4 logic inputs, 2 logic outputs, 3 relay outputs and 1 analogue output,
- ☐ plug-in I/O connectors,
- ☐ function for configuring a second motor and easy-to-adapt settings,
- ☐ display of electrical values, the state of the load and the operating time,
- ☐ RS 485 serial link for connection to Modbus.

Options

A remote terminal (4) can be mounted on the door of a wall-fixing or floor-standing enclosure.
PowerSuite advanced dialogue solutions:
- ■ PowerSuite Pocket PC with PPC type terminal (5),
- ■ PowerSuite software workshop (6).

A range of wiring accessories for connecting the starter to PLCs via a Modbus connection (7).
Bus communication and Ethernet, Fipio, DeviceNet and Profibus DP network communication options.

Characteristics:
pages 1/32 to 1/35
References:
pages 1/40 to 1/43
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Schemes:
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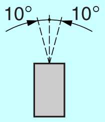
Soft starters

Altistart 48 soft start - soft stop units

Environment characteristics

Conforming to standards			The electronic starters have been developed and performance tested in accordance with international standards, in particular with the starter product standard EN/IEC 60947-4-2.
CE marking			Products have CE marking in accordance with the harmonised standard EN/IEC 60947-4-2.
Product certifications			UL, CSA Pending: DNV, C-Tick, Gost, CCIB
Degree of protection	Starters ATS 48D17● to 48C11●		IP 20 (IP 00 in the absence of connections)
	Starters ATS 48C14● to 48M12● *(1)*		IP 00
Vibration resistance	Conforming to IEC 60068-2-6		1.5 mm from 2 to 13 Hz 1 gn from 13 to 200 Hz
Shock resistance	Conforming to IEC 60068-2-27		15 gn for 11 ms
Starter noise level *(2)*	Starters ATS 48D32● to D47●	**dBA**	52
	Starters ATS 48D62● to C11●	**dBA**	58
	Starters ATS 48C14● to C17●	**dBA**	50
	Starters ATS 48C21● to C32●	**dBA**	54
	Starters ATS 48C41● to C66●	**dBA**	55
	Starters ATS 48C79● to M12●	**dBA**	60
Fans	Starters ATS 48D17● and D22●		Natural convection
	Starters ATS 48D32● to M12●		Forced convection. The fans are activated automatically when a temperature threshold is reached. For flow rate: see page 1/51.
Ambient temperature around the unit	Operation	**°C**	- 10...+ 40 without derating (between + 40 and + 60, derate the nominal current of the Altistart by 2 % for each °C).
	Storage, conforming to IEC 60947-4-2	**°C**	- 25...+ 70
Maximum relative humidity	Conforming to IEC 60068-2-3		95 % without condensation or dripping water
Maximum ambient pollution	Conforming to IEC 60664-1		Level 3
Maximum operating altitude		**m**	1000 without derating (above this, derate the nominal current of the Altistart by 2.2 % for each additional 100 m). Limit to 2000 m
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Electrical characteristics

Operating category	Conforming to IEC 60947-4-2		AC-53a
Three-phase supply voltage	Starters ATS 48●●●Q	**V**	230 - 15 % to 415 + 10 %
	Starters ATS 48●●●Y	**V**	208 - 15 % to 690 + 10 %
Frequency		**Hz**	50/60 ± 5 % (automatic) 50 or 60 ± 20 % (must be set)
Nominal starter current	Starters ATS 48●●●Q	**A**	17...1200
	Starters ATS 48●●●Y	**A**	17 to 1200
Motor power	Starters ATS 48●●●Q	**kW**	4 to 630
	Starters ATS 48●●●Y	**kW/HP**	5.5 to 900/5 to 1200
Voltage indicated on the motor rating plate	Starters ATS 48●●●Q	**V**	230 to 415
	Starters ATS 48●●●Y	**V**	208 to 690
Starter control circuit supply voltage	Starters ATS 48●●●Q	**V**	220 - 15 % to 415 + 10 %, 50/60 Hz
	Starters ATS 48●●●Y	**V**	110 - 15 % to 230 + 10 %, 50/60 Hz
Maximum control circuit consumption (with fans operating)	Starters ATS 48D17● to C17●	**W**	30
	Starters ATS 48C21● to C32●	**W**	50
	Starters ATS 48C41● to M12●	**W**	80
Relay output (2 configurable outputs)	3 relay outputs (R1, R2, R3), normally open contacts 1 "N/O" Minimum switching capacity: 10 mA for ⎓ 6 V Maximum switching capacity on inductive load: 1.8 A for ∿ 230 V and ⎓ 30 V (cos φ= 0.5 and L/R=20ms). Maximum nominal operating voltage ∿ 400 V Factory setting: R1 assigned as the "fault relay" (configurable) R2 assigned as the "end of starting relay" to control the starter bypass relay R3 assigned as "motor powered" (configurable)		

(1) Protective covers can be fitted to the power terminals of ATS 48C14● to C32● starters. ATS 48C41● to 48M12● starters have protection on the front panel and on the sides.

(2) Starters located 1 m away. The noise levels may change depending on the characteristics of the fans.

Electrical characteristics (continued)

Logic inputs LI (2 configurable inputs)		4 logic inputs, impedance 4.3 kΩ, isolated: Stop, Run, LI3, LI4 + 24 V power supply (maximum 30 V) I max. 8 mA State 0 if U < 5 V and I < 2 mA State 1 if U > 11 V and I > 5 mA
Internal source available		1 x + 24 V output, isolated and protected against short-circuits and overloads Accuracy ± 25%. Max. current 200 mA
Logic outputs LO (configurable)		2 logic outputs LO1 and LO2 with 0 V common, compatible with level 1 PLC, according to standard IEC 65A-68 + 24 V power supply (minimum: + 12 V, maximum: + 30 V) Maximum output current: 200 mA if supplied externally
Analogue output AO (configurable)		Current output 0-20 mA or 4-20 mA Maximum load impedance: 500 Ω Accuracy ± 5% of the maximum value
Input for PTC probe		Total resistance of probe circuit 750 Ω at 25°C, according to IEC 60 738-A
Maximum I/O connection capacity		2.5 mm^2 (AWG 12)
Communication		RS 485 multidrop serial link integrated in the starter, for Modbus, with RJ45 type connector Transmission speed 4800, 9600 or 19200 bps Maximum number of Altistart 48 connected: 18 Other uses: - connection to a remote terminal, or - connection to a PC, or - connection to other buses and networks via communication options.
Protection	Thermal	Built-in, starter and motor (calculated and/or thermal protection with PTC probes)
	Line protection	Phase failure, indicated by output relay
Current settings		The nominal motor current In can be adjusted from 0.4 to 1.3 times the starter nominal current. Adjustment of the maximum starting current from 1.5 to 7 times the motor In, limited to 5 times the starter nominal current.
Starting mode		By torque control with starter current limited to 5 In maximum Factory setting: 4 In for standard operation on 15 s torque ramp
Stopping mode	Freewheel stop	"Freewheel" stop (factory setting)
	Controlled stop on torque ramp	Programmed between 0.5 and 60 s (for pump applications)
	Braked stop	Controlled dynamically by the flux

Electromagnetic compatibility EMC *(1)*

	Standards	Test levels	Examples (sources of interference)
Summary of immunity tests carried out with the Altistart 48	**IEC 61000-4-2 level 3** Electrostatic discharge: - by contact, - in the air.	6 kV 8 kV	Contact off an electrically charged individual
	IEC 61000-4-3 level 3 Radiated electromagnetic fields	10 V/m	Equipment transmitting radio frequencies
	IEC 61000-4-4 level 4 Rapid electrical transients: - power supply cables, - control cables.	4 kV 2 kV	Opening/closing of a contactor
	IEC 61000-4-5 level 3 Shock wave: - phase/phase, - phase/earth.	1 kV 2 kV	-
	IEC 61000-4-12 level 3 Damped oscillating waves	1 kV - 1 M Hz	Oscillating circuit on the line supply
Radiated and conducted emissions	According to IEC 60947-4-2, class A, on all starters		
	According to IEC 60947-4-2, class B, on starters up to 170 A: ATS 48D17● to 48C17●. Must be bypassed at the end of starting		

(1) The starters conform to product standard IEC 60947-4-2, in particular with regard to EMC. This standard ensures a level of immunity for products and a level of emitted interference. In steady state, the interference emitted is below that required by the standard. During acceleration and deceleration phases, low level loads may be affected by low frequency interference (harmonics). To reduce this interference, connect chokes between the line supply and the Altistart 48 (see page 1/45).

Note:

■ Power factor correction capacitors can only be used upstream of the Altistart and only powered up at the end of starting.

■ The starter must be earthed to conform to the regulations concerning leakage currents (⩽ 30 mA). When the use of an upstream "residual current device" for protection is required by the installation standards, an AS-Interface type device must be used. Check its compatibility with the other protective devices. If the installation involves several starters on the same line supply, each starter must be earthed separately.

Presentation:
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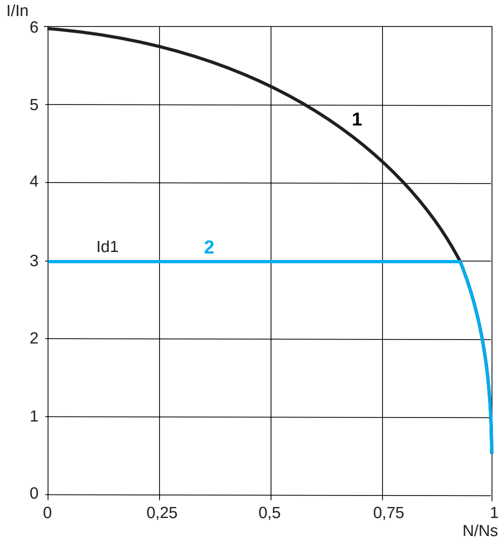
Torque characteristics

Curves indicating changes in the torque depending on the starting current of a three-phase asynchronous motor.
Curves 1: direct line starting.
Curves 2: starting in current limiting mode.
Torque curve Ts1 indicates the total torque range available depending on the limiting current Is1.
Limiting the starting current Is to a preset value Is1 will reduce the starting torque Ts1 to a value which is almost equal to the square of currents Is1/Is.
Example:
for motor characteristics: Ts = 3 Tn for Is = 6 In,
limit the current to Is1 = 3 In (0.5 Is)
resulting in a starting torque Ts1 = Ts x (0.5)² = 3 Tn x 0.25 = 0.75 Tn

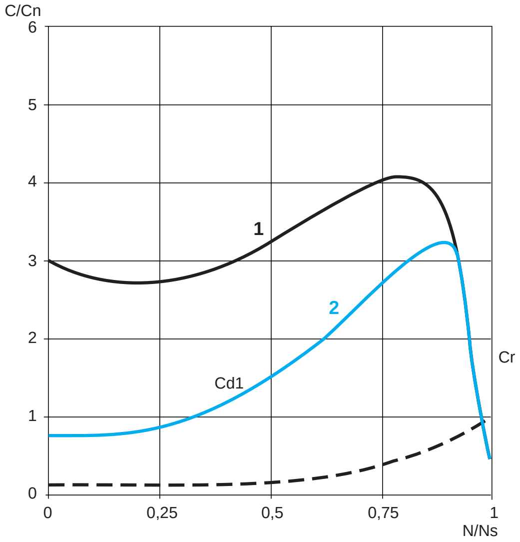
Starting current

1 Direct line starting current
2 Starting current limited to Is1



Starting torque

1 Direct line starting torque
2 Starting torque with current limited to Is1



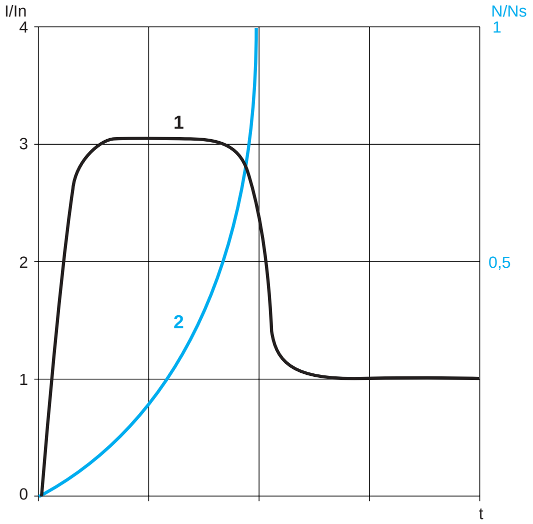
Conventional starting using current limitation or voltage ramp

With current limitation Is1, the accelerating torque applied to the motor is equal to the motor torque Ts1 minus the resistive torque Tr.
The accelerating torque increases in the starting range as the speed changes and is at its highest at the end of acceleration (curve 2).
This characteristic means that the load is taken up very abruptly, which is not recommended for pump type applications.

Example of speed curve for starting with current limitation

1 Current applied to the motor (I/In)

2 Motor speed N/Ns



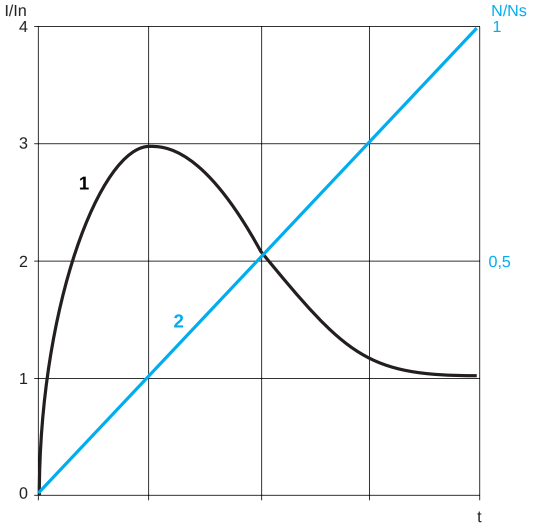
Starting with the Altistart 48

Torque control on the Altistart 48 applies the torque to the motor during the entire starting phase if the current required (curve 1) does not exceed the limiting current.
The accelerating torque can be virtually constant over the entire speed range (curve 2).
It is possible to set the Altistart in order to obtain a high torque on starting for a rapid motor speed rise whilst limiting its temperature rise, and a lower accelerating torque at the end of starting for gradual loading.
This control function is ideal for centrifugal pumps or for machines with high resistive torque on starting.

Example of speed curve for starting with torque control

1 Current applied to the motor (I/In)

2 Motor speed N/Ns



Stopping with the Altistart 48

- Freewheel stop: the motor comes to a freewheel stop.
- Decelerated stop: this type of stop is ideal for pumps and can be used to effectively reduce pressure surges. Torque control on the Altistart 48 reduces the effect of hydraulic transients even if the load increases. This type of control makes adjustment easy.
- Braked stop: this type of stop is suitable for high inertia applications as it reduces the stopping time of the machine.

Soft starters

Altistart 48 soft start - soft stop units

Selection criteria for an Altistart 48 soft start - soft stop unit

The Altistart 48 must be selected on the basis of 3 main criteria:

- Two line power supply voltage ranges are available for selection:
  - three-phase a.c. voltage: 230 - 415 V,
  - three-phase a.c. voltage: 208 - 690 V.

- The power and the nominal current indicated on the motor name plate.

- The type of application and the operating cycle.

To simplify selection, the applications are categorised into 2 types:
- standard applications,
- severe applications.

Standard or severe applications define the limiting values of the current and the cycle for motor duties S1 and S4.

Standard application

In standard applications, the Altistart 48 is designed to provide:

- Starting at 4 In for 23 seconds or at 3 In for 46 seconds from a cold state (corresponding to motor duty S1).

- Starting at 3 In for 23 seconds or at 4 In for 12 seconds with a load factor of 50 % and 10 starts per hour or a an equivalent thermal cycle (corresponding to motor duty S4).

The motor thermal protection must conform to protection class 10 (see page 1/70).
Example: centrifugal pump.

Severe application

In severe applications, the Altistart 48 is designed to provide:

- Starting at 4 In for 48 seconds or at 3 In for 90 seconds from a cold state (corresponding to S1 motor duty).

- Starting at 4 In for 25 seconds with a load factor of 50 % and 5 starts per hour or a an equivalent thermal cycle (corresponding to S4 motor duty).

The motor thermal protection must conform to protection class 20 (see page 1/70).
Example: grinder.

Motor duties

S1 motor duty corresponds to starting followed by operation at constant load enabling the thermal equilibrium to be reached.
S4 motor duty corresponds to a cycle comprising starting, operation at constant load and an idle period.
This cycle is characterised by a load factor of 50 %.

Selecting the starter

Once the appropriate application has been selected from the following page, select the starter from pages 1/40 to 1/43 according to the supply voltage and the motor power.

Caution:
if the Altistart 48 is installed inside an enclosure, observe the mounting and derating recommendations (see page 1/51).

Application areas

Depending on the type of machine, the applications are categorized as standard or severe based on the starting characteristics, which are given as examples only, in the table below.

Type of machine	Application	Functions performed by the Altistart 48	Starting current (% In)	Starting time (s)
Centrifugal pump	Standard	Deceleration (reduction in pressure surges) Protection against underloads or inversion of the phase rotation direction	300	5 to 15
Piston pump	Standard	Control of running dry and direction of rotation of the pump	350	5 to 10
Fan	Standard Severe if > 30 s	Detection of overloads caused by clogging or underloads (motor fan transmission broken) Braking torque on stopping	300	10 to 40
Cold compressor	Standard	Protection, even for special motors	300	5 to 10
Screw compressor	Standard	Protection against inversion of direction of phase rotation Contact for automatic draining on stopping	300	3 to 20
Centrifugal compressor	Standard Severe if > 30 s	Protection against inversion of direction of phase rotation Contact for automatic emptying on stopping	350	10 to 40
Piston compressor	Standard	Protection against inversion of direction of phase rotation Contact for automatic emptying on stopping	350	5 to 10
Conveyor, transporter	Standard	Overload control for detecting faults or underload control for detecting breaks	300	3 to 10
Lifting screw	Standard	Overload control for detecting hard spots or underload control for detecting breaks	300	3 to 10
Drag lift	Standard	Overload control for detecting jamming or underload control for detecting breaks	400	2 to 10
Lift	Standard	Overload control for detecting jamming or underload control for detecting breaks Constant starting with variable load	350	5 to 10
Circular saw, band saw	Standard Severe if > 30 s	Braking for fast stop	300	10 to 60
Pulper, butchery knife	Severe	Torque control on starting	400	3 to 10
Agitator	Standard	The current display indicates the density of the product	350	5 to 20
Mixer	Standard	The current display indicates the density of the product	350	5 to 10
Grinder	Severe	Braking to limit vibrations during stopping, overload control to detect jamming	450	5 to 60
Crusher	Severe	Braking to limit vibrations during stopping, overload control to detect jamming	400	10 to 40
Refiner	Standard	Torque control on starting and stopping	300	5 to 30
Press	Severe	Braking to increase the number of cycles	400	20 to 60

Soft starters

Altistart 48 soft start - soft stop units

Special uses

Other criteria can influence the selection of the Altistart 48:

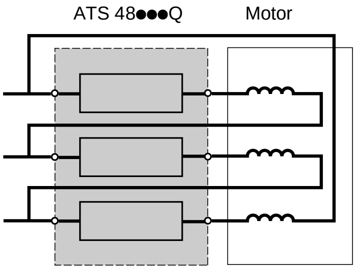
Starter wired to the motor delta terminal

(see the recommended application diagram on page 1/54)

In addition to the most frequently encountered wiring layouts, where the starter is installed in the line supply of the motor and the motor is connected in star or delta configuration, the Altistart 48 ATS 48●●●Q can be wired to the motor delta terminal in series with each winding (see the application diagram below). The starter current is lower than the line current absorbed by the motor by a ratio of $\sqrt{3}$. This type of installation enables a starter with a lower rating to be used.

Example: for a 400 V/110 kW motor with a line current of 195 A (nominal current for the delta connection), the current in each winding is equal to $195/\sqrt{3}$, i.e. 114 A. Select the starter rating with a maximum permanent nominal current just above this current, i.e. 140A (ATS 48C14Q for a standard application).
To avoid making this calculation, simply use the table on page 1/41.

This type of installation only permits freewheel stopping and is not compatible with the cascade and preheating functions.



Starter wired in series with the motor windings

Note: the nominal current and limiting current settings as well as the current displayed during operation are on-line values (so do not have to be calculated by the user).

Caution: for this type of installation, observe the wiring scheme and the associated recommendations on page 1/54.

Starter bypassed by a contactor

(see the recommended application diagram on page 1/53)

The starter can be bypassed by a contactor at the end of starting (to limit the heat dissipated by the starter). The bypass contactor is controlled by the starter and the current measurements and protective mechanisms remain active when the starter is bypassed.
The starter is selected on the basis of the 3 main criteria and one of the following criteria:

- If the starter is bypassed at the end of starting, the motor is always started from cold state and the starter can be oversized by one rating.
Example: select an ATS 48D17Q for an 11 kW motor in a standard 400 V application.

- If the starter must be able to operate without the bypass contactor at the end of starting, it does not have to be derated.
Example: select an ATS 48D17Q for a 7.5 kW motor in a standard 400 V application.

Soft starters

Altistart 48 soft start - soft stop units

Special uses (continued)

Motors in parallel

Motors may be connected in parallel provided that the power limit of the starter is not exceeded (the sum of the motor currents must not exceed the nominal current of the starter selected depending on the type of application). Provide thermal protection for each motor.

Brush motor

The Altistart 48 can operate with a bypassed rotor resistance motor or with a resistance lug. The starting torque is modified in accordance with the rotor resistance. If necessary, maintain a low resistance in order to obtain the required torque to overcome the resistive torque on starting.
A bypassed brush motor has a very low starting torque. A high stator current is required to obtain the sufficient starting torque.
Oversize the starter in order that the value of the limiting current is 7 times that of the nominal current.
Note: ensure that the starting torque of the motor, equal to 7 times the nominal current, is greater than the resistive torque.
Note: the Altistart 48 torque control enables excellent soft starting despite the limiting current being 7 times the nominal current required to start the motor.

Dahlander motor and 2-speed motor

The Altistart 48 can operate with a 2-speed motor. A motor demagnetisation period must elapse before changing from low speed to high speed in order to avoid antiphases between the line supply and the motor, which would generate very high currents.
Select the starter using the 3 main criteria.

Very long cable

Very long motor cables cause voltage drops due to the resistance of the cable. If the voltage drop is significant, it could affect the current consumption and the torque available. This must therefore be taken into account when selecting the motor and the starter.

Starters in parallel on the same line supply

If several starters are installed on the same line supply, line chokes should be installed between the transformer and the starter (see page 1/45).

Recommendations for use

Caution: do not use the Altistart 48 upstream of loads other than motors (for examples transformers and resistors are forbidden).
Do not connect power factor correction capacitors to the terminals of a motor controlled by an Altistart 48.

Soft starters

Altistart 48 soft start - soft stop units
Line voltage 230/415 V
Connection in the motor supply line

ATS 48D17Q

ATS 48C14Q

ATS 48M12Q

For standard applications

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)*		Nominal current (IcL) *(2)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V					
kW	kW	A	A	W		kg
4	7.5	17	14.8	59	**ATS 48D17Q**	4.900
5.5	11	22	21	74	**ATS 48D22Q**	4.900
7.5	15	32	28.5	104	**ATS 48D32Q**	4.900
9	18.5	38	35	116	**ATS 48D38Q**	4.900
11	22	47	42	142	**ATS 48D47Q**	4.900
15	30	62	57	201	**ATS 48D62Q**	8.300
18.5	37	75	69	245	**ATS 48D75Q**	8.300
22	45	88	81	290	**ATS 48D88Q**	8.300
30	55	110	100	322	**ATS 48C11Q**	8.300
37	75	140	131	391	**ATS 48C14Q**	12.400
45	90	170	162	479	**ATS 48C17Q**	12.400
55	110	210	195	580	**ATS 48C21Q**	18.200
75	132	250	233	695	**ATS 48C25Q**	18.200
90	160	320	285	902	**ATS 48C32Q**	18.200
110	220	410	388	1339	**ATS 48C41Q**	51.400
132	250	480	437	1386	**ATS 48C48Q**	51.400
160	315	590	560	1731	**ATS 48C59Q**	51.400
–	355	660	605	1958	**ATS 48C66Q**	51.400
220	400	790	675	2537	**ATS 48C79Q**	115.000
250	500	1000	855	2865	**ATS 48M10Q**	115.000
355	630	1200	1045	3497	**ATS 48M12Q**	115.000

For severe applications

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)*		Nominal current *(3)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V					
kW	kW	A	A	W		kg
3	5.5	12	14.8	46	**ATS 48D17Q**	4.900
4	7.5	17	21	59	**ATS 48D22Q**	4.900
5.5	11	22	28.5	74	**ATS 48D32Q**	4.900
7.5	15	32	35	99	**ATS 48D38Q**	4.900
9	18.5	38	42	116	**ATS 48D47Q**	4.900
11	22	47	57	153	**ATS 48D62Q**	8.300
15	30	62	69	201	**ATS 48D75Q**	8.300
18.5	37	75	81	245	**ATS 48D88Q**	8.300
22	45	88	100	252	**ATS 48C11Q**	8.300
30	55	110	131	306	**ATS 48C14Q**	12.400
37	75	140	162	391	**ATS 48C17Q**	12.400
45	90	170	195	468	**ATS 48C21Q**	18.200
55	110	210	233	580	**ATS 48C25Q**	18.200
75	132	250	285	695	**ATS 48C32Q**	18.200
90	160	320	388	1017	**ATS 48C41Q**	51.400
110	220	410	437	1172	**ATS 48C48Q**	51.400
132	250	480	560	1386	**ATS 48C59Q**	51.400
160	315	590	605	1731	**ATS 48C66Q**	51.400
–	355	660	675	2073	**ATS 48C79Q**	115.000
220	400	790	855	2225	**ATS 48M10Q**	115.000
250	500	1000	1045	2865	**ATS 48M12Q**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10. IcL corresponds to the starter rating.
(3) Corresponds to the maximum permanent current in class 20.
(4) The factory setting current corresponds to the value of the nominal current of a standard 4-pole, 400 V, class 10 motor (standard application). Adjust the settings in accordance with the motor nominal current.

Presentation:
pages 1/30 and 1/31

Characteristics:
pages 1/32 to 1/35

Dimensions:
pages 1/48 and 1/49

Schemes:
pages 1/52 to 1/57

Soft starters

Altistart 48 soft start - soft stop units

Line voltage 230/415 V

Connection to the motor delta terminals

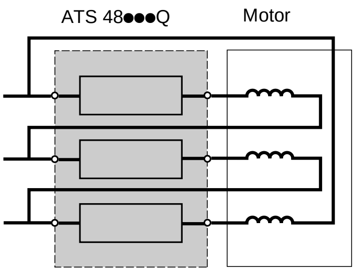


Figure 1
Special use:
starter connected to the motor delta terminal in series with each winding

For standard applications according to figure 1

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)* **230 V**	**400 V**	**Nominal current** *(2)*	**Factory setting current** *(4)*	**Power dissipated at nominal load**	**Reference**	**Weight**
kW	**kW**	**A**	**A**	**W**		**kg**
7.5	15	29	14.8	59	**ATS 48D17Q**	4.900
9	18.5	38	21	74	**ATS 48D22Q**	4.900
15	22	55	28.5	104	**ATS 48D32Q**	4.900
18.5	30	66	35	116	**ATS 48D38Q**	4.900
22	45	81	42	142	**ATS 48D47Q**	4.900
30	55	107	57	201	**ATS 48D62Q**	8.300
37	55	130	69	245	**ATS 48D75Q**	8.300
45	75	152	81	290	**ATS 48D88Q**	8.300
55	90	191	100	322	**ATS 48C11Q**	8.300
75	110	242	131	391	**ATS 48C14Q**	12.400
90	132	294	162	479	**ATS 48C17Q**	12.400
110	160	364	195	580	**ATS 48C21Q**	18.200
132	220	433	233	695	**ATS 48C25Q**	18.200
160	250	554	285	902	**ATS 48C32Q**	18.200
220	315	710	388	1339	**ATS 48C41Q**	51.400
250	355	831	437	1386	**ATS 48C48Q**	51.400
–	400	1022	560	1731	**ATS 48C59Q**	51.400
315	500	1143	605	1958	**ATS 48C66Q**	51.400
355	630	1368	675	2537	**ATS 48C79Q**	115.000
–	710	1732	855	2865	**ATS 48M10Q**	115.000
500	–	2078	1045	3497	**ATS 48M12Q**	115.000

For severe applications according to figure 1

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)* **230 V**	**400 V**	**Nominal current** *(3)*	**Factory setting current** *(4)*	**Power dissipated at nominal load**	**Reference**	**Weight**
kW	**kW**	**A**	**A**	**W**		**kg**
5.5	11	22	14.8	46	**ATS 48D17Q**	4.900
7.5	15	29	21	59	**ATS 48D22Q**	4.900
9	18.5	38	28.5	74	**ATS 48D32Q**	4.900
15	22	55	35	99	**ATS 48D38Q**	4.900
18.5	30	66	42	116	**ATS 48D47Q**	4.900
22	45	81	57	153	**ATS 48D62Q**	8.300
30	55	107	69	201	**ATS 48D75Q**	8.300
37	55	130	81	245	**ATS 48D88Q**	8.300
45	75	152	100	252	**ATS 48C11Q**	8.300
55	90	191	131	306	**ATS 48C14Q**	12.400
75	110	242	162	391	**ATS 48C17Q**	12.400
90	132	294	195	468	**ATS 48C21Q**	18.200
110	160	364	233	580	**ATS 48C25Q**	18.200
132	220	433	285	695	**ATS 48C32Q**	18.200
160	250	554	388	1017	**ATS 48C41Q**	51.400
220	315	710	437	1172	**ATS 48C48Q**	51.400
250	355	831	560	1386	**ATS 48C59Q**	51.400
–	400	1022	605	1731	**ATS 48C66Q**	51.400
315	500	1143	675	2073	**ATS 48C79Q**	115.000
355	630	1368	855	2225	**ATS 48M10Q**	115.000
–	710	1732	1045	2865	**ATS 48M12Q**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10.
(3) Corresponds to the maximum permanent current in class 20.
(4) For this type of connection, the factory setting current must be adjusted in accordance with the nominal motor current.

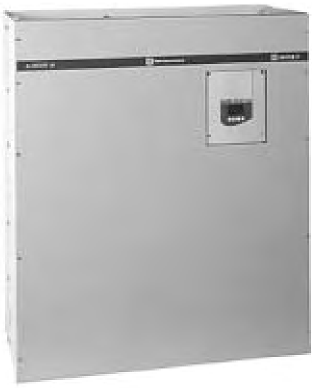
Soft starters

Altistart 48 soft start - soft stop units

Line voltage 208/690 V
Motor power in HP

ATS 48D17Y

ATS 48C14Y



ATS 48M12Y

For standard applications

Motor				Starter 208/690 V - 50/60 Hz				
Motor power *(1)*				Nominal current (IcL) *(2)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
208 V	230 V	460 V	575 V					
HP	*HP*	*HP*	*HP*	A	A	W		kg
3	*5*	*10*	*15*	17	14	59	**ATS 48D17Y**	4.900
5	*7.5*	*15*	*20*	22	21	74	**ATS 48D22Y**	4.900
7.5	*10*	*20*	*25*	32	27	104	**ATS 48D32Y**	4.900
10	*–*	*25*	*30*	38	34	116	**ATS 48D38Y**	4.900
–	*15*	*30*	*40*	47	40	142	**ATS 48D47Y**	4.900
15	*20*	*40*	*50*	62	52	201	**ATS 48D62Y**	8.300
20	*25*	*50*	*60*	75	65	245	**ATS 48D75Y**	8.300
25	*30*	*60*	*75*	88	77	290	**ATS 48D88Y**	8.300
30	*40*	*75*	*100*	110	96	322	**ATS 48C11Y**	8.300
40	*50*	*100*	*125*	140	124	391	**ATS 48C14Y**	12.400
50	*60*	*125*	*150*	170	156	479	**ATS 48C17Y**	12.400
60	*75*	*150*	*200*	210	180	580	**ATS 48C21Y**	18.200
75	*100*	*200*	*250*	250	240	695	**ATS 48C25Y**	18.200
100	*125*	*250*	*300*	320	302	902	**ATS 48C32Y**	18.200
125	*150*	*300*	*350*	410	361	1339	**ATS 48C41Y**	51.400
150	*–*	*350*	*400*	480	414	1386	**ATS 48C48Y**	51.400
–	*200*	*400*	*500*	590	477	1731	**ATS 48C59Y**	51.400
200	*250*	*500*	*600*	660	590	1958	**ATS 48C66Y**	51.400
250	*300*	*600*	*800*	790	720	2537	**ATS 48C79Y**	115.000
350	*350*	*800*	*1000*	1000	954	2865	**ATS 48M10Y**	115.000
400	*450*	*1000*	*1200*	1200	1170	3497	**ATS 48M12Y**	115.000

For severe applications

Motor				Starter 208/690 V - 50/60 Hz				
Motor power *(1)*				Nominal current *(3)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
208 V	230 V	460 V	575 V					
HP	*HP*	*HP*	*HP*	A	A	W		kg
2	*3*	*7.5*	*10*	12	14	46	**ATS 48D17Y**	4.900
3	*5*	*10*	*15*	17	21	59	**ATS 48D22Y**	4.900
5	*7.5*	*15*	*20*	22	27	74	**ATS 48D32Y**	4.900
7.5	*10*	*20*	*25*	32	34	99	**ATS 48D38Y**	4.900
10	*–*	*25*	*30*	38	40	116	**ATS 48D47Y**	4.900
–	*15*	*30*	*40*	47	52	153	**ATS 48D62Y**	8.300
15	*20*	*40*	*50*	62	65	201	**ATS 48D75Y**	8.300
20	*25*	*50*	*60*	75	77	245	**ATS 48D88Y**	8.300
25	*30*	*60*	*75*	88	96	252	**ATS 48C11Y**	8.300
30	*40*	*75*	*100*	110	124	306	**ATS 48C14Y**	12.400
40	*50*	*100*	*125*	140	156	391	**ATS 48C17Y**	12.400
50	*60*	*125*	*150*	170	180	468	**ATS 48C21Y**	18.200
60	*75*	*150*	*200*	210	240	580	**ATS 48C25Y**	18.200
75	*100*	*200*	*250*	250	302	695	**ATS 48C32Y**	18.200
100	*125*	*250*	*300*	320	361	1017	**ATS 48C41Y**	51.400
125	*150*	*300*	*350*	410	414	1172	**ATS 48C48Y**	51.400
150	*–*	*350*	*400*	480	477	1386	**ATS 48C59Y**	51.400
–	*200*	*400*	*500*	590	590	1731	**ATS 48C66Y**	51.400
200	*250*	*500*	*600*	660	720	2073	**ATS 48C79Y**	115.000
250	*300*	*600*	*800*	790	954	2225	**ATS 48M10Y**	115.000
350	*350*	*800*	*1000*	1000	1170	2865	**ATS 48M12Y**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10. IcL corresponds to the starter rating.
(3) Corresponds to the maximum permanent current in class 20.
(4) The factory setting current corresponds to the value of the nominal current of a standard motor according to NEC, 460 V, class 10 (standard application). Adjust the settings in accordance with the motor nominal current.

Presentation:
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Characteristics:
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Soft starters

Altistart 48 soft start - soft stop units
Line voltage 208/690 V
Motor power in kW

For standard applications

Motor							Starter 208/690 V - 50/60 Hz				
Motor power *(1)*							**Nominal current (IcL)** *(2)*	**Factory setting current** *(4)*	**Power dissipated at nominal load**	**Reference**	**Weight**
230 V	**400 V**	**440 V**	**500 V**	**525 V**	**660 V**	**690 V**					
kW	**kW**	**kW**	**kW**	**kW**	**kW**	**kW**	**A**	**A**	**W**		**kg**
4	7.5	7.5	9	9	11	15	17	14	59	**ATS 48D17Y**	4.900
5.5	11	11	11	11	15	18.5	22	21	74	**ATS 48D22Y**	4.900
7.5	15	15	18.5	18.5	22	22	32	27	104	**ATS 48D32Y**	4.900
9	18.5	18.5	22	22	30	30	38	34	116	**ATS 48D38Y**	4.900
11	22	22	30	30	37	37	47	40	142	**ATS 48D47Y**	4.900
15	30	30	37	37	45	45	62	52	201	**ATS 48D62Y**	8.300
18.5	37	37	45	45	55	55	75	65	245	**ATS 48D75Y**	8.300
22	45	45	55	55	75	75	88	77	290	**ATS 48D88Y**	8.300
30	55	55	75	75	90	90	110	96	322	**ATS 48C11Y**	8.300
37	75	75	90	90	110	110	140	124	391	**ATS 48C14Y**	12.400
45	90	90	110	110	132	160	170	156	479	**ATS 48C17Y**	12.400
55	110	110	132	132	160	200	210	180	580	**ATS 48C21Y**	18.200
75	132	132	160	160	220	250	250	240	695	**ATS 48C25Y**	18.200
90	160	160	220	220	250	315	320	302	902	**ATS 48C32Y**	18.200
110	220	220	250	250	355	400	410	361	1339	**ATS 48C41Y**	51.400
132	250	250	315	315	400	500	480	414	1386	**ATS 48C48Y**	51.400
160	315	355	400	400	560	560	590	477	1731	**ATS 48C59Y**	51.400
–	355	400	–	–	630	630	660	590	1958	**ATS 48C66Y**	51.400
220	400	500	500	500	710	710	790	720	2537	**ATS 48C79Y**	115.000
250	500	630	630	630	900	900	1000	954	2865	**ATS 48M10Y**	115.000
355	630	710	800	800	–	–	1200	1170	3497	**ATS 48M12Y**	115.000

For severe applications

Motor							Starter 208/690 V - 50/60 Hz				
Motor power *(1)*							**Nominal current** *(3)*	**Factory setting current** *(4)*	**Power dissipated at nominal load**	**Reference**	**Weight**
230 V	**400 V**	**440 V**	**500 V**	**525 V**	**660 V**	**690 V**					
kW	**kW**	**kW**	**kW**	**kW**	**kW**	**kW**	**A**	**A**	**W**		**kg**
3	5.5	5.5	7.5	7.5	9	11	12	14	46	**ATS 48D17Y**	4.900
4	7.5	7.5	9	9	11	15	17	21	59	**ATS 48D22Y**	4.900
5.5	11	11	11	11	15	18.5	22	27	74	**ATS 48D32Y**	4.900
7.5	15	15	18.5	18.5	22	22	32	34	99	**ATS 48D38Y**	4.900
9	18.5	18.5	22	22	30	30	38	40	116	**ATS 48D47Y**	4.900
11	22	22	30	30	37	37	47	52	153	**ATS 48D62Y**	8.300
15	30	30	37	37	45	45	62	65	201	**ATS 48D75Y**	8.300
18.5	37	37	45	45	55	55	75	77	245	**ATS 48D88Y**	8.300
22	45	45	55	55	75	75	88	96	252	**ATS 48C11Y**	8.300
30	55	55	75	75	90	90	110	124	306	**ATS 48C14Y**	12.400
37	75	75	90	90	110	110	140	156	391	**ATS 48C17Y**	12.400
45	90	90	110	110	132	160	170	180	468	**ATS 48C21Y**	18.200
55	110	110	132	132	160	200	210	240	580	**ATS 48C25Y**	18.200
75	132	132	160	160	220	250	250	302	695	**ATS 48C32Y**	18.200
90	160	160	220	220	250	315	320	361	1017	**ATS 48C41Y**	51.400
110	220	220	250	250	355	400	410	414	1172	**ATS 48C48Y**	51.400
132	250	250	315	315	400	500	480	477	1386	**ATS 48C59Y**	51.400
160	315	355	400	400	560	560	590	590	1731	**ATS 48C66Y**	51.400
–	355	400	–	–	630	630	660	720	2073	**ATS 48C79Y**	115.000
220	400	500	500	500	710	710	790	954	2225	**ATS 48M10Y**	115.000
250	500	630	630	630	900	900	1000	1170	2865	**ATS 48M12Y**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10. IcL corresponds to the starter rating.
(3) Corresponds to the maximum permanent current in class 20.
(4) The factory setting current corresponds to the value of the nominal current of a standard motor according to NEC, 460 V, class 10 (standard application). Adjust the settings in accordance with the motor nominal current.

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Characteristics:
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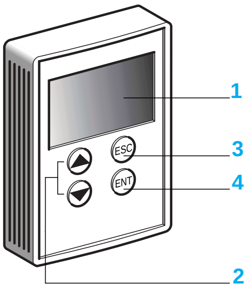
Soft starters

Altistart 48 soft start - soft stop units
Options: remote terminal, line chokes

Remote terminal

The terminal can be mounted on the door of a wall-fixing or floor-standing enclosure. It has the same signalling display and configuration buttons as the terminal integrated in the starter. A switch to lock access to the menu is located at the rear of the terminal.

The option comprises:
- the remote terminal
- a mounting kit containing a cover, screws and an IP 54 seal on the front panel
- a 3 m connecting cable with a 9-way SUB-D connector for connecting to the terminal and an RJ45 connector for connecting to the Altistart 48



1 Information is displayed in the form of codes or values in three "7-segment" displays
2 Buttons for scrolling through the menus or modifying values
3 "ESC": Button for exiting the menus (cannot be used for validation purposes)
4 "ENT": Validation button for entering a menu or confirming the new value selected

Line chokes

The use of line chokes is recommended in particular when installing several electronic starters on the same line supply. The values of the chokes are defined for a voltage drop between 3% and 5% of the nominal line voltage.
Install the line choke between the line contactor and the starter.

References:
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Soft starters

Altistart 48 soft start - soft stop units

Options: remote terminal, line chokes, protective covers, documentation

VW3 G48101

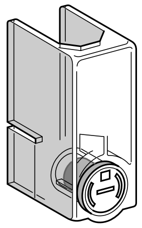
Remote terminal

Description	Reference	Weight kg
Remote terminal	**VW3 G48101**	0.200

Line chokes

For starters	Value of the choke mH	Nominal current A	Degree of protection	Reference	Weight kg
ATS 48D17●	1.7	15	IP 20	**VZ1 L015UM17T**	2.100
ATS 48D22●	0.8	30	IP 20	**VZ1 L030U800T**	4.100
ATS 48D32● and 48D38●	0.6	40	IP 20	**VZ1 L040U600T**	5.100
ATS 48D47● and 48D62●	0.35	70	IP 20	**VZ1 L070U350T**	8.000
ATS 48D75● to 48C14●	0.17	150	IP 00	**VZ1 L150U170T**	14.900
ATS 48C17● to 48C25●	0.1	250	IP 00	**VZ1 L250U100T**	24.300
ATS 48C32●	0.075	325	IP 00	**VZ1 L325U075T**	28.900
ATS 48C41● and 48C48●	0.045	530	IP 00	**VZ1 L530U045T**	37.000
ATS 48C59● to 48M10●	0.024	1025	IP 00	**VZ1 LM10U024T**	66.000
ATS 48M12●	0.016	1435	IP 00	**VZ1 LM14U016T**	80.000

Nota : *line chokes with IP 00 degree of protection must be fitted with a protective bar to protect personnel against electrical contact.*



LA9 F702

Protective covers for power terminals

To be used with tags closed

For starters	Number of covers per set	Reference	Weight kg
ATS 48C14● and ATS 48C17●	6 *(1)*	**LA9 F702**	0.250

(1) The starters have 9 unprotected power terminals.

Documentation

Description	Format	Reference	Weight kg
Altistart 48 user's manual	A5	**VVD ED 301066**	0.150
Modbus user's manual	A5	**VVD ED 302023**	0.150
International technical manual (ITM) *(2)*	CD-ROM	**DCI CD 398111**	0.150

(2) Library containing:
- *manuals and quick reference guides for starters and speed drives,*
- *user's manuals for communication gateways.*

Presentation:
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Soft starters

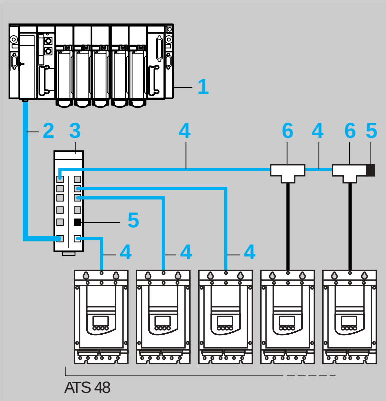
Altistart 48 soft start - soft stop units

Communication options

Modbus communication bus

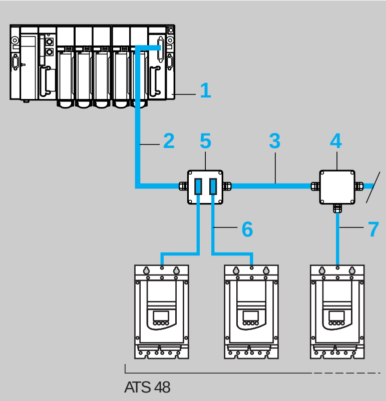
The Altistart 48 is connected directly to the Modbus bus via its RJ45 type connector port.
This port supports the RS 458 (2-wire) standard and the Modbus RTU protocol.
The communication function provides access to the configuration, adjustment, control and signalling functions of the starter.

Connections via splitter blocks and RJ45 type connectors



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus splitter block **LU9 GC3**
4 Modbus drop cable **VW3 A8 306 R●●**
5 Line terminators **VW3 A8 306 RC**
6 Modbus T-junction box **VW3 A8 306 TF●●** (with cable)

Connections via junction boxes



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus cable **TSX CSA ●00**
4 Junction box **TSX SCA 50**
5 Subscriber sockets **TSX SCA 62**
6 Modbus drop cable **VW3 A8 306**
7 Modbus drop cable **VW3 A8 306 D30**

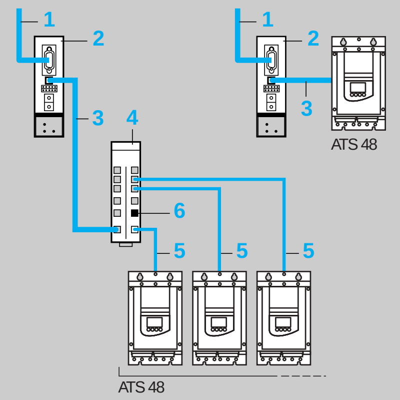
Connections via screw terminals

In this case, use a Modbus drop cable **VW3 A8 306 D30** and line terminators **VW3 A8 306 DRC**.

Other communication buses

The Altistart 48 can also be connected to Ethernet, Fipio, Profibus DP and DeviceNet networks via a module (bridge or gateway).
Communication on the network is used for:
- controlling
- monitoring and
- configuring the Modbus products connected to the network

Connection via modules



1 To network
2 Communication modules
3 Cables **VW3 A8 306 R●●**, **VW3 P07 306 R10** or **VW3 A8 306 D30**
4 Modbus splitter block **LU9 GC3**
5 Modbus drop cable **VW3 A8 306 R●●**
6 Line terminator **VW3 A8 306 RC**

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(1) Please consult our "Modicon Premium automation platform" and "Modicon TSX Micro automation platform" catalogues.

References:
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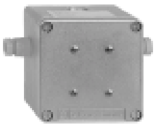
Soft starters

Altistart 48 soft start - soft stop units

Communication options



TSX SCA 50

TSX SCA 62

Modbus communication bus

Connection accessories

Description			Unit reference	Weight kg
Junction box 3 screw terminals, RC line terminator To be connected using cable VW3 A8 306 D30			**TSX SCA 50**	0.520
Subscriber sockets 2 x female 15-way SUB-D connectors and 2 screw terminals, RC line terminator To be connected using cable VW3 A8 306			**TSX SCA 62**	0.570
Modbus splitter block 8 RJ45 type connectors and 1 screw terminal			**LU9 GC3**	0.500
Line terminators (1)	For RJ45 connector	R = 120 Ω, C = 1 nF	**VW3 A8 306 RC**	0.200
		R = 150 Ω	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nF	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	**VW3 A8 306 DR**	0.200
Modbus T-junction boxes		With integrated cable (0.3 m)	**VW3 A8 306 TF03**	–
		With integrated cable (1 m)	**VW3 A8 306 TF10**	–

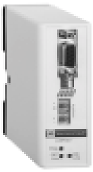
Connecting cables

Description	Length m	Connectors	Reference	Weight kg
Cables for Modbus bus	3	1 RJ45 connector and one end stripped	**VW3 A8 306 D30**	0.150
	3	1 RJ45 connector and 1male 15-way SUB-D connector for TSX SCA 62	**VW3 A8 306**	0.150
	0.3	2 RJ45 connectors	**VW3 A8 306 R03**	0.050
	1	2 RJ45 connectors	**VW3 A8 306 R10**	0.050
	3	2 RJ45 connectors	**VW3 A8 306 R30**	0.150
Cables for Profibus DP	1	2 RJ45 connectors	**VW3 P07 306 R10**	0.050
RS 485 double shielded twisted pair cables	100	Supplied without connector	**TSX CSA 100**	–
	200	Supplied without connector	**TSX CSA 200**	–
	500	Supplied without connector	**TSX CSA 500**	–

Other communication buses

Description	Cables to be connected	Reference	Weight kg
Ethernet/Modbus bridge with 1 x Ethernet 10baseT port (RJ45 type)	VW3 A8 306 D30	**174 CEV 300 10** *(2)*	0.500
Fipio/Modbus gateway *(3)*	VW3 A8 306 R●●	**LUF P1**	0.240
DeviceNet/Modbus gateway *(3)*	VW3 A8 306 R●●	**LUF P9**	0.240
Profibus DP/Modbus gateway Parameters set using standard Profibus DP configurator, Hilscher Sycon type *(4)*	VW3 P07 306 R10	**LA9 P307**	0.240
Profibus DP/Modbus gateway Parameters set using ABC Configurator software *(3)*	VW3 A8 306 R●●	**LUF P7**	0.240

LUF P1



LA9 P307

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(1) Sold in lots of 2.
(2) Please consult our "Modicon Premium automation platform and PL7 software" catalogue.
(3) See pages 4/22 and 4/23.
(4) See pages 4/24 and 4/25.

Presentation:
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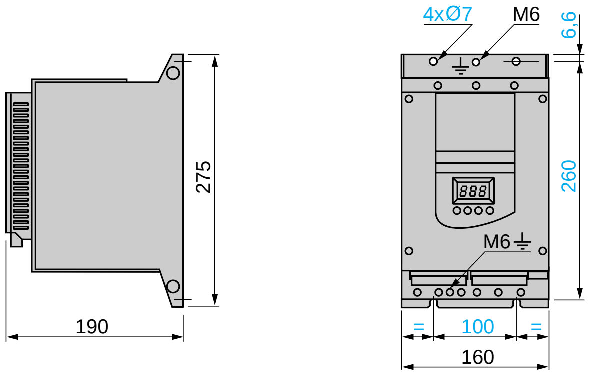
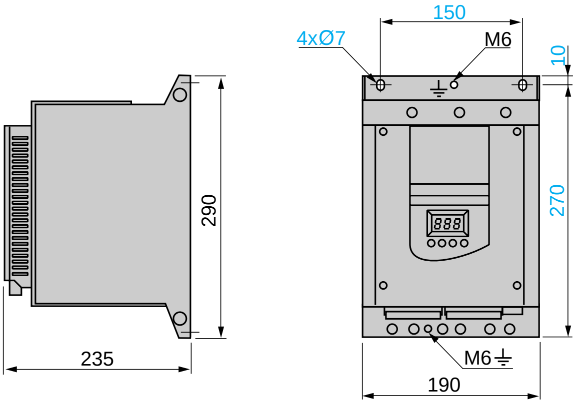
Soft starters

Altistart 48 soft start - soft stop units

ATS 48D17● to ATS 48D47●



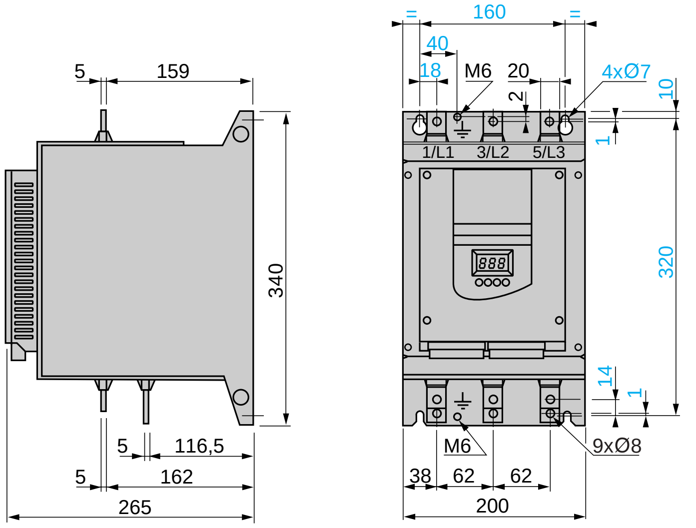
ATS 48D62● to ATS 48C11●



Maximum connection capacity:
Earth connections: 10 mm^2 (AWG 8)
Power terminals: 16 mm^2 (AWG 8)

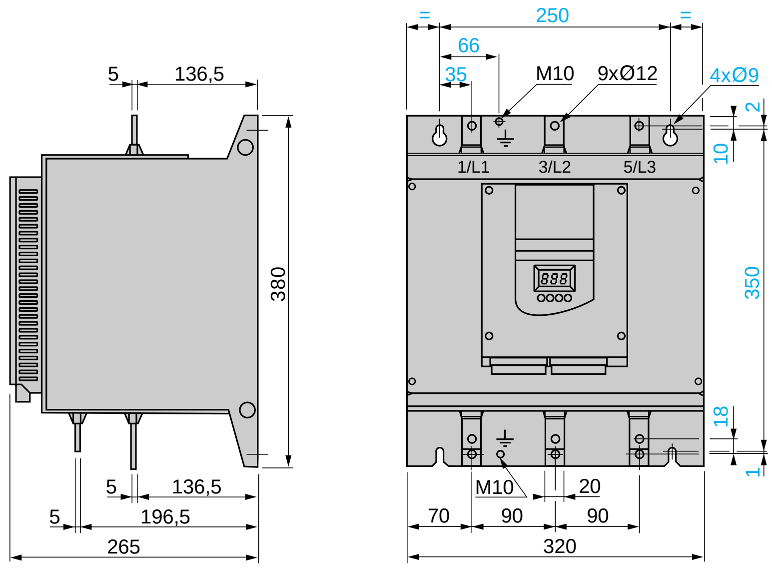
Maximum connection capacity:
Earth connections: 16 mm^2 (AWG 4)
Power terminals: 50 mm^2 (AWG 2/0)

ATS 48C14● to ATS 48C17●



Maximum connection capacity:
Earth connections: 120 mm^2 (busbar)
Power terminals: 95 mm^2 (AWG 2/0)

ATS 48C21● to ATS 48C32●



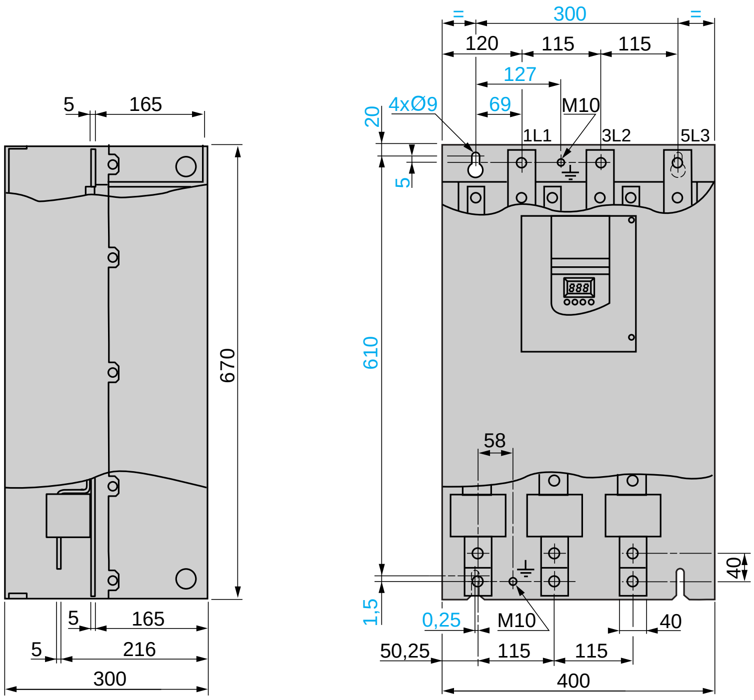
Maximum connection capacity:
Earth connections: 120 mm^2 (busbar)
Power terminals: 240 mm^2 (busbar)

Soft starters

Altistart 48 soft start - soft stop units

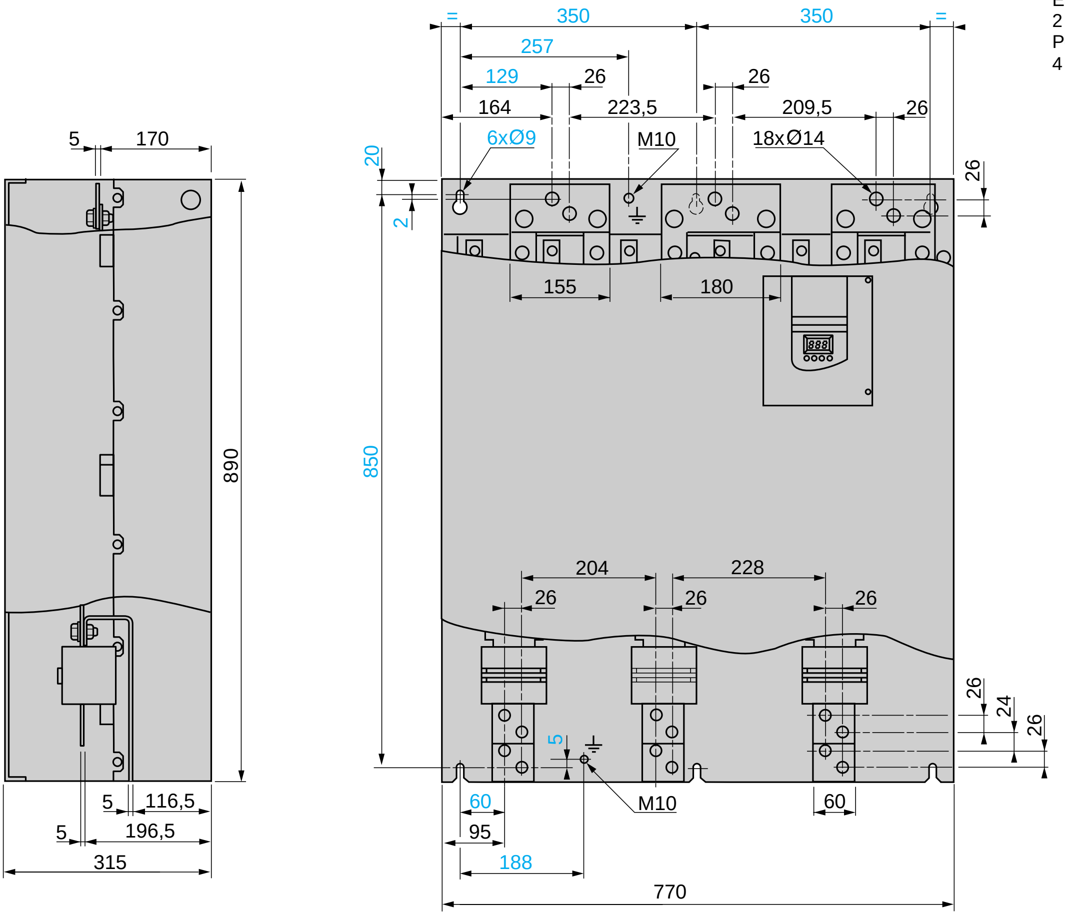
ATS 48C41● to C66●

Maximum connection capacity:
Earth connections:
240 mm² (busbar)
Power terminals:
2 x 240 mm² (busbar)



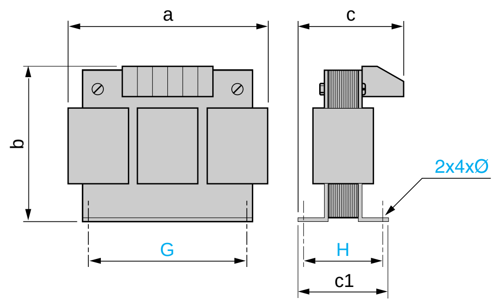
ATS 48C79● to M12●

Maximum connection capacity:
Earth connections:
2 x 240 mm² (busbar)
Power terminals:
4 x 240 mm² (busbar)

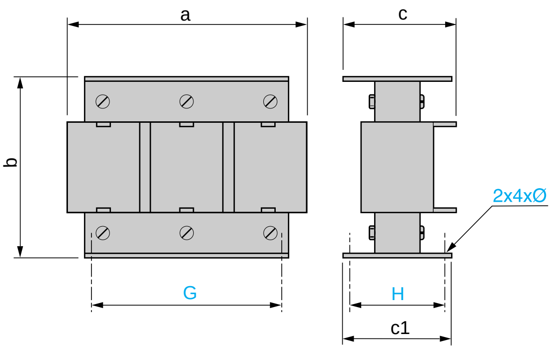


Chokes

VZ1-L015UM17T to L070U350T



VZ1-L150U170T to LM14U016T

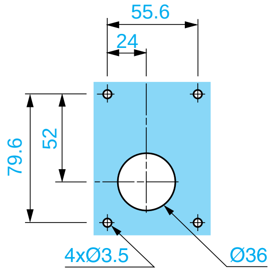


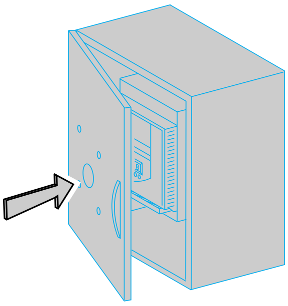
VZ1-	a	b	c	c1	G	H	Ø
L015UM17T	120	150	80	75	60/80.5	52	6
L030U800T	150	180	120	100	75/106.5	76	7
L040U600T	180	215	130	100	85/122	76	7
L070U350T	180	215	150	130	85/122	97	7

VZ1-	a	b	c	c1	G	H	Ø
L150U170T	270	240	170	140	105/181	96	11.5
L250U100T	270	240	220	160	105/181	125	11.5
L325U075T	270	240	240	175	105/181	138	11.5
L530U045T	380	410	225	140	310	95	9
LM10U024T	400	410	310	170	310	125	9
LM14U016T	420	490	340	170	310	125	9

Mounting the remote terminal

VW3 G48101





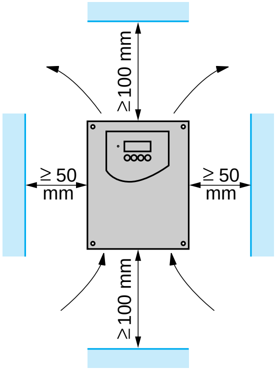
Presentation:
pages 1/30 and 1/31

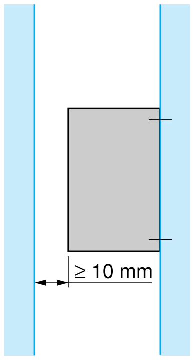
Characteristics:
pages 1/32 and 1/33

References:
pages 1/40 to 1/43

Schemes:
pages 1/52 to 1/57

Mounting recommendations

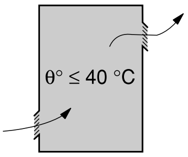


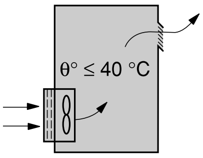


- Install the Altistart vertically, at ± 10°.
- Do not place the Altistart close to or above heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Caution: the IP 00 version of the Altistart 48 must be fitted with a protective bar to protect personnel against electrical contact.
Protective covers are available for the ATS 48C14● to ATS 48C32●. They should be ordered separately.

Mounting in a metal wall-fixing or floor-standing enclosure with degree of protection IP 23 or IP 54





- Observe the mounting recommendations above.
- To ensure proper air circulation in the starter:
  - ☐ fit ventilation grilles,
  - ☐ ensure that there is sufficient ventilation. If there is not, install forced ventilation with a filter ; the openings and/or fans must provide a flow rate at least equal to that of the starter fans (see the table below).
- Use special filters with IP 54 protection.

Fan flow rate depending on the starter rating

ATS 48 starter	Flow rate m^3/hour
ATS48 D32● and D38●	14
ATS48 D47●	28
ATS48 D62● to C11●	86
ATS48 C14● and C17●	138
ATS48 C21● to C32●	280
ATS48 C41● to C66●	600
ATS48 C29● to M12●	1200

Metal wall-fixing or floor-standing enclosure with IP 54 degree of protection
For non-ventilated Altistart units (ATS 48D17● and 48D22●), install a fan ⩽ 50 mm below the starter to circulate the air inside the enclosure in order to avoid hot spots.

Calculating the size of the enclosure

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

θ = maximum temperature inside enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

The starter/motor combinations on pages 1/40 and 1/41 can only be used in ambient temperatures ⩽ 40 °C.
For temperatures between 40 °C and 60 °C, derate the maximum permanent current of the starter by 2% for every degree above 40 °C.
Power dissipated by the starter: see pages 1/40 and 1/41.
If the starts are infrequent, it is advisable to bypass the Altistart at the end of starting in order to reduce heat dissipation.
The power dissipated will then be between 15 and 30 W.
Add the power dissipated by the other equipment components.

Effective exchange surface area of enclosure S (m^2)

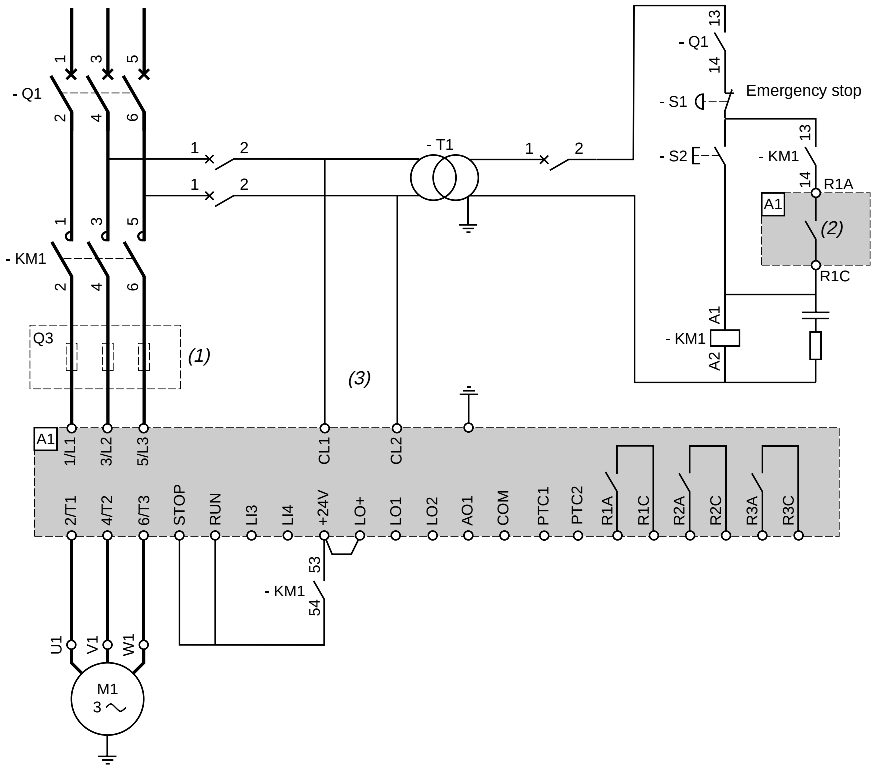
(sides + top + front panel if wall-mounted)

$$SS = \frac{K}{Rth}$$

K is the thermal resistance per m^2 of casing.

For ACM type metal enclosures: K = 0.12 with internal fan, K = 0.15 without fan.
Caution: do not use insulated enclosures as they have a poor level of conductivity.

Recommended application diagram for non-reversing unit with line contactor, type 1 and type 2 coordinations



Select the components to connect, according to the descriptions on page 1/53, from the association tables on pages 1/58 to 1/67.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(2) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see Characteristics page 1/32), for example when connecting to high rating contactors.

(3) Insert a transformer if the line voltage is different to that defined for the control circuit (see page 1/32).

Types of coordination

The standard defines tests for different current levels which are designed to expose the device to extreme conditions.
Based on the state of the components after a short-circuit test, the standard defines 2 types of coordination.

- Type 1 coordination: damage to the contactor and the starter is acceptable under 2 conditions:
  - no risk is posed to the operator,
  - elements other than the contactor and the starter are not damaged.

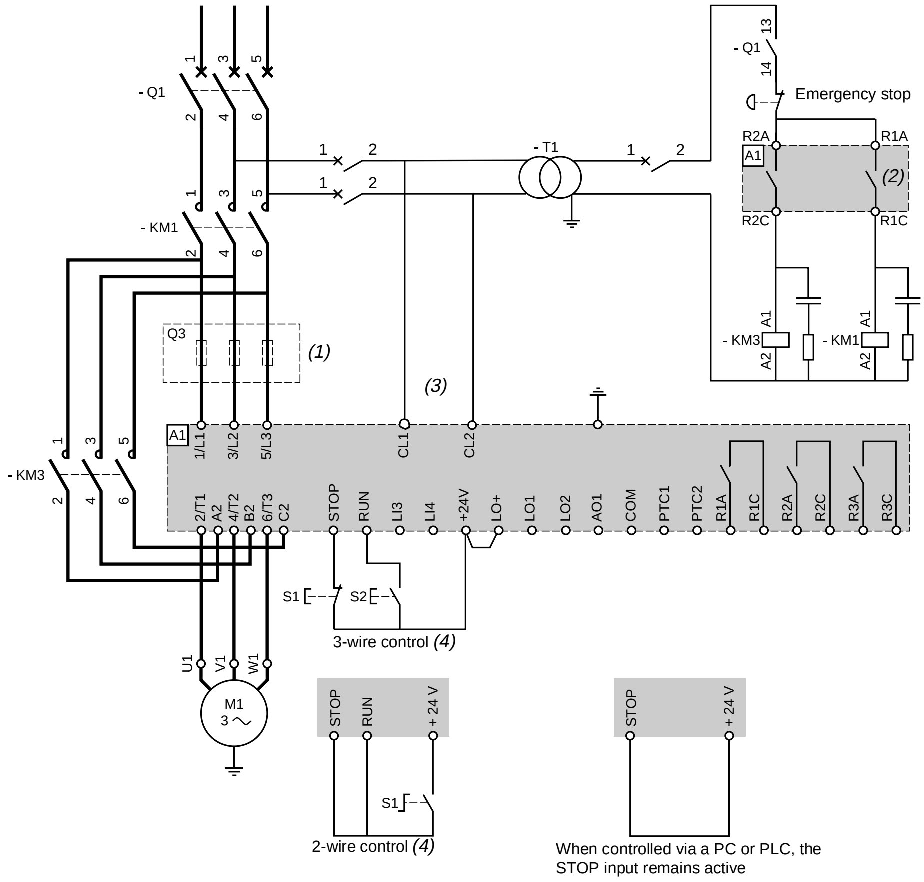
Maintenance must be carried out after a short-circuit.

- Type 2 coordination: minor soldering of the contactor contacts is permissible if they can be separated easily. The starter must not be damaged beyond repair. The protection and control devices remain operational after type 2 coordination tests.

Once the fuses have been replaced, check the contactor.

Nota : *the starter will protect the motor and the cables against overloads. If this protection function is disabled, external thermal protection must be provided.*

Recommended application diagram for non-reversing unit with starter line and bypass contactors, type 1 and type 2 coordinations



Select the components to connect, according to the descriptions below, from the association tables on pages 1/58 to 1/67.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(2) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see Characteristics page 1/32), for example when connecting to high rating contactors.

(3) Insert a transformer if the line voltage is different to that defined for the control circuit (see page 1/32).

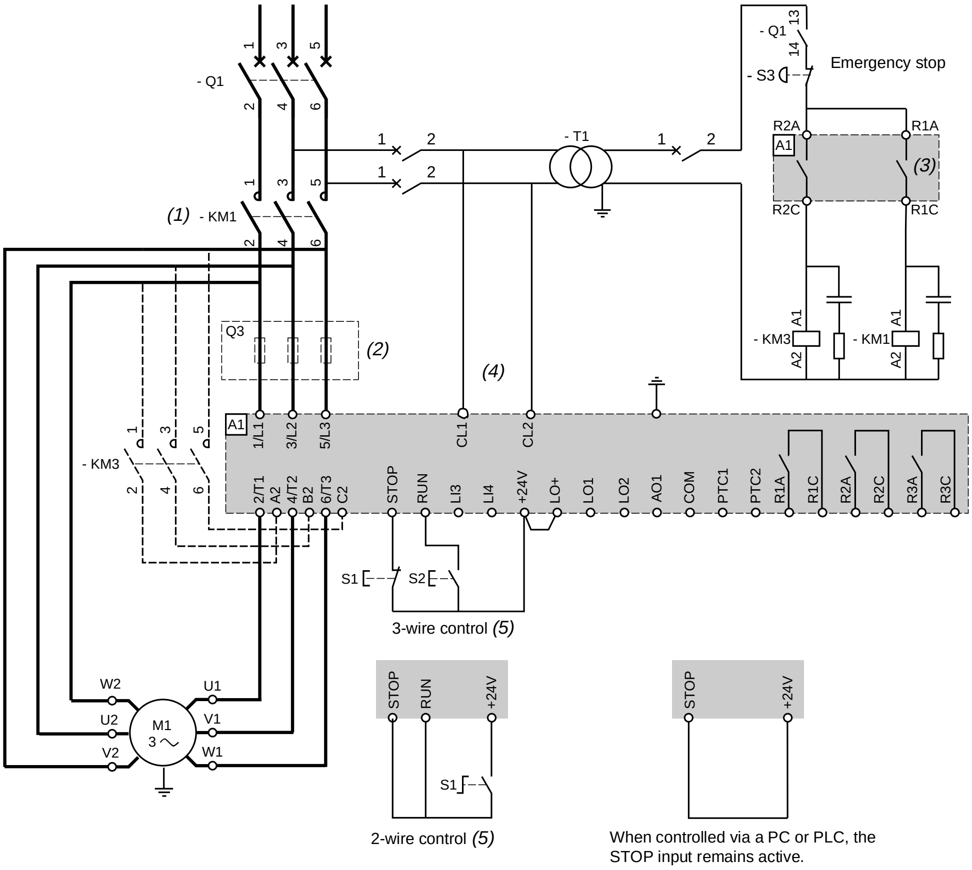
(4) 2-wire and 3-wire control (see page 1/74).

Components to connect depending on the types of coordination and voltages

Designation	Description
M1	Motor
A1	Starter (standard applications and severe applications)
Q1	Circuit-breaker or switch/fuses
Q3	3 FA fuses
KM1, KM3	Contactor
S1, S2	Control (separate parts XB2 or XB2 M)

Recommended application diagram for connection to the motor delta terminals, non-reversing, freewheel stop, with starter line and bypass contactors, type 1 and type 2 coordinations

This type of wiring enables the starter rating to be reduced.
ATS 48●●●Q



Select the components to connect according to the descriptions on page 1/55 and the association tables on pages 1/58 to 1/67.

(1) A line contactor must be used in the sequence.

(2) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(3) R1 must be assigned as the "isolating relay" to control contactor KM1. Beware of the operating limits of the contacts (see Characteristics page 1/32), for example when connecting to high rating contactors.

(4) Insert a transformer if the line voltage is different to that defined for the control circuit (see page 1/32).

(5) 2-wire and 3-wire controls (see page 1/74).

Types of coordination

The standard defines tests for different current levels which are designed to expose the device to extreme conditions.
Based on the state of the components after a short-circuit test, the standard defines 2 types of coordinations.

- Type 1 coordination: damage to the contactor and the starter is acceptable under 2 conditions:
  - no risk is posed to the operator,
  - elements other than the contactor and the starter are not damaged.

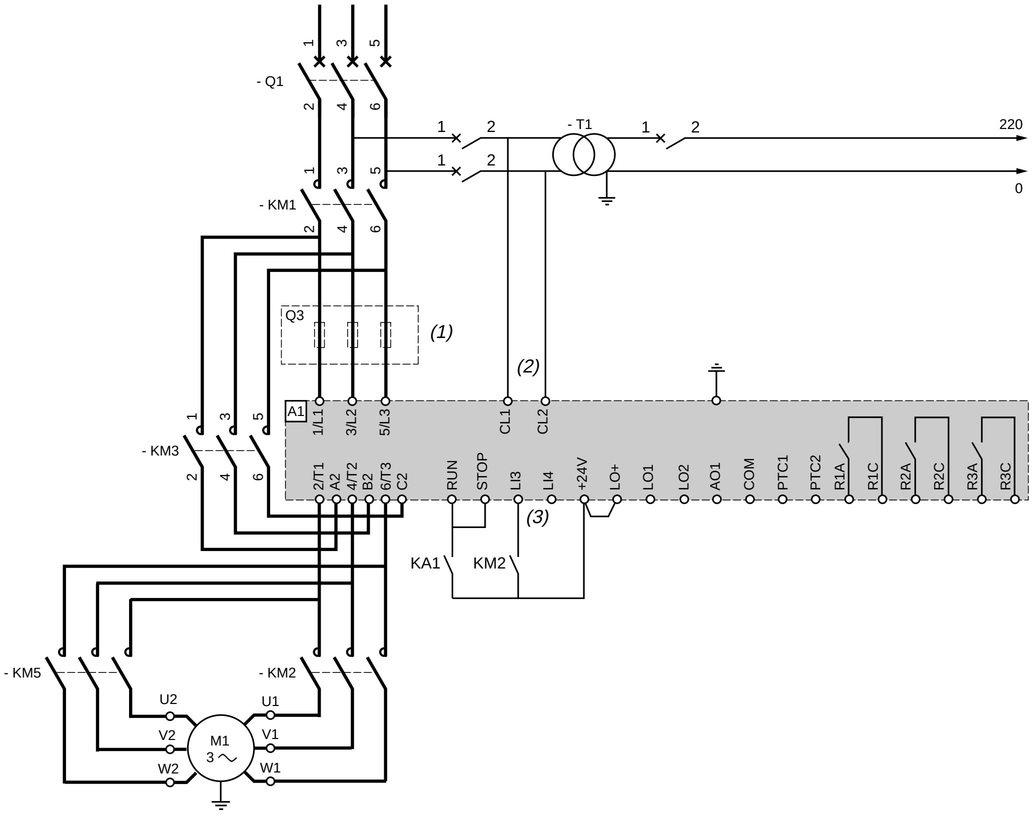
Maintenance must be carried out after a short-circuit.

- Type 2 coordination: minor soldering of the contactor contacts is permissible if they can be separated easily. The starter must not be damaged beyond repair. The protection and control devices remain operational after type 2 coordination tests.

Once the fuses have been replaced, check the contactor.

Nota : *the starter will protect the motor and the cables against overloads. If this protection function is disabled, external thermal protection must be provided.*

Recommended application diagram for LSP/HSP motor, non-reversing with starter line and bypass contactors



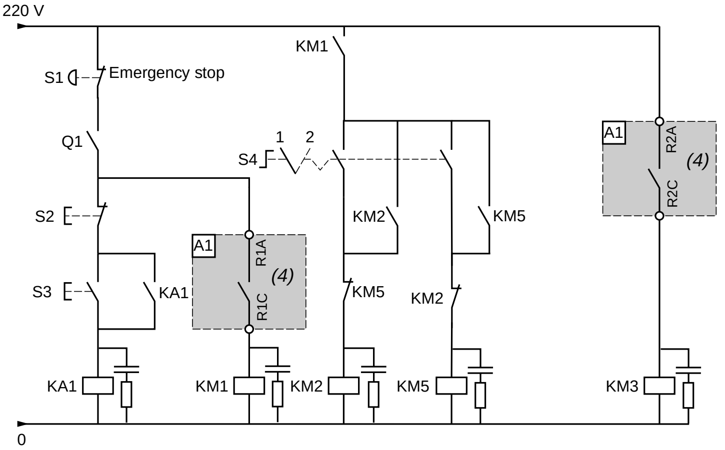
Select the components to connect, according to the descriptions below, from the association tables on pages 1/58 to 1/67.

(1) *For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.*

(2) *Insert a transformer if the line voltage is different to that defined for the control circuit (see page 1/32).*

(3) *Assign logic input LI3 to "activate the adjustment functions of the 2nd motor".*

(4) *Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see Characteristics page 1/32), for example when connecting to high rating contactors.*



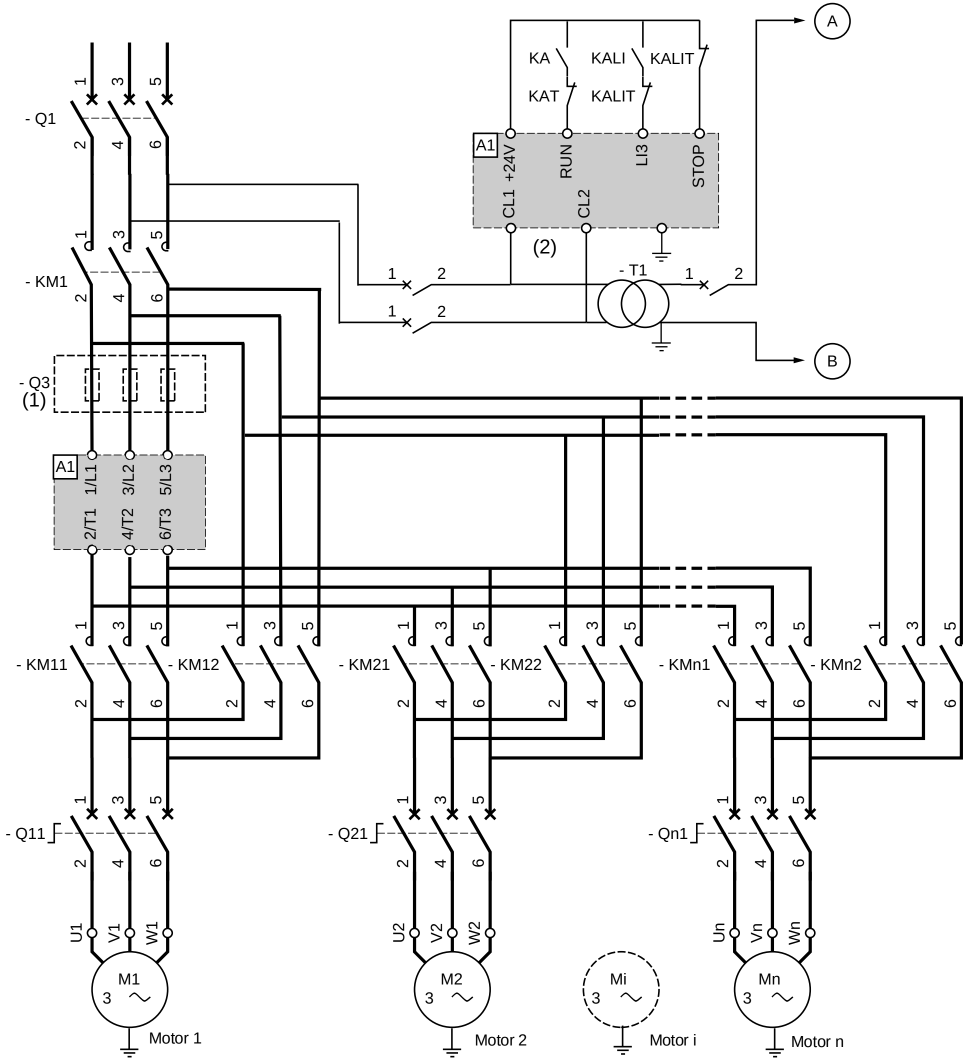
S4 : 1 = low speed
S4 : 2 = high speed

Components to connect depending on the types of coordination and voltages

Designation	Description
M1	Motor
A1	Starter (standard applications and severe applications)
Q1	Circuit-breaker or switch/fuses
Q3	3 FA fuses
KM1, KM2, KM3, KM5, KA1	Contactors and relays
S1, S2, S3	Control (separate parts XB2 or XB2 M)

Recommended application diagram for starting and decelerating several motors cascaded with a single Altistart 48, non-reversing and line contactor

The diagram is given as an example only. For more details, refer to the Altistart 48 user's manual.



Select the components to connect, according to the designations below, from the association tables on pages 1/58 to 1/67.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.
(2) Insert a transformer if the line voltage is different to that defined for the control circuit (see page 1/32).

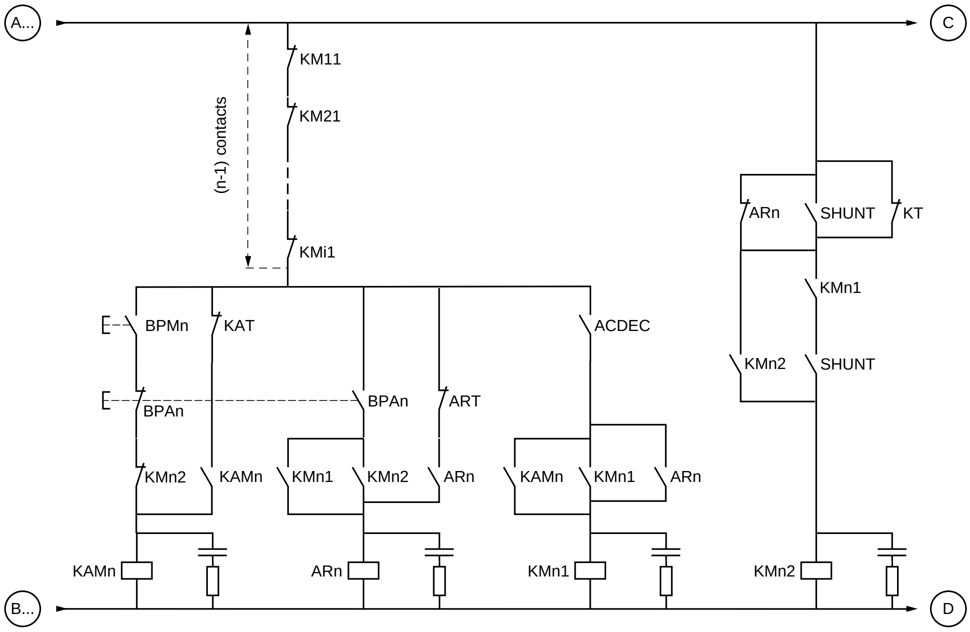
Important:
- One Altistart 48 logic input must be configured as a "cascading" input.
- In the event of a fault, it will not be possible to decelerate or brake any motors that may be running at that time.
- Adjust the thermal protection of each circuit-breaker Q_{n1} for the corresponding nominal motor current.

Components to connect depending on the types of coordination and voltages

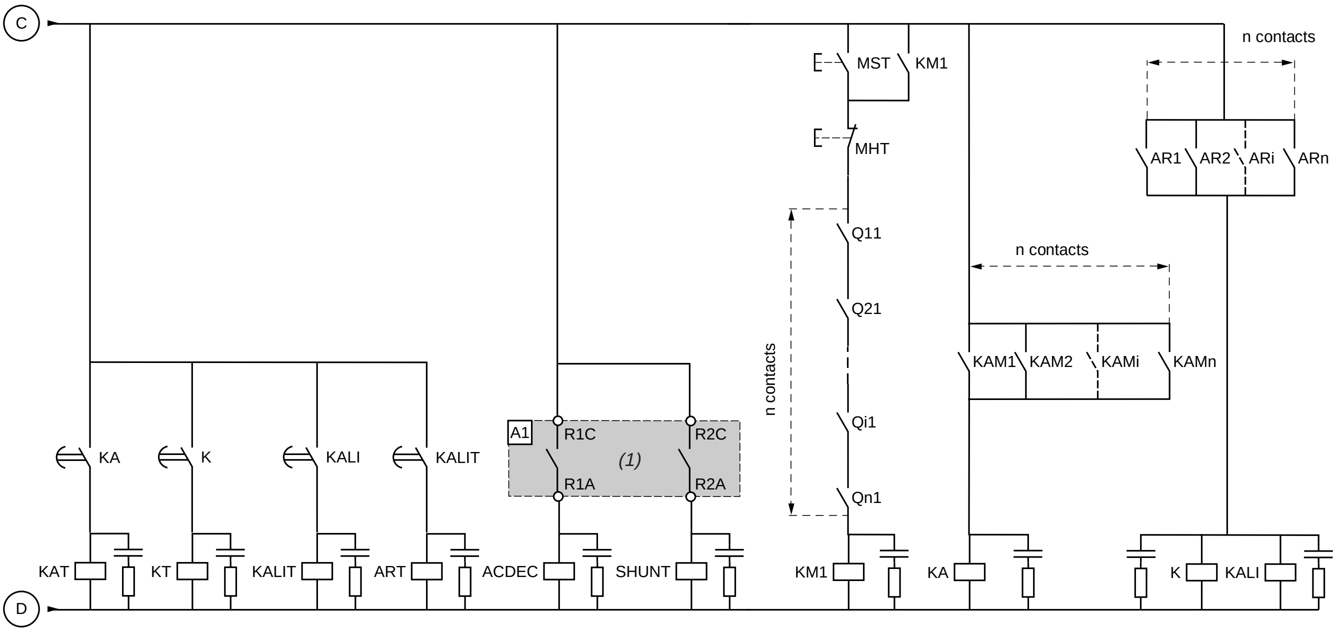
Designation	Description
M1, M2, Mi, Mn	Motor
A1	Starter (standard applications and severe applications)
KM1, KM2, ..., KMi, KMn	Contactor
Q1	Circuit-breaker or switch/fuses
Q3	3 FA fuses
Q11, Q21, ..., Qn1	Thermal magnetic circuit-breakers
KA, KAT, KALI, KALIT	Control (separate parts XB2 or XB2 M)

Recommended application diagram for starting and decelerating several motors cascaded with a single Altistart 48, non-reversing and line contactor (continued)

Motor n control



Cascade control



(1) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see Characteristics page 1/32), for example when connecting to high rating contactors.

BPMn: "Run" button motor n
BPAn: "Stop" button motor n
MST: General "Run" button
MHT: General "Stop" button

Soft starters

Altistart 48 soft start - soft stop units
230 V power supply
Type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57)

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		**Starter** *(1)*		**Type of circuit-breaker**		**Type of contactor**	**Type of switch or switch disconnector (bare unit)**	**Am fuses**			
		Class 10 Standard applications	**Class 20** Severe applications	**Telemecanique** ***Merlin Gerin***	**Rating**			**Unit reference** *(3)*		**Size**	**Rating**
kW	**A**				**A**			Without striker	With striker		**A**
M1		A1		Q1		KM1, KM2, KM3					
3	11.5	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
				NS80H MA	12.5	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
4	14.5	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
				NS80H MA	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
5.5	20	**ATS 48D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D25**	**LS1 D32**	**DF2 CA25**	–	10 x 38	25
				NS80H MA	25	**LC1 D25**	**LS1 D32**	**DF2 CA25**	–	10 x 38	25
7.5	27	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
				NS80H MA	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
9	32	**ATS 48D38●**	**ATS 48D47●**	**GK3 EF40**	40	**LC1 D38**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
				NS80H MA	50	**LC1 D38**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
11	39	**ATS 48D47●**	**ATS 48D62●**	**GK3 EF65**	65	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
				NS80H MA	50	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
15	52	**ATS 48D62●**	**ATS 48D75●**	**GK3 EF65**	65	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
				NS80H MA	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
18.5	64	**ATS 48D75●**	**ATS 48D88●**	**GK3 EF80**	80	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
				NS80H MA	80	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
22	75	**ATS 48D88●**	**ATS 48C11●**	***NS100● MA*** *(2)*	100	**LC1 D115**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
30	103	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** *(2)*	150	**LC1 D115**	**GK1 FK**	**DF2 FA125**	**DF4 FA125**	22 x 58	125
37	126	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** *(2)*	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	0	160
45	150	**ATS 48C17●**	**ATS 48C21●**	***NS250● MA*** *(2)*	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
55	182	**ATS 48C21●**	**ATS 48C25●**	***NS250● MA*** *(2)*	220	**LC1 F225**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
75	240	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** *(2)*	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1251**	**DF4 JA1251**	2	250
90	295	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** *(2)*	320	**LC1 F330**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
110	356	**ATS 48C41●**	**ATS 48C48●**	***NS630● MA*** *(2)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1401**	**DF4 KA1401**	3	400
132	425	**ATS 48C48●**	**ATS 48C59●**	***NS630● MA*** *(2)*	500	**LC1 F500**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
160	520	**ATS 48C59●**	**ATS 48C66●**	***NS630b●*** *(2)* ***Micrologic 5.0***	630	**LC1 F630**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
				C801● *(2)* ***STR35 ME***	800	**LC1 F630**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
–	–	**ATS 48C66●**	**ATS 48C79●**	***NS800●*** *(2)* ***Micrologic 5.0***	800	**LC1 F800**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
				C801● *(2)* ***STR35 ME***	800	**LC1 F800**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
220	700	**ATS 48C79●**	**ATS 48M10●**	***NS800●*** *(2)* ***Micrologic 5.0***	800	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C801● *(2)* ***STR35 ME***	800	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
250	800	**ATS 48M10●**	**ATS 48M12●**	**NS1000●** *(2)* **Micrologic 5.0**	1000	**LC1 BM33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001● *(2)* ***STR35 ME***	1000	**LC1 BM33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
355	1115	**ATS 48M12●**	–	**NS1250●** *(2)* **Micrologic 5.0**	1250	**LC1BP33**	–	**DF2 LA1251**	**DF4 LA1251**	4	1250
				C1251● *(2)* ***STR35 ME***	1250	**LC1BP33**	–	**DF2 LA1251**	**DF4 LA1251**	4	1250

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see table below).
(3) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold in lots of 1.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17● to ATS 48C32●	**50**
ATS 48C41● to ATS 48M12●	**70**

Breaking capacity of circuit-breakers according to standard IEC 60947-2

230 V	**Icu (kA)**		
GV2 L20, GK3 EF40, NS80	100		
GV2 L22, GV2 L32, GK3 EF65, GK3 EF80	50		
230 V	**Icu (kA)**		
	N	**H**	**L**
NS100, NS160, NS250, NS400, NS630	85	100	150
NS800, NS1000	50	70	150
NS1250	50	70	–
C801, C1001	85	100	150
C1251	85	100	–

Soft starters

Altistart 48 soft start - soft stop units
230 V power supply
Type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		Starter *(1)*		Type of circuit-breaker		Type of contactor
		Class 10	**Class 20**	**Telemecanique**	**Rating**	
kW	**A**	Standard applications	Severe applications	***Merlin Gerin***	**A**	
M1		A1		Q1		KM1, KM2, KM3
3	11.5	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	12.5	**LC1 D40**
4	14.5	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	25	**LC1 D40**
5.5	20	**ATS 48-D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D40**
				NS80H MA	25	**LC1 D40**
7.5	27	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D80**
				NS80H MA	50	**LC1 D80**
9	32	**ATS 48D38●**	**ATS 48D47●**	**GK3 EF40**	40	**LC1 D80**
				NS80H MA	50	**LC1 D80**
11	39	**ATS 48D47●**	**ATS 48D62●**	**GK3 EF65**	65	**LC1 D80**
				NS80H MA	50	**LC1 D80**
15	52	**ATS 48D62●**	**ATS 48D75●**	**GK3 EF65**	65	**LC1 D80**
				NS80H MA	80	**LC1 D80**
18.5	64	**ATS 48D75●**	**ATS 48D88●**	**GK3 EF80**	80	**LC1 D80**
				NS80H MA	80	**LC1 D80**
22	75	**ATS 48D88●**	**ATS 48C11●**	***NS100● MA*** *(2)*	100	**LC1 D115**
30	103	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** *(2)*	150	**LC1 D115**
37	126	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** *(2)*	150	**LC1 D150**
45	150	**ATS 48C17●**	**ATS 48C21●**	***NS250● MA*** *(2)*	220	**LC1 F185**
55	182	**ATS 48C21●**	**ATS 48C25●**	***NS250● MA*** *(2)*	220	**LC1 F225**
75	240	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** *(2)*	320	**LC1 F265**
90	295	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** *(2)*	320	**LC1 F330**
110	356	**ATS 48C41●**	**ATS 48C48●**	***NS630● MA*** *(2)*	500	**LC1 F400**
132	425	**ATS 48C48●**	**ATS 48C59●**	***NS630● MA*** *(2)*	500	**LC1 F500**
160	520	**ATS 48C59●**	**ATS 48C66●**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
200	626	**ATS 48C66●**	**ATS 48C79●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
220	700	**ATS 48C79●**	**ATS 48M10●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
250	800	**ATS 48M10●**	**ATS 48M12●**	***NS1000L Micrologic 5.0***	1000	**LC1 BM33**
355	1115	**ATS 48M12●**	–	***NS1250●*** *(2)* ***Micrologic 5.0*** *(3)*	1250	**LC1 BP33**

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).
(3) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17● to ATS 48C79●	**50**
ATS 48M10● and ATS 48M12●	**85**

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	Fast-acting fuses with micro-contact			
Reference	Unit reference *(4)*	Size	Rating A	I^2t $kA^2.s$
A1	Q3			
ATS 48D17●	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22● and ATS 48D32●	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38● and ATS 48D47●	**DF3 FR100**	22 x 58	100	12
ATS 48D62● and ATS 48D75●	**DF4 00125**	00	125	45
ATS 48D88● and ATS 48C11●	**DF4 00160**	00	160	82
ATS 48C14● and ATS 48C17●	**DF4 30400**	30	400	120
ATS 48C21● to ATS 48C32●	**DF4 31700**	31	700	490
ATS 48D75●	**DF4 33800**	33	800	490
ATS 48C48● and ATS 48C59●	**DF4 331000**	33	1000	900
ATS 48C66●	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79●	**DF4 441600**	44	1600	1600
ATS 48M10● and ATS 48M12●	**DF4 442200**	44	2200	4100

(4) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold in lots of 1.

Soft starters

Altistart 48 soft start - soft stop units
380 V, 400 V, 415 V power supply
Type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57)

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		**Starter** *(1)*		**Type of circuit-breaker**		**Type of contactor**	**Type of switch or switch disconnector (bare unit)**	**Am fuses**			
		Class 10 Standard applications	**Class 20** Severe applications	**Telemecanique** ***Merlin Gerin***	**Rating**			**Unit reference** *(3)*		**Size**	**Rating**
kW	**A**				**A**			Without striker	With striker		**A**
M1		A1		Q1		KM1, KM2, KM3					
5.5	11	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
				NS80H MA	12.5	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
7.5	14.8	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
				NS80H MA	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
11	21	**ATS 48D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D25**	**LS1 D32**	**DF2 CA25**	–	10 x 38	25
				NS80H MA	25	**LC1 D25**	**LS1 D32**	**DF2 CA25**	–	10 x 38	25
15	28.5	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
				NS80H MA	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
18.5	35	**ATS 48D38●**	**ATS 48D47●**	**GK3 EF40**	40	**LC1 D38**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
				NS80H MA	50	**LC1 D38**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
22	42	**ATS 48D47●**	**ATS 48D62●**	**GK3 EF65**	65	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
				NS80H MA	50	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
30	57	**ATS 48D62●**	**ATS 48D75●**	**GK3 EF65**	65	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
				NS80H MA	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
37	69	**ATS 48D75●**	**ATS 48D88●**	**GK3 EF80**	80	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
				NS80H MA	80	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
45	81	**ATS 48D88●**	**ATS48C11●**	***NS100● MA*** *(2)*	100	**LC1 D115**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
55	100	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** *(2)*	150	**LC1 D115**	**GK1 FK**	**DF2 FA125**	**DF4 FA125**	22 x 58	125
75	131	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** *(2)*	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	0	160
90	162	**ATS 48C17●**	**ATS 48C21●**	***NS250● MA*** *(2)*	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
110	195	**ATS 48C21●**	**ATS 48C25●**	***NS250● MA*** *(2)*	220	**LC1 F225**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
132	233	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** *(2)*	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1251**	**DF4 JA1251**	2	250
160	285	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** *(2)*	320	**LC1 F330**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
220	388	**ATS 48C41●**	**ATS 48C48●**	***NS630● MA*** *(2)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1401**	**DF4 KA1401**	3	400
250	437	**ATS 48C48●**	**ATS 48C59●**	***NS630● MA*** *(2)*	500	**LC1 F500**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
315	560	**ATS 48C59●**	**ATS 48C66●**	***NS630b●*** *(2)* ***Micrologic 5.0***	630	**LC1 F630**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
				C801● *(2)* ***STR35ME***	800	**LC1 F630**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
355	605	**ATS 48C66●**	**ATS 48C79●**	***NS800●*** *(2)* ***Micrologic 5.0***	800	**LC1 F800**	**GS1 V**	**DF2 LA1631**	**DF4 LA1631**	4	630
				C801● *(2)* ***STR35ME***	800	**LC1 F800**	**GS1 V**	**DF2 LA1631**	**DF4 LA1631**	4	630
400	675	**ATS 48C79●**	**ATS 48M10●**	***NS800●*** *(2)* ***Micrologic 5.0***	800	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C801● *(2)* ***STR35ME***	800	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
500	855	**ATS 48M10●**	**ATS 48M12●**	***NS1000●*** *(2)* ***Micrologic 5.0***	1000	**LC1 BM33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001● *(2)* ***STR35ME***	1000	**LC1 BM33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
630	1045	**ATS48M12●**	–	***NS1250●*** *(2)* ***Micrologic 5.0***	1250	**LC1 BP33**	**–**	**DF2 LA1251**	**DF4 LA1251**	4	1250
				C1251● *(2)* ***STR35ME***	1250	**LC1 BP33**	**–**	**DF2 LA1251**	**DF4 LA1251**	4	1250

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see table below)
(3) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA:sold in lots of 3.
DF● LA: sold in lots of 1.

Maximum prospective short-circuit current of the starter according to IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17● to ATS 48C32●	**50**
ATS 48C41● to ATS 48M12●	**70**

Breaking capacity of circuit-breakers according to standard IEC 60947-2

380 V, 400 V, 415 V	**Icu (kA)**		
GV2 L20, GV2 L22, GV2 L32, GK3 EF40	50		
GK3 EF65, GK3 EF80	35		
NS80	70		
380 V, 400 V, 415 V	**Icu (kA)**		
	N	**H**	**L**
NS100	25	70	150
NS160, NS250	36	70	150
NS400, NS630	45	70	150
NS800, NS1000, C801, C1001	50	70	150
NS1250, C1251	50	70	–

Soft starters

Altistart 48 soft start - soft stop units

380 V, 400 V or 415 V power supply
Type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		**Starter** *(1)*		**Type of circuit-breaker**		**Type of contactor**
		Class 10	**Class 20**	**Telemecanique**	**Rating**	
kW	**A**	Standard applications	Severe applications	***Merlin Gerin***	**A**	
M1		A1		Q1		KM1, KM2, KM3
5.5	11	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	12.5	**LC1 D40**
7.5	14.8	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	25	**LC1 D40**
11	21	**ATS 48D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D40**
				NS80H MA	25	**LC1 D40**
15	28.5	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D80**
				NS80H MA	50	**LC1 D80**
18.5	35	**ATS 48D38●**	**ATS 48D47●**	***NS80H MA***	50	**LC1 D80**
22	42	**ATS 48D47●**	**ATS 48D62●**	***NS80H MA***	50	**LC1 D80**
30	57	**ATS 48D62●**	**ATS 48D75●**	***NS80H MA***	80	**LC1 D80**
37	69	**ATS 48D75●**	**ATS 48D88●**	***NS80H MA***	80	**LC1 D80**
45	81	**ATS 48D88●**	**ATS 48C11●**	***NS100● MA*** *(2)*	100	**LC1 D115**
55	100	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** *(2)*	150	**LC1 D115**
75	131	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** *(2)*	150	**LC1 D150**
90	162	**ATS 48C17●**	**ATS 48C21●**	***NS 250● MA*** *(2)*	220	**LC1 F185**
110	195	**ATS 48C21●**	**ATS 48C25●**	***NS 250● MA*** *(2)*	220	**LC1 F225**
132	233	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** *(2)*	320	**LC1 F265**
160	285	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** *(2)*	320	**LC1 F330**
220	388	**ATS 48C41●**	**ATS 48C48●**	***NS630● MA*** *(2)*	500	**LC1 F500**
250	437	**ATS 48C48●**	**ATS 48C59●**	***NS630● MA*** *(2)*	500	**LC1 F500**
315	560	**ATS 48C59●**	**ATS 48C66●**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
355	605	**ATS48C66●**	**ATS48C79●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
400	675	**ATS48C79●**	**ATS48M10●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
500	855	**ATS48M10●**	**ATS48M12●**	***NS1000L Micrologic 5.0***	1000	**LC1 BM33**
630	1045	**ATS48M12●**	–	***NS1250●*** *(2)* ***Micrologic 5.0*** *(3)*	1250	**LC1 BP33**

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).
(3) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17●	**50**
ATS 48D22● to ATS 48D47●	**40**
ATS 48D62● to ATS 48C79●	**50**
ATS 48M10● and ATS 48M12●	**85**

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	**Fast-acting fuses with micro-contact**			
Reference	**Unit reference** *(4)*	**Size**	**Rating A**	**I²t kA².s**
A1	Q3			
ATS 48D17●	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22● and ATS 48D32●	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38● and ATS 48D47●	**DF3 FR100**	22 x 58	100	12
ATS 48D62● and ATS 48D75●	**DF4 00125**	00	125	45
ATS 48D88● and ATS 48C11●	**DF4 00160**	00	160	82
ATS 48C14● and ATS 48C17●	**DF4 30400**	30	400	120
ATS 48C21● to ATS 48C32●	**DF4 31700**	31	700	490
ATS 48D75●	**DF4 33800**	33	800	490
ATS 48C48● and ATS 48C59●	**DF4 331000**	33	1000	900
ATS 48C66●	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79●	**DF4 441600**	44	1600	1600
ATS 48M10● and ATS 48M12●	**DF4 442200**	44	2200	4100

(4) DF3 ER, DF3 FR: sold in lots of 10.
DF4: sold in lots of 1.

Soft starters

Altistart 48 soft start - soft stop units

440 V power supply
Type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57)

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		**Starter**		**Type of circuit-breaker**		**Type of contactor**	**Type of switch or switch disconnector (bare unit)**	**Am fuses**			
		Class 10 Standard applications	**Class 20** Severe applications	**Telemecanique** ***Merlin Gerin***	**Rating**			**Unit reference** *(2)* Without striker	With striker	**Size**	**Rating**
kW	**A**				**A**						**A**
M1		A1		Q1		KM1, KM2, KM3					
5.5	10.4	–	**ATS 48D17Y**	***NS100● MA*** *(1)* ***NS80H MA***	12.5	**LC1 D12**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
7.5	13.7	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)* ***NS80H MA***	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
11	20.1	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** *(1)* ***NS80H MA***	25	**LC1 D25**	**GK1 EK**	**DF2 EA25**	**DF3 EA25**	14 x 51	25
15	26.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
18.5	32.8	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D40**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
22	39	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D40**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
30	52	**ATS 48D62Y**	**ATS 48D75Y**	***NS80H MA***	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
37	64	**ATS 48D75Y**	**ATS 48D88Y**	***NS80H MA***	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
45	76	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
55	90	**ATS 48C11Y**	**ATS 48C14Y**	***NS100● MA*** *(1)*	100	**LC1 D115**	**GS1 L**	**DF2 GA1121**	**DF4 GA1121**	0	125
75	125	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	1	160
90	150	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
110	178	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F225**	**GS1 N**	**DF2 HA1251**	**DF4 HA1251**	1	250
132	215	**ATS 48C25Y**	**ATS 48C32Y**	***NS250● MA*** *(1)*	220	**LC1 F265**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
160	256	**ATS 48C32Y**	**ATS 48C41Y**	***NS400● MA*** *(1)*	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1401**	**DF4 JA1401**	2	315
220	353	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MA*** *(1)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
250	401	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MA*** *(1)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
355	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 F630**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
400	611	**ATS 48C66Y**	**ATS 48C79Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 F630**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
500	780	**ATS 48C79Y**	**ATS 48M10Y**	***NS800●*** *(1)* ***Micrologic 5.0***	800	**LC1 BM33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C801● *(1)* ***STR35ME***	800	**LC1 BM33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
630	965	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000●*** *(1)* ***Micrologic 5.0***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001L ***STR35ME***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
710	1075	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250
				C1251● *(1)* ***STR35ME***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250

(1) Replace ● with N, H or L, according to the breaking capacity (see table below).
(2) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold in lots of 1.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17Y to ATS 48C32Y	**50**
ATS 48C41Y to ATS 48M12Y	**70**

Breaking capacity of circuit-breakers according to standard IEC 60947-2

440 V	**Icu (kA)**		
GV2 L20, GV2 L22, GV2 L32	20		
GK3 EF40	30		
GK3 EF65, GK3 EF80	25		
NS80	65		
440 V	**Icu (kA)**		
	N	**H**	**L**
NS100	25	65	130
NS160, NS250	35	65	130
NS400, NS630	42	65	130
NS800, NS1000	50	65	130
NS1250	50	65	–
C801, C1001	42	65	150
C1251	42	65	–

Soft starters

Altistart 48 soft start - soft stop units
440 V power supply
Type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		**Starter**		**Type of circuit-breaker**		**Type of contactor**
		Class 10 Standard applications	**Class 20** Severe applications	**Telemecanique** ***Merlin Gerin***	**Rating**	
kW	**A**				**A**	
M1		A1		Q1		KM1, KM2, KM3
5.5	10.4	–	**ATS 48D17Y**	***NS80H-MA***	12.5	**LC1 D40**
				NS100● MA *(1)*	12.5	**LC1 D80**
7.5	13.7	**ATS 48D17Y**	**ATS 48D22Y**	***NS80H-MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
11	20.1	**ATS 48D22Y**	**ATS 48D32Y**	***NS80H-MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
15	26.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H-MA***	50	**LC1 D80**
18.5	32.8	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
22	39	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
30	52	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
				NS80H MA	80	**LC1 D80**
37	64	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
				NS80H MA	80	**LC1 D80**
45	76	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
55	90	**ATS 48C11Y**	**ATS 48C14Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
75	125	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**
90	150	**ATS 48C17Y**	**ATS 48C21Y**	***NS160● MA*** *(1)*	150	**LC1 D150**
110	178	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F185**
132	215	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
160	256	**ATS 48C32Y**	**ATS 48C41Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
220	353	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MA*** *(1)*	500	**LC1 F400**
250	401	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MA*** *(1)*	500	**LC1 F500**
355	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
400	611	**ATS 48C66Y**	**ATS 48C79Y**	***NS800L Micrologic 5.0***	800	**LC1 F800**
500	780	**ATS 48C79Y**	**ATS 48M10Y**	***NS800L Micrologic 5.0***	800	**LC1 F800**
630	965	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000L Micrologic 5.0***	1000	**LC1 BP33**
710	1075	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0*** *(2)*	1250	**LC1 BP33**

(1) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).

(2) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17Y	**50**
ATS 48D22Y to ATS 48D47Y	**20**
ATS 48D62Y and ATS 48D75Y	**50**
ATS 48D88Y ATS 48C41Y	**40**
ATS 48C11Y to ATS 48C32Y	**50**
ATS 48C48Y to ATS 48C79Y	**50**
ATS 48M10Y and ATS 48M12Y	**85**

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	**Fast-acting fuses with micro-contact**			
Reference	**Unit reference** *(3)*	**Size**	**Rating A**	**I^2t kA².s**
A1	Q3			
ATS 48D17Y	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22Y and ATS 48D32Y	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38Y and ATS 48D47Y	**DF3 FR100**	22 x 58	100	12
ATS 48D62Y and ATS 48D75Y	**DF4 00125**	00	125	45
ATS 48D88Y and ATS 48C11Y	**DF4 00160**	00	160	82
ATS 48C14Y and ATS 48C17Y	**DF4 30400**	30	400	120
ATS 48C21Y to ATS 48C32Y	**DF4 31700**	31	700	490
ATS 48C41Y	**DF4 33800**	33	800	490
ATS 48C48Y and ATS 48C59Y	**DF4 331000**	33	1000	900
ATS 48C66Y	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79Y	**DF4 441600**	44	1600	1600
ATS 48M10Y and ATS 48M12Y	**DF4 442200**	44	2200	4100

(3) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold in lots of 1.

Soft starters

Altistart 48 soft start - soft stop units
500 V power supply
Type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57)

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		**Starter**		**Type of circuit-breaker**		**Type of contactor**	**Type of switch or switch disconnector (bare unit)**	**Am fuses**			
kW	**A**	**Class 10** Standard applications	**Class 20** Severe applications	**Telemecanique** ***Merlin Gerin***	**Rating** **A**			**Unit reference** *(2)* Without striker	With striker	**Size**	**Rating** **A**
M1		A1		Q1		KM1, KM2, KM3					
7.5	12	–	**ATS 48D17Y**	***NS100● MA*** *(1)* ***NS80H MA***	12.5	**LC1 D12**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
9	14	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)* ***NS80H MA***	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
11	18.4	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA (1)*** ***NS80H MA***	25	**LC1 D25**	**GK1 EK**	**DF2 EA25**	**DF3 EA25**	14 x 51	25
18.5	28.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
22	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D40**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
30	45	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
37	55	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
45	65	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
55	80	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D80**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
75	105	**ATS 48C11Y**	**ATS 48C14Y**	***NS160● MA*** *(1)*	150	**LC1 D115**	**GS1 L**	**DF2 GA1121**	**DF4 GA1121**	0	125
90	130	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	0	160
110	156	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
132	207	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F265**	**GS1 N**	**DF2 HA1251**	**DF4 HA1251**	1	250
160	257	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
220	310	**ATS 48C32Y**	**ATS 48C41Y**	***NS630● MA*** *(1)*	500	**LC1 F400**	**GS1 QQ**	**DF2 JA1401**	**DF4 JA1401**	2	400
250	360	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MA*** *(1)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
315	460	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MA*** *(1)*	500	**LC1 F500**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
400	540	**ATS 48C59Y**	**ATS 48C66Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 F630**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
450	630	**ATS 48C66Y**	**ATS 48C79Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
500	680	**ATS 48C79Y**	**ATS 48M10Y**	***NS800● MA*** *(1)* ***Micrologic 5.0***	800	**LC1 BL33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C1001● (1) ***STR35 ME***	1000	**LC1 BL33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
630	850	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000●*** *(1)* ***Micrologic 5.0***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001● *(1)* ***STR35 ME***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
800	1100	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250
				C1251● *(1)* ***STR35 ME***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250

(1) Replace ● with N, H or L, according to the breaking capacity (see table below).
(2) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold in lots of 1

Breaking capacity of circuit-breakers according to standard IEC 60947-2

500 V	**Icu (kA)**		
GV2 L20, GV2 L22, GV2 L32	10		
GK3 EF40	20		
GK3 EF65, GK3 EF80	15		
NS80	25		
500 V	**Icu (kA)**		
	N	**H**	**L**
NS100	18	50	100
NS160, NS250, NS630	30	50	70
NS400	30	50	100
NS800, NS1000, C801, C1001	40	50	100
NS1250, C1251	40	50	–

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17Y to ATS 48C32Y	**50**
ATS 48C41Y to ATS 48M12Y	**70**

Presentation:
pages 1/30 and 1/31
Characteristics:
pages 1/32 to 1/35
References:
pages 1/40 to 1/43
Dimensions:
pages 1/48 to 1/51
Schemes:
pages 1/52 to 1/57

Soft starters

Altistart 48 soft start - soft stop units
500 V power supply
Type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		**Starter**		**Type of circuit-breaker**		**Type of contactor**
		Class 10	**Class 20**	**Telemecanique**	**Rating**	
kW	**A**	Standard applications	Severe applications	***Merlin Gerin***	**A**	
M1		A1		Q1		KM1, KM2, KM3
7.5	12	–	**ATS 48D17Y**	***NS80H MA***	12.5	**LC1 D40**
				NS100● MA *(1)*	12.5	**LC1 D80**
9	14	**ATS 48D17Y**	**ATS 48D22Y**	***NS80H MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
11	18.4	**ATS 48D22Y**	**ATS 48D32Y**	***NS80H MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
18.5	28.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
22	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
30	45	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
37	55	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
45	65	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
55	80	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
75	105	**ATS 48C11Y**	**ATS 48C14Y**	***NS160● MA*** *(1)*	150	**LC1 D115**
90	130	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**
110	156	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1 F185**
132	207	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F265**
160	257	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F400**
220	310	**ATS 48C32Y**	**ATS 48C41Y**	***NS400● MA*** *(1)*	320	**LC1 F400**
250	360	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MA*** *(1)*	500	**LC1 F500**
315	460	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MA*** *(1)*	500	**LC1 F500**
400	540	**ATS 48C59Y**	**ATS 48C66Y**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
450	630	**ATS 48C66Y**	**ATS 48C79Y**	***NS630bL Micrologic 5.0***	630	**LC1 F800**
500	680	**ATS 48C79Y**	**ATS 48M10Y**	***NS800L Micrologic 5.0***	800	**LC1 BL33**
630	850	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000L Micrologic 5.0***	1000	**LC1 BP33**
800	1100	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0*** *(2)*	1250	**LC1 BP33**

(1) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).

(2) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	**Fast-acting fuses with micro-contact**			
Reference	**Unit reference** *(3)*	**Size**	**Rating A**	**I²t kA².s**
A1	Q3			
ATS 48D17Y	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22Y and ATS 48D32Y	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38Y and ATS 48D47Y	**DF3 FR100**	22 x 58	100	12
ATS 48D62Y and ATS 48D75Y	**DF4 00125**	00	125	45
ATS 48D88Y and ATS 48C11Y	**DF4 00160**	00	160	82
ATS 48C14Y and ATS 48C17Y	**DF4 30400**	30	400	120
ATS 48C21Y to ATS 48C32Y	**DF4 31700**	31	700	490
ATS 48C41Y	**DF4 33800**	33	800	490
ATS 48C48Y and ATS 48C59Y	**DF4 331000**	33	1000	900
ATS 48C66Y	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79Y	**DF4 441600**	44	1600	1600
ATS 48M10Y and ATS 48M12Y	**DF4 442200**	44	2200	4100

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17Y	**50**
ATS 48D22Y to ATS 48D47Y	**20**
ATS 48D62Y and ATS 48D75Y	**50**
ATS 48D88Y	**40**
ATS 48C11Y to ATS 48C32Y	**50**
ATS 48C41Y	**40**
ATS 48C48Y to ATS 48C79Y	**50**
ATS 48M10Y and ATS 48M12Y	**85**

(3) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold in lots of 1.

Soft starters

Altistart 48 soft start - soft stop units
690 V power supply
Type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57)

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuses (dark blue columns), contactor, starter

Motor		**Starter**		**Type of circuit-breaker**		**Type of contactor**	**Type of switch or switch disconnector (bare unit)**	**Am fuses**			
		Class 10 Standard applications	**Class 20** Severe applications	**Telemecanique** ***Merlin Gerin***	**Rating**			**Unit reference** (2) Without striker	With striker	**Size**	**Rating**
kW	**A**				**A**						**A**
M1		A1		Q1		KM1, KM2, KM3					
11	12.1	–	**ATS 48D17Y**	***NS100● MA*** *(1)* ***NS80H MA***	12.5 12.5	**LC1 D18**	**GK1 FK**	**DF2 FA16**	**DF3 FA16**	22 x 58	16
15	16.5	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)* **NS80H MA**	25 25	**LC1 D25**	**GK1 FK**	**DF2 FA20**	**DF3 FA20**	22 x 58	20
18.5	20.2	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D32**	**GK1 FK**	**DF2 FA25**	**DF3 FA25**	22 x 58	25
22	24.2	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D40**	**GK1 FK**	**DF2 FA32**	**DF3 FA32**	22 x 58	32
30	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D40**	**GK1 FK**	**DF2 FA40**	**DF3 FA40**	22 x 58	40
37	40	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D65**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
45	49	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D80**	–	–	–	–	–
55	58	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1D-115**	–	–	–	–	–
75	75.5	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1D-115**	–	–	–	–	–
90	94	**ATS 48C11Y**	**ATS 48C14Y**	***NS160● MA*** *(1)*	150	**LC1D-150**	–	–	–	–	–
110	113	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1D-150**	–	–	–	–	–
160	165	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1F-265**	–	–	–	–	–
200	203	**ATS 48C21Y**	**ATS 48C25Y**	***NS400● MA*** *(1)*	320	**LC1F-330**	–	–	–	–	–
250	253	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1F-400**	–	–	–	–	–
315	321	**ATS 48C32Y**	**ATS 48C41Y**	***NS630● MA*** *(1)*	500	**LC1F-500**	–	–	–	–	–
400	390	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MA*** *(1)*	500	**LC1 F630**	–	–	–	–	–
500	490	**ATS 48C48Y**	**ATS 48C59Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 BL33**	–	–	–	–	–
				C801● *(1)* ***STR35 ME***	800	**LC1 BL33**	–	–	–	–	–
560	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 BL33**	–	–	–	–	–
				C801● *(1)* ***STR35 ME***	800	**LC1 BL33**	–	–	–	–	–
630	605	**ATS 48C66Y**	**ATS 48C79Y**	***NS800●*** *(1)* ***Micrologic 5.0***	800	**LC1 BP33**	–	–	–	–	–
				C801● *(1)* ***STR35 ME***	800	**LC1 BP33**	–	–	–	–	–
710	694	**ATS 48C79Y**	**ATS 48M10Y**	***NS800●*** *(1)* ***Micrologic 5.0***	800	**LC1 BP33**	–	–	–	–	–
				C801● *(1)* ***STR35 ME***	800	**LC1 BP33**	–	–	–	–	–
900	880	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000●*** *(1)* ***Micrologic 5.0***	1000	**LC1 BR33**	–	–	–	–	–
				C1001L ***STR35 ME***	1000	**LC1 BR33**	–	–	–	–	–
950	1000	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0***	1250	**LC1 BR33**	–	–	–	–	–
				C1251● *(1)* ***STR35 ME***	1250	**LC1 BR33**	–	–	–	–	–

(1) Replace ● with N, H or L, according to the breaking capacity (see table below).
(2) DF● FA: sold in lots of 10.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17Y and ATS 48C32Y	50
ATS 48C41Y to ATS 48M12Y	70

Breaking capacity of circuit-breakers according to standard IEC 60947-2

690 V	**Icu (kA)**
GV2 L20, GV2 L22, GV2 L32	4
GK3 EF40, GK3 EF65, GK3 EF80, NS80	6

690 V	**Icu (kA)**		
	N	**H**	**L**
NS100	8	10	75
NS160, NS250	8	10	20
NS400	10	20	75
NS630	10	20	35
NS800, NS1000	30	42	25
NS1250	30	42	–
C801, C1001	25	40	60
C1251	25	40	–

Presentation:
pages 1/30 and 1/31

Characteristics:
pages 1/32 to 1/35

References:
pages 1/40 to 1/43

Dimensions:
pages 1/48 to 1/51

Schemes:
pages 1/52 to 1/57

Soft starters

Altistart 48 soft start - soft stop units
690 V power supply
Type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/52 to 1/57) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		**Starter**		**Type of circuit-breaker**		**Type of contactor**
		Class 10	**Class 20**	**Telemecanique** ***Merlin Gerin***	**Rating**	
kW	**A**	Standard applications	Severe applications		**A**	
M1		A1		Q1		KM1, KM2, KM3
11	12.1	–	**ATS 48D17Y**	***NS100● MA*** *(1)*	12.5	**LC1 D80**
15	16.5	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)*	25	**LC1 D80**
18.5	20.2	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
22	24.2	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
30	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
37	40	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
45	49	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
55	58	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
75	75.5	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
90	94	**ATS 48C11Y**	**ATS 48C14Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
110	113	**ATS 48C14Y**	**ATS 48C17Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
160	165	**ATS 48C17Y**	**ATS 48C21Y**	***NS 400● MA*** *(1)*	320	**LC1 F265**
200	203	**ATS 48C21Y**	**ATS 48C25Y**	***NS400● MA*** *(1)*	320	**LC1 F400**
250	253	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F500**
315	321	**ATS 48C32Y**	**ATS 48C41Y**	***NS630● MA*** *(1)*	500	**LC1 F500**
400	390	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MA*** *(1)*	500	**LC1 F630**
500	490	**ATS 48C48Y**	**ATS 48C59Y**	***NS630bL Micrologic 5.0***	630	**LC1 BL33**
560	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630bL Micrologic 5.0***	630	**LC1 BL33**
630	605	**ATS 48C66Y**	**ATS 48C79Y**	***NS800L Micrologic 5.0***	800	**LC1 BP33**
710	694	**ATS 48C79Y**	**ATS 48M10Y**	***NS800L Micrologic 5.0***	800	**LC1 BP33**
900	880	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000L Micrologic 5.0***	1000	**LC1 BR33**
950	1000	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0*** *(2)*	1250	**LC1 BR33**

(1) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).
(2) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter reference	**Fast-acting fuses with micro-contact**			
	Unit reference *(3)*	**Size**	**Calibre** **A**	**I^2t** **$kA^2.s$**
A1	Q3			
ATS 48D17Y	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22Yand ATS 48D32Y	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38Y and ATS 48D47Y	**DF3 FR100**	22 x 58	100	12
DF3 ER50	**DF4 00125**	00	125	45
ATS 48D88Y and ATS 48C11Y	**DF4 00160**	00	160	82
ATS 48C14Y and ATS 48C17Y	**DF4 30400**	30	400	120
ATS 48C21Y to ATS 48C32Y	**DF4 31700**	31	700	490
ATS 48C41Y	**DF4 33800**	33	800	490
ATS 48C48Y and ATS 48C59Y	**DF4 331000**	33	1000	900
ATS 48D17Y	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79Y	**DF4 441600**	44	1600	1600
ATS 48M10Y and ATS 48M12Y	**DF4 442200**	44	2200	4100

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	**Iq (kA)**
ATS 48D17Y	**50**
ATS 48M10Y and ATS 48M12Y	**15**
ATS 48M10Y and ATS 48M12Y	**20**
ATS 48D62Y and ATS 48D75Y	**50**
ATS 48D88Y	**20**
ATS 48C11Y to ATS 48C32Y	**50**
ATS 48C41Y	**25**
ATS 48C48Y to ATS 48C79Y	**50**
ATS 48M10Y and ATS 48M12Y	**85**

(3) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold in lots of 1.

Summary of functions

	See pages
Starter factory setting	1/68
Adjustment functions	**See pages**
Nominal motor current (maximum permanent current)	1/69
Limiting current	1/69
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Initial starting torque	1/69
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Time before restarting	1/71
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Relay and analogue output application functions	1/75
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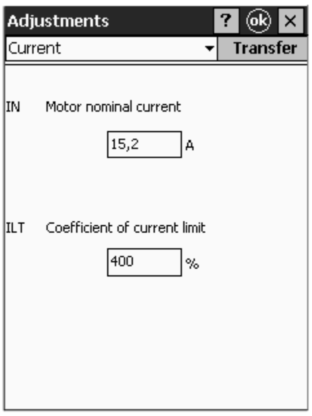
Starter factory setting

The starter is supplied ready for use in most applications. The main functions enabled and the default function values are as follows:

- nominal motor current (depends on the starter rating),
- limiting current: 400%,
- acceleration ramp time: 15 s,
- initial starting torque: 20%,
- selection of the type of stop: freewheel stop,
- motor thermal protection: class 10,
- time before restarting: 2 s,
- motor phase loss threshold: 10%,
- line frequency: automatic,
- RUN and STOP logic inputs: 2-wire or 3-wire control via wiring,
- logic input LI3: forced freewheel stop,
- logic input LI4: local mode control (serial link disabled),
- logic output LO1: thermal motor alarm,
- logic output LO2: motor powered,
- relay output R1: fault relay,
- relay output R3: motor powered,
- analogue output: motor current.



IN Motor nominal current
15,2 A

ILT Coefficient of current limit
400 %

Current setting with PowerSuite on PPC

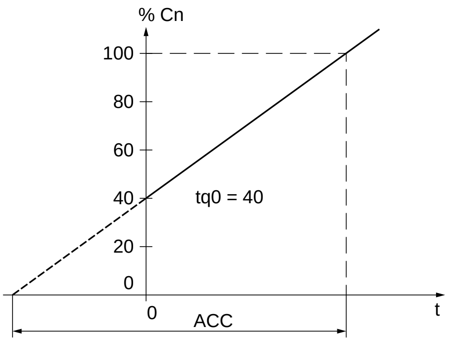
Adjustment functions

■ **Nominal motor current** (maximum permanent current)
The nominal current of the starter can be adapted to the nominal motor current indicated on the rating plate.
Adjustment range: 0.4 to 1.3 times the starter nominal current.

■ **Limiting current**
The maximum starting current can be adjusted.
Adjustment range: 150% to 700% of the nominal motor current set and limited to 500% of the maximum permanent current defined for the starter rating.

■ **Acceleration ramp time**
During the starting phase, the Altistart 48 applies a torque ramp to the motor. The time (ACC) set corresponds to the time taken by the ramp to reach the nominal torque (starting at 0). Adjustment range: 1 to 60 s.

■ **Initial starting torque**
The initial torque tq0 applied to the motor can be used to instantly overcome any resistive starting torque. Adjustment range: 0 to 100% of the nominal motor torque.

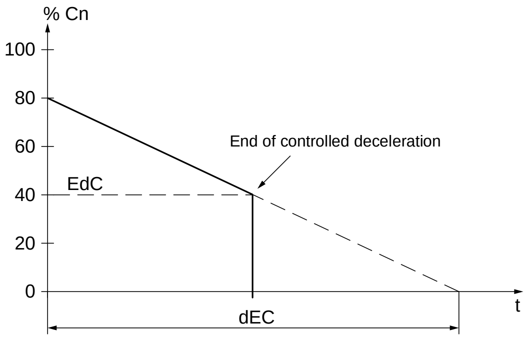


Acceleration ramp during time ACC with initial starting torque tq0 = 40% of the nominal motor torque

■ **Selection of the type of stop**
Three types of stops are available for selection:

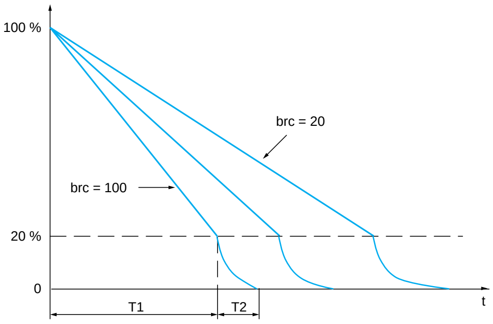
□ **Freewheel motor stop**

□ **Motor stop by deceleration via torque control (pump application)** This type of stop enables a centrifugal pump to be decelerated gradually on a ramp in order to avoid a sudden stop. It can be used to dampen the hydraulic transient in order to significantly reduce pressure surges.
The deceleration ramp time (dEC) can be adjusted.
During deceleration, the pump flow rate decreases and becomes negligible at a certain speed. To continue to decelerate would serve no purpose. A torque threshold (EdC) can be set at which the motor will change to freewheel stop mode, avoiding the unnecessary heating of the motor and the pump.

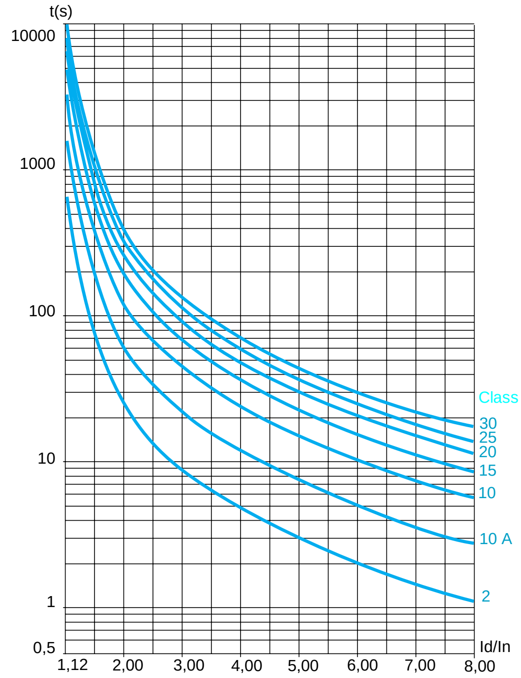


Decelerated stop by torque control during time dEC with threshold Edc for changing to freewheel stop mode Edc = 40% of nominal motor torque

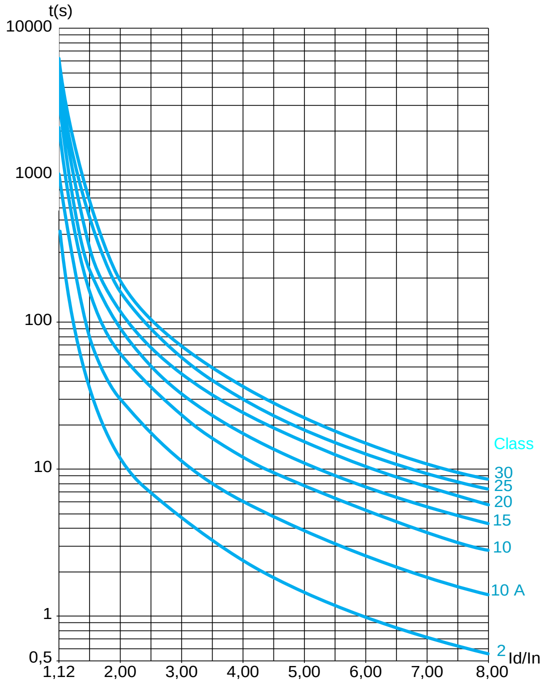
□ **Dynamic braking motor stop (application: stopping high inertia machines)**
This type of stop will decelerate the motor if there is considerable inertia.
The braking torque level (brc) can be adjusted. The dynamic braking time (T1) corresponds to the time taken to decelerate from 100% to 20% of the nominal motor speed. To improve braking at the end of deceleration, the starter injects a d.c. current for an adjustable period of time (T2).



Dynamic braking stops for different braking torque levels brc



Motor thermal protection curves (cold)



Motor thermal protection curves (warm)

Protection functions

The Altistart 48 offers functions for protecting the motor and the machine.

■ Calculated motor thermal protection

The starter continuously calculates the temperature rise of the motor based on the nominal current which has been set and the actual current absorbed. In order to adapt the Altistart to individual motors and applications, several protection classes are offered in accordance with standard IEC 60947-4-2:
class 30, class 25, class 20 (severe application), class 15, class 10 (standard application), class 10 A, sub-class 2.
Different protection classes are defined for the starting capacities of the motor:
- cold start without thermal fault (corresponding to a stabilised motor thermal state, motor switched off),
- warm start without thermal fault (corresponding to a stabilised motor thermal state, at nominal power).

The motor thermal protection function can be disabled.
After the motor has stopped or the starter has been switched off, the thermal state is calculated even if the control circuit is not energised. The Altistart thermal control prevents the motor from restarting if the temperature rise is too high. If special motors are used which do not have thermal protection via curves, provide external thermal protection via probes or thermal overload relays.
The starter is factory-set to protection class 10.
The tripping curves are based on the relationship between the starting current Is and the (adjustable) nominal motor current In.

Trip time (cold)

Trip time for a standard application (class 10)			Trip time for a severe application (class 20)		
Is = 3 In	Is = 4 In	Is = 5 In	Is = 3.5 In	Is = 4 In	Is = 5 In
46 s	23 s	15 s	63 s	48 s	29 s

Trip time (warm)

Trip time for a standard application (class 10)			Trip time for a severe application (class 20)		
Is = 3 In	Is = 4 In	Is = 5 In	Is = 3.5 In	Is = 4 In	Is = 5 In
23 s	12 s	7.5 s	32 s	25 s	15 s

■ Reset motor thermal state

Activating the function resets the motor thermal state calculated by the starter to zero.

■ Motor thermal protection with PTC probes

The starter integrates the processing of PTC probes, thus avoiding the use of an external device. The "PTC probe thermal overshoot" fault or alarm can be indicated using a configurable logic output or displayed via the serial link. The function can be disabled.
Note: the "PTC probe protection" and "calculated motor thermal protection" functions are independent and can be active simultaneously.

■ Starter ventilation

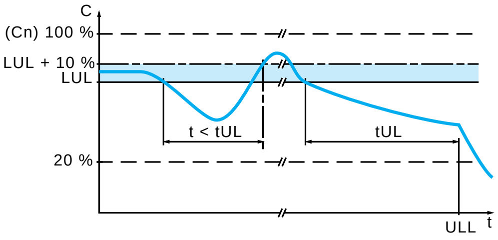
The cooling fan on the starter is switched on as soon as the heatsink temperature reaches 50 °C. It is switched off when the temperature returns to 40 °C.

■ Starter thermal protection

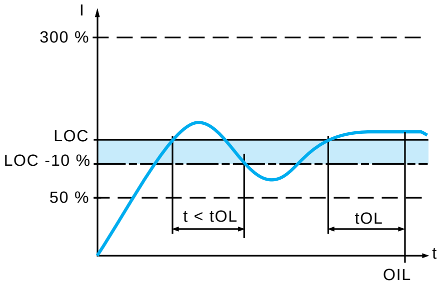
The starter is protected against thermal overloads by an analogue thermal probe.

Soft starters

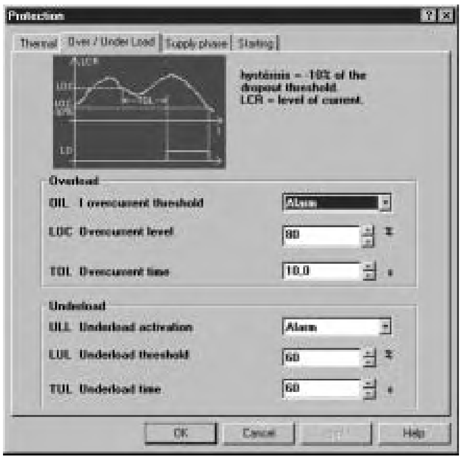
Altistart 48 soft start - soft stop units



Motor underload detection (ULL)



Motor overcurrent detection (OIL)



hysteresis = -10% of the dropout threshold
LCR = level of current.

Overload

OIL I overcurrent threshold: Alarm

LOC Overcurrent level: 80 %

TOL Overcurrent time: 10.0 s

Underload

ULL Underload activation: Alarm

LUL Underload threshold: 60 %

TUL Underload time: 60 s

Configuring the starter overload and underload with PowerSuite on a PC

Protection functions (continued)

■ Motor underload protection

The starter detects a motor underload if the motor torque falls below a preset torque threshold (LUL) for a specific (adjustable) period of time (tUL).
The motor underload threshold can be set between 20% and 100% of the nominal motor torque. The permissible underload duration can be set between 1 and 60 s.
The detection function can trigger an alarm or a fault. The detection function can be disabled. The "motor underload detected" alarm can be indicated by a configurable logic output and/or displayed via the serial link in the state of the starter.
The "motor underload detected" fault (ULF) locks the starter and can be displayed via the serial link.

■ Excessive acceleration time protection

This protection function can be used to detect a start which takes place in adverse conditions. Examples of such conditions include a locked rotor or a motor unable to reach its nominal rotation speed.
If the start duration is greater than the value set (between 10 and 999 s), the drive changes to fault mode. The function can be disabled.

■ Current overload protection

The starter detects a current overload if the motor current exceeds a preset overcurrent threshold (LOC) for a specific (adjustable) period of time (tOL).
The overcurrent threshold can be set between 50% and 300% of the nominal motor current.
The permissible overcurrent duration can be set between 0.1 and 60 s.
This function is only active in steady state.
The detection function can trigger an alarm or a fault. It can also be disabled.
The "current overload detected" alarm can be indicated by a configurable logic output and/or displayed via the serial link.
The "current overload detected" fault (OLC) locks the starter and can be displayed via the serial link in the state of the starter.

■ Protection against line phase inversion

This function can be used to detect the direction of rotation of the motor phases and, if it is enabled, to indicate a fault when the direction of rotation is reversed.

■ Time before restarting

This function can be used to avoid several consecutive starts which may cause:
- the thermal overheating of the application, which is not permitted,
- a thermal fault which will require maintenance work to be carried out,
- overcurrents (if the direction of rotation is reversed) or repeats (run/stop commands).

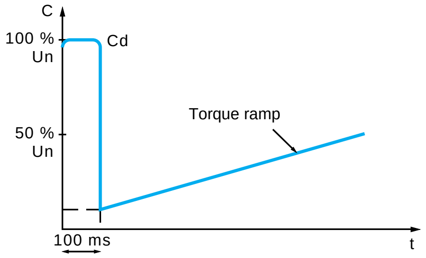
Following a stop command, the motor can only restart once the preset time delay has elapsed.
The motor is restarted once the time delay has elapsed if a run command is still valid or if a new run command is sent.
Adjustment range: 0 to 999 s.

■ Motor phase loss detection

The function is used to adjust the sensitivity of the protection function in order to detect a loss of current or a low current in one of the three motor phases for at least 0.5 s or in all three motor phases for at least 0.2 s. The value of the minimum current level can be set between 5% and 10% of the starter nominal current.

■ Automatic restart

After locking on a fault, the function permits up to six restart attempts at intervals of 60 s if the fault has disappeared and the run commands are still present. After the sixth attempt, the starter will remain locked and the fault will have to be reset before a restart is permitted.
If the function is active, the fault relay remains activated if line phase loss, motor phase loss or line frequency out of tolerance faults are detected. This function can only be used in 2-wire control.



Application of a voltage boost equal to 100% of the nominal motor voltage

Advanced adjustment functions

■ Torque limit

Designed primarily for high inertia and constant torque conveyor applications, the function restricts the torque ramp reference to the preset value.
For example, the function can be used to limit the torque to a constant value throughout the starting period.
Adjustment range: 10% to 200% of the nominal motor torque.

■ Voltage boost level

The function can be used to avoid any "starting" torque (phenomenon caused by friction on stopping or by mechanical play). When a run command is sent, the starter applies a fixed voltage to the motor for a limited period of time before starting. The function can be disabled.
The voltage setting value varies between 50% and 100% of the nominal motor voltage.

■ Connecting the starter to the motor delta terminal

ATS48●●●Q starters connected to motors with delta terminals can be wired in series in the motor windings. This type of connection reduces the current in the starter by a ratio of $\sqrt{3}$, which enables a lower rating starter to be used. The nominal current and limiting current settings as well as the current displayed during operation are on-line values and are indicated on the motor. For this application, the braking or decelerating stop functions are inactive. Only freewheel stopping is possible.
The adjustment range of the nominal motor current and the limiting current are multiplied by $\sqrt{3}$ if the function is selected.
This function is not compatible with the following functions: motor phase loss detection, motor preheating, cascade, decelerated stop and dynamic braking.
Use the scheme recommended on page 1/54 for this type of configuration.

■ Test on low power motor

This function can be used to test a starter on a motor whose power is very much lower that of the starter. It can be used, for example, to check the electrical wiring of a device.
The function is automatically cancelled when the starter is switched off.
The next time the starter is switched on, the starter returns to its initial configuration.

■ Activation of the cascade function

This function can be used to start and decelerate several cascaded motors with a single starter.
In order to gain maximum benefit from torque control, it is advisable to use motors with powers between 0.5 and 1 times the power of the motor.
The wiring diagram for the cascaded motor function is shown on page 60524/6.
This function is not compatible with the following functions: motor preheating and connection to the motor delta terminal.

■ Line frequency

The following frequencies can be selected for the function:
- 50 Hz. The frequency fault monitoring tolerance is ± 20%,
- 60 Hz. The frequency fault monitoring tolerance is ± 20%,
- automatic detection of the line frequency by the starter. The frequency fault monitoring tolerance is ± 6%.

□ 50 Hz and 60 Hz are recommended if the power supply is provided by a generating set, given their high tolerance.

■ Reset kWh or the operating time

Sets the value of the power in kW/h or the operating time value to 0. The calculation of the values is updated once the reset command has been sent.

■ Return to factory settings

The function can be used to reset each setting to its initial value (starter factory setting, see page 1/68).

2nd motor adjustment functions

In order to access the 2nd motor adjustment functions, one logic input must be assigned to the second set of motor parameters function. The adjustment functions and ranges are identical for both sets of motor parameters.
The settings are as follows (see page 1/69):
- nominal motor current,
- limiting current,
- acceleration ramp time,
- initial starting torque,
- deceleration ramp time,
- threshold for changing to freewheel stop mode at the end of deceleration,
- maximum torque limit.

Communication functions

The Altistart 48 is supplied with an RS 485 multidrop serial link with Modbus protocol as standard. The serial link is configured in the Communication menu using:
- ☐ the address of the starter, which can be set between 0 and 31,
- ☐ the communication speed, which can be set at: 4800, 9600 or 19200 bps,
- ☐ the format of the communication data. The following formats can be selected:
  - 8 data bits, odd parity, 1 stop bit,
  - 8 data bits, even parity, 1 stop bit,
  - 8 data bits, no parity, 1 stop bit,
  - 8 data bits, no parity, 2 stop bits.
- ☐ the time-out, which can be set between 1 and 60 s.

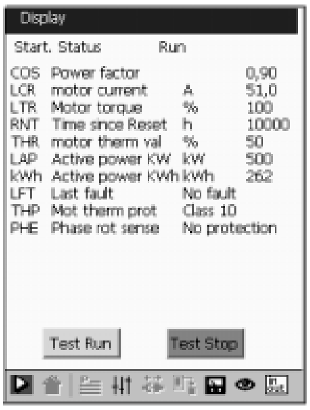
PowerSuite advanced dialogue solutions

The PowerSuite advanced dialogue solutions (see pages 3/2 and 3/3) offer the following advantages:
- ☐ connection to the Altistart 48 and access to the adjustment, monitoring and control functions,
- ☐ display of messages in plain text in 5 languages (English, French, German, Spanish and Italian),
- ☐ preparation and saving of settings to hard disk,
- ☐ comparison and editing of settings using office automation tools,
- ☐ downloading of starter settings to the PC and uploading from the PC to the starter.

Displaying the commands and settings with PowerSuite on PC

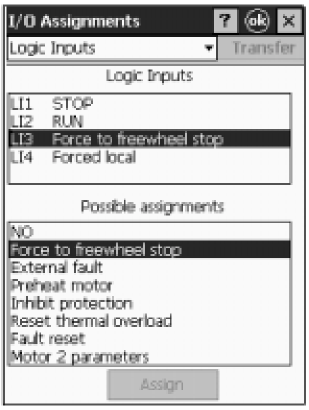
Application monitoring functions

The monitoring functions provide the following information:
- ■ Cosine φ, displayed between 0.00 and 1.00.
- ■ Motor thermal state: 100% corresponds to the thermal state of the motor consuming the permanently set nominal current.
- ■ Motor current: displayed in amperes between 0 and 999 A and in kilo amperes between 1000 and 9999 A.
- ■ The operating time corresponding to the total number of starter operating hours during heating, acceleration, steady state, deceleration, braking and continuous bypass operation. It is displayed in hours between 0 and 999 hours and in kilo-hours between 1000 and 65536 hours.
- ■ The active power is displayed between 0 and 255%, where 100% corresponds to the power at the set nominal current and at full voltage.
- ■ The motor torque is displayed between 0 and 255%, where 100% corresponds to the nominal torque.
- ■ The active power consumed is displayed in kW. The line voltage value must be configured. The accuracy of this setting will depend on the error between the voltage configured and the actual voltage.
- ■ Power in kWh displayed with PowerSuite.
- ■ The following starter states are shown in the display of the current state:
- ☐ starter without run command and power not supplied,
- ☐ starter without run command and power supplied,
- ☐ acceleration/deceleration in progress,
- ☐ steady state operation,
- ☐ braking in progress,
- ☐ starter in current limiting mode,
- ☐ starting time delay not elapsed.
- ■ Last fault. Displays the last fault which occurred.
- ■ Phase rotation direction. Displays the direction of rotation (direct or indirect).
- ■ Terminal locking code
- ☐ An access code can be used to protect access to the adjustment and configuration parameters of the starter. Only the monitoring parameters will then be visible.



```
Start. Status          Run
COS  Power factor           0,90
LCR  motor current     A    51,0
LTR  Motor torque      %    100
RNT  Time since Reset  h    10000
THR  motor therm val   %    50
LAP  Active power KW   kW   500
kWh  Active power KWh  kWh  262
LFT  Last fault        No fault
THP  Mot therm prot    Class 10
PHE  Phase rot sense   No protection
```

Monitoring the parameters with PowerSuite on PPC



LI1 STOP
LI2 RUN
LI3 Force to freewheel stop
LI4 Forced local

NO
Force to freewheel stop
External fault
Preheat motor
Inhibit protection
Reset thermal overload
Fault reset
Motor 2 parameters

Assigning the logic inputs with PowerSuite on PPC

Logic input application functions

The starter has 4 logic inputs:

■ **2 logic inputs (RUN and STOP) are reserved for run/stop commands** which can be sent in the form of stay-put contacts or as pulsed contacts.
□ **2-wire control**: starting and stopping are controlled by a single logic input. State 1 of the logic input controls starting and state 0 controls stopping.
□ **3-wire control**: starting and stopping are controlled by 2 separate logic inputs.
A stop is obtained on opening (state 0) the STOP input.
The pulse on the RUN input is stored until the stop input opens.

■ **2 logic inputs (LI3 and LI4) can be configured with the following functions**:
□ **Freewheel stop**: when combined with a braked stop or decelerated stop command, activating the logic input will stop the motor in freewheel mode.
□ **External fault**: enables the starter to detect an external user fault (level, pressure, etc). When the contact is open, the starter changes to fault mode.
□ **Motor preheating**: used to prevent the motor from freezing or to prevent temperature variations which may cause condensation. When the logic input is activated, an adjustable current flows through the motor after a time delay which can be set between 0 and 999 s. This current heats the motor without causing it to rotate. This function is not compatible with the following functions: connection to the motor delta terminal and cascading.
□ **Force to local control mode**: if a serial link is used, this function can be used to change from line mode (control via serial link) to local mode (control via the terminal).
□ **Inhibit all protection**: enables the forced operation of the starter in an emergency by overriding the main faults (smoke extraction system for example).
Warning: this type of use invalidates the starter warranty.
□ **Reset motor thermal fault**: enables the fault to be reset remotely.
□ **Activation of the cascade function**: in this case, the motor thermal protection is disabled and relay R1 is configured as the fault isolation relay. Can be used to start and decelerate several motors one after the other with a single starter (see application diagram on pages 1/56 and 1/57).
□ **Reset all faults**: enables all faults to be reset remotely.
□ **Second set of motor parameters**: enables a second set of parameters to be selected to start and decelerate two different motors with a single starter.

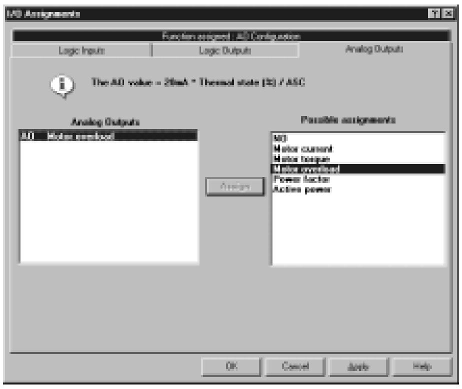
Soft starters

Altistart 48 soft start - soft stop units

Logic output application functions

The starter has 2 logic outputs (LO1 and LO2) which, depending on their configuration, can be used for remote indication of the following states or events:

- Motor thermal alarm: indicates that the motor thermal state has exceeded the alarm threshold and can be used for example to avoid starting a motor if the thermal reserve is insufficient.
- Motor powered: indicates that there may be current in the motor.
- Motor overcurrent alarm: the motor current is higher than the threshold set.
- Motor underload alarm: the motor torque is lower than the threshold set.
- Motor PTC probe alarm: indicates that the thermal state monitored by the PTC motor probe has been exceeded.
- Second set of motor parameters activated



Function assigned : AO Configuration

The AO value = 20mA * Thermal state (%) / ASC

Analog Outputs

AO Motor overload

Possible assignments

NO
Motor current
Motor torque
Motor overload
Power factor
Active power

Assigning the analogue output with PowerSuite on PC

Relay and analogue output application functions

The starter has 3 relays, 2 of which are configurable.

- **End of starting relay R2**: cannot be configured.

The end of starting relay controls the bypass contactor on the starter. It is activated when the motor has completed the starting phase. It is deactivated when a stop command is sent and in the event of a fault. The starter regains control when a braking or deceleration command is sent.

- **Relay R1 application functions**

Relay R1 can be configured as follows:

☐ fault relay: relay R1 is activated when the starter is powered and there are no faults. It is deactivated when a fault occurs and the motor switches to freewheel mode,

☐ isolating relay: the contact of relay R1 closes when a run command is sent and re-opens when a stop command is sent, at the end of deceleration on a decelerated stop or in the event of a fault. The line contactor is deactivated and the motor is isolated from the line supply (see application diagram page 1/53).

- **Relay R3 application functions**

Relay R3 is configured to indicate the same states or events as logic outputs LO1 or LO2 (see above).

- **Analogue current output AO application functions**

☐ the analogue output AO provides an image of the following values:
motor current, motor torque, motor thermal state, cosine φ, active power.

☐ the following settings are associated with the analogue output:
  - the type of signal supplied: 0-20 mA or 4-20 mA,
  - the scale setting of the signal. The function associates the maximum amplitude of the analogue output (20 mA) with a percentage of the nominal value of the parameter, which can be set between 50% and 500%.

Function compatibility table

Functions	Decelerating stop	Dynamic braking stop	Forced freewheel stop	Thermal protection	Motor phase loss detection	Connection to the motor delta terminal	Tests on low power motor	Cascaded motors	Motor preheating
Decelerating stop	▨	■	□	□	□	■	□	□	▨
Dynamic braking stop	■	▨	□	□	□	■	□	□	▨
Forced freewheel stop	□	□	▨	□	□	▨	□	■	▨
Thermal protection	□	□	□	▨	▨	□	□	■	□ (1)
Motor phase loss detection	□	□	□	▨	▨	■ (1)	□	▨	■ (1)
Connection to the motor delta terminal	■	■	▨	□	■ (1)	▨	■	■	■
Tests on low power motor	□	□	□	□	□	■	▨	■	□
Cascaded motors	□	□	■	■	▨	■	■	▨	■
Motor preheating	▨	▨	▨	□ (2)	■ (1)	■	□	■	▨

□ Compatible functions
■ Incompatible functions
▨ Not applicable

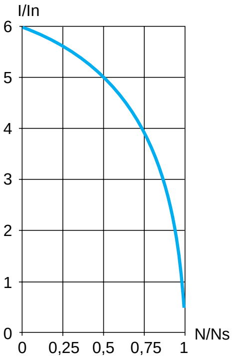
(1) Motor phase loss not detected.

(2) Thermal protection is not provided during motor preheating.

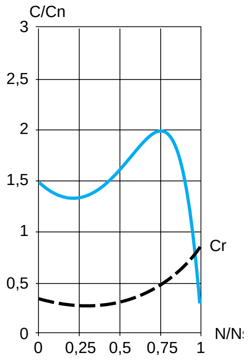
Soft starters

Conventional starting of three-phase asynchronous motors

Direct starting



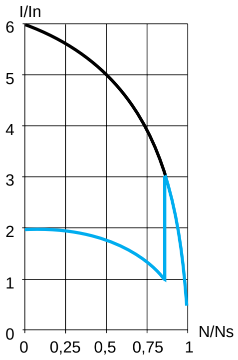
Starting current



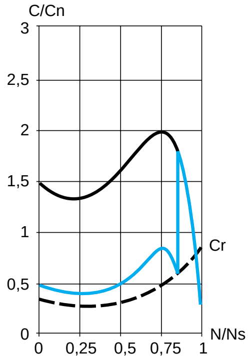
Starting torque

- Starting current: 4 to 8 times the nominal current.
- Starting torque: 0.5 to 1.5 times the nominal torque.
- Characteristics:
  - motor with 3 terminals, low and medium power,
  - on-load starting,
  - high current peak and voltage drop,
  - simple device,
  - sudden starting for the mechanism.
- No parameter adjustment.

"Star-delta" starting



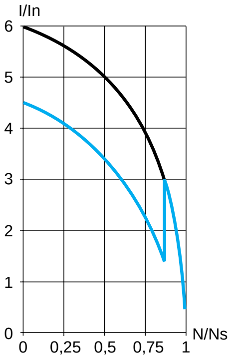
Starting current



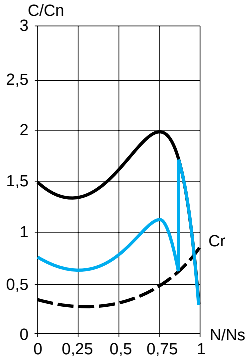
Starting torque

- Starting current: 1.8 to 2.6 times the nominal current.
- Starting torque: 0.5 times the nominal torque.
- Characteristics:
  - motor with 6 terminals,
  - no-load or low resistive torque starting,
  - high current peaks and torque when changing to "star-delta" mode,
  - a device requiring maintenance,
  - subject to mechanical stress when starting.
- No parameter adjustment.

Rheostatic stator starting



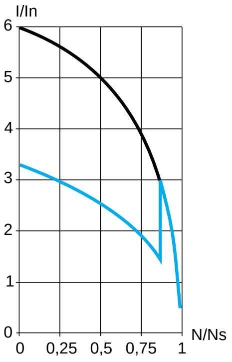
Starting current



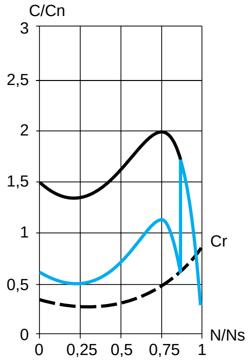
Starting torque

- Starting current: 4.5 times the nominal current.
- Starting torque: 0.5 to 0.75 times the nominal torque.
- Characteristics:
  - motor with 3 terminals, high power,
  - starting with increasing resistive torque,
  - high current peak,
  - a large, bulky device requiring maintenance,
  - subject to mechanical stress when starting.
- No parameter adjustment.

Auto transformer starting



Starting current



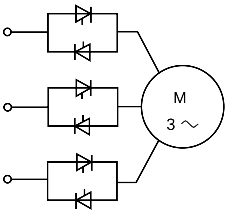
Starting torque

- Starting current: 1.7 to 4 times the nominal current.
- Starting torque: 0.4 to 0.85 times the nominal torque.
- Characteristics:
  - motor with 3 terminals, high power,
  - large voltage drop and current peak when connected at full voltage,
  - a complex, bulky device requiring maintenance,
  - subject to mechanical stress when starting.
- No parameter adjustment.

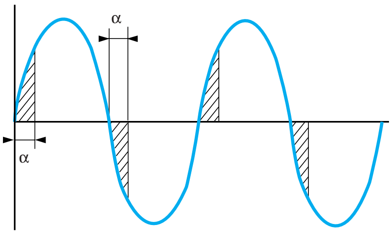
Soft starters

Progressive starting
of three-phase asynchronous motors

Conventional electronic starting with variable voltage and current limiting



Schematic diagram



Firing angle

- ■ A controller with 6 thyristors connected head to tail in each line phase is used to power the three-phase asynchronous motor by gradually increasing the voltage on start-up.

☐ Depending on the firing time and angle of the thyristors, it can be used to supply a voltage which will gradually increase at a fixed frequency.

☐ The gradual increase in the output voltage can either be controlled by the acceleration ramp, or by the value of the limiting current, or linked to both parameters.

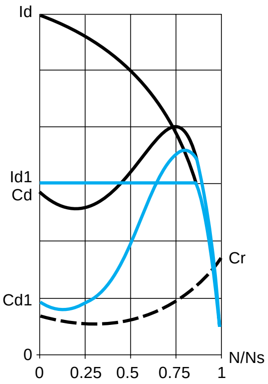


Figure 1

■ Figure 1 shows the behaviour of the torque in relation to the starting current.

■ Limiting the starting current Is to a preset value Is1 will reduce the starting torque Ts1 to a value which is almost equal to the ratio of the square of currents Is and Is1.

Example

On a motor with the following characteristics: Ts = 2 Tn for Is = 6In, current limiting at Is1= 3 In or 0.5 Is results in a starting torque: Ts1 = Ts x $(0.5)^2$ = 2 Tn x 0.25 = 0.5 Tn.

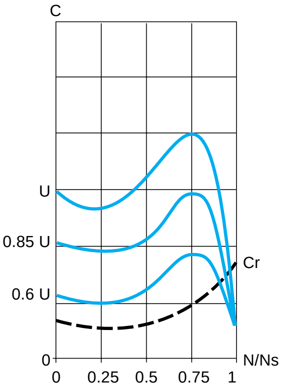


Figure 2

■ Figure 2 shows the torque/speed characteristic of a squirrel cage motor in relation to the supply voltage.

The torque varies like the square of the voltage at a fixed frequency. The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Advantages of starting with the Altistart 48

■ Conventional electronic starting

■ To rectify problems caused by:
  - mechanical stress when starting,
  - hydraulic transients during acceleration and deceleration in pump applications.

Conventional electronic starting requires the use of several current limits or the switching of several voltage ramps.

The settings become complicated and must be modified every time the load changes.

■ Starting with the Altistart 48

■ The Altistart 48 torque control enables starting without mechanical stress and the smooth control of hydraulic transients with a single acceleration ramp.

■ The settings are simple and effective, whatever the load.

2 - Variable speed drives for asynchronous motors

2.1 Altivar 11

2.2 Altivar 31

2.3 Altivar 38

2.4 Altivar 58

2.5 Controller inside programmable card

2.6 Altivar 68

Variable speed drives for asynchronous motors

Applications		**Variable speed drive of asynchronous motors**		
Field of application		**Industry**		**Building**
Type of machine		**Simple machines**		**Pumps and fans**
				
Power range for 50…60 Hz supply (kW)		**0.18…2.2**	**0.18…15**	**0.75…315**
	Single phase 100…120 V (kW)	0.18…0.75	–	–
	Single phase 200…240 V (kW)	0.18…2.2	0.18…2.2	–
	3-phase 200…230 V (kW)	0.18…2.2	–	–
	3-phase 200…240 V (kW)	–	0.18…15	–
	3-phase 380…460 V (kW)	–	–	0.75…315
	3-phase 380…500 V (kW)	–	0.37…15	–
	3-phase 525…600 V (kW)	–	0.75…15	–
Drive	Output frequency	0.5…200 Hz	0.5…500 Hz	0.1…500 Hz
	Type of control	Sensorless flux vector control		
	Transient overtorque	150…170% of the nominal motor torque	170…200% of the nominal motor torque	110% of the nominal motor torque for 60 sec.
Functions Number of functions		26	50	44
Number of preset speeds		4	16	8
Number of I/O	Analog inputs	1	3	2 to 3
	Logic inputs	4	6	4 to 6
	Analog outputs	–	1	1 to 2
	Logic outputs	1	–	0 to 1
	Relay outputs	1	2	2
Communication	Integrated	–	Modbus and CANopen	Modbus
	Available as an option	–	Ethernet TCP/IP, DeviceNet, Fipio, Profibus DP	Ethernet TCP/IP, Fipio, Modbus Plus, INTERBus, Profibus DP, AS-Interface, Uni-Telway, CANopen, DeviceNet, METASYS N2, Lonworks
Cards (optional)		–	–	Pump switching "Controller Inside" programmable cards I/O extension card
Standards and certifications		EN 50178, EN 61800-3 EN 55011, EN 55022 class B and class A gr.1 NOM 117, C-TICK, CSA, UL, N998, CE	EN 50178, EN 61800-3 EN 55011, EN 55022: class A, class B with option C-TICK, UL, N998, CE	EN 50178, EN 61800-3 EN 55011 class A EN 55022 class B UL, N998, CE
References		**ATV 11**	**ATV 31**	**ATV 38**
Pages		2/12 to 2/14	2/38 and 2/39	2/88

Industry		
Modular complex machines, infrastructures	**Machines requiring torque and precision at very low speed as well as a raised dynamic**	**High-power machine**
		
0.37…75	**0.75…55**	**75…630**
–	–	–
0.37…5.5	–	–
1.5…7.5	–	–
–	–	–
–	–	–
0.75…75	0.75…55	75…630 (400…500 V)
–	–	–
0.1…500 Hz		0…300 Hz
Sensorless flux vector control		
200% of nominal motor torque for 2 seconds, 170% for 60 seconds		180% of nominal motor torque in high torque configuration
> 60		
8		8
2 to 3		2 to 4
4 to 6		4 to 8
1 to 2		
0 to 1		
2		1 to 5
Modbus		–
Ethernet TCP/IP, Fipio, Modbus Plus, INTERBus, Profibus DP, AS-Interface, Uni-Telway, CANopen, DeviceNet		Fipio, Modbus, Modbus Plus, Profibus DP
Multi-motor Multi-parameter Simple positioning “Controller Inside” programmable card I/O extension card		I/O extension card
EN 50178, EN 55011, EN 55022 class A, class B with option IEC 61000-4/2/4-3/4-4/4-5, EN 61800-3, DNV, GOST UL, CE, CSA, N998, NOM 117		EN 50178, EN 61800-3 CSA, UL, CE
ATV 58	**ATV 58F**	**ATV 68, ATV 68F**
2/132 to 2/135	2/214	2/246 and 2/247

Variable speed drives for asynchronous motors

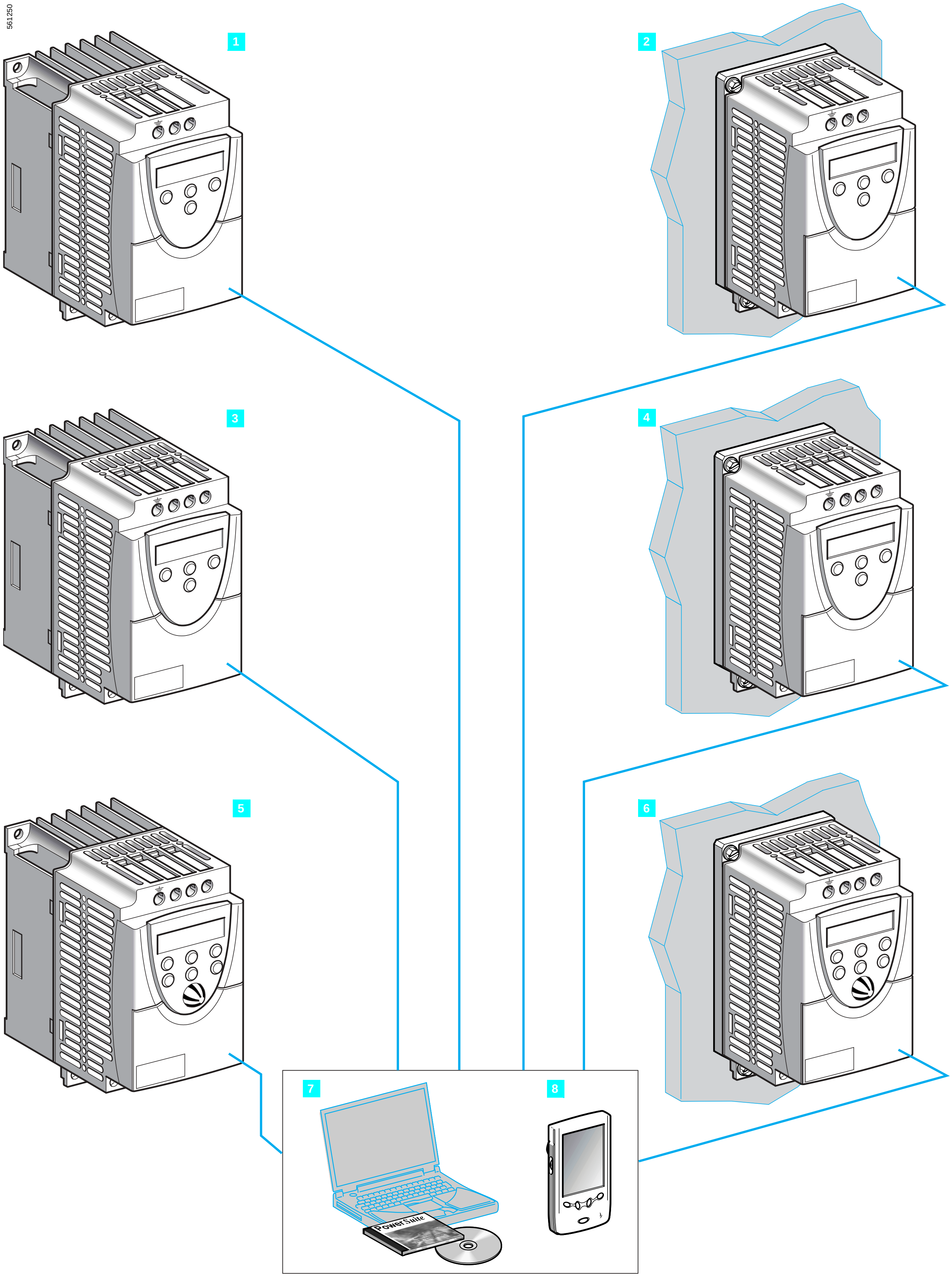
Motor starters with variable speed drives

Applications		**Motor starters for asynchronous motors**		
Type of machine		**Simple machines**		**Pumps and fans**
Power range for 50…60 Hz supply (kW)		**0.18…15**		**3…75**
	Single phase 200…240 V (kW)	0.18…2.2		–
	3-phase 200…230 V (kW)	–		–
	3-phase 380…500 V (kW)	0.37…15		3…75
Control and protection functions associated with the drive		Enclosure can be customized by the user	Drive kit to be fixed at the back of the floor-standing or wall-mounted enclosure	Load break switch with padlockable front external control Line chokes 2-directional on-off switch Speed reference potentiometer –
Type of control		Sensorless flux vector control		
Energy saving		–		Yes
Communication	Integrated serial link	Modbus, CANopen		Modbus RS 485
	Industrial buses and networks	–		Ethernet, Fipio, Modbus Plus, INTERBus, Profibus DP, AS-Interface, Uni-Telway, CANopen, DeviceNet, N2, Lonworks
Degree of protection		IP 55	IP 00	IP 55
Dialogue		Via integrated or remote display terminal		Via removable terminal which can be used remotely
PowerSuite software workshop		Compatible		
References		**ATV 31C**	**ATV 31K**	**ATV 38ED ENERGY**
Pages		2/39	2/40	2/118

Complex machines		High-power machines
		
0.37…5.5	**3…75**	**75…630**
0.37…2.2	–	–
1.5…2.2	–	–
0.75…5.5	3…75	75…630 (400…500 V)
Protection circuit-breaker with padlockable front external control	Load break switch with padlockable front external control	Switch and fast-acting fuses. See the many possible combinations on pages 2/292 and 2/293.
–	Line chokes	
		–
Speed reference potentiometer		–
Downstream contactor	–	–
		Sensor/sensorless flux vector control
		RS 232 C
		Fipio, Modbus Plus, Profibus DP, Modbus
		IP 00/IP 23/IP 54 depending on the version
		Via remote display terminal
		Incompatible
ATV 58EU COMPACT	**ATV 58ED ENERGY**	**ATV 68E, ATV 68EX**
2/182	2/183	2/240

Variable speed drives for asynchronous motors

Altivar 11



Applications

The Altivar 11 is a frequency inverter for 3-phase squirrel cage asynchronous motors rated between 0.18 kW and 2.2 kW.

There are three types of power supply:

- 100 V to 120 V single phase.
- 200 V to 240 V single phase.
- 200 V to 230 V 3-phase.

The Altivar 11 incorporates specific features for local markets (Europe range, America range, Asia range) and has functions suitable for the most common applications, including:

- Horizontal materials handling (small conveyors, etc).
- Ventilation, pumping, access control, automatic doors.
- Special machines (mixers, washing machines, centrifuges, etc).

Functions

The main functions incorporated in the Altivar 11 drive are:

- Starting and speed control.
- Reversal of operation direction.
- Acceleration, deceleration, stopping.
- Motor and drive protection.
- 2-wire/3-wire control.
- 4 preset speeds.
- Saving the configuration in the drive.
- d.c. injection on stopping.
- Ramp switching.
- Catching a spinning load.
- Local controls (Asia range only).

Several functions can be assigned to one logic input.

Standard versions

The Altivar 11 offer consists of 3 ranges designed for 3 different markets:

- **Europe range: ATV 11●U●●M2E** (items 1, 2)
  - ☐ power supply: 240 V single phase,
  - ☐ positive logic operation,
  - ☐ integrated class B EMC filter.
- **America range: ATV 11●U●●●●U** (items 1, 2, 3, 4)
  - ☐ power supplies: 120 V single phase, 240 V single phase or 230 V 3-phase,
  - ☐ positive logic operation,
  - ☐ meets current requirement in standard NEC 1999 208 V.
- **Asia range: ATV 11●U●●●●A** (items 5, 6)
  - ☐ power supplies: 120 V single phase, 240 V single phase or 230 V 3-phase,
  - ☐ positive or negative logic operation,
  - ☐ local controls: Run and Stop keys, and potentiometer.

Altivar 11 drives are supplied either with heatsink (items 1, 3, 5) for normal environments and ventilated enclosures, or on a base plate (items 2, 4, 6) for mounting on a machine frame, when the size of the frame enables dissipation of the heat.

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 11●U●●M2E** drives simplifies installation of machines and provides an economical means of meeting CE marking requirements.

ATV 11●U●●●●U and **ATV 11●U●●●●A** drives are available without EMC filter. Filters are available as an option for customer assembly, if conformity to EMC standards is required.

Options

The drive only communicates, in point-to-point mode, with the following tools and software:

- PowerSuite advanced dialogue solutions:
  - ☐ PowerSuite software workshop for configuring the drive (item 7),
  - ☐ PowerSuite for Pocket PC (item 8),
  - ☐ converter for connecting a PC or a Pocket PC.

The following options can be used with the Altivar 11 drive:

- Braking module connected to the drive's DC bus.
- Braking resistors, for dissipating the energy returned to the drive when the motor is operating as a generator.
- EMC radio interference input filters.
- Plates for mounting on ⊔ rail.
- Adaptor plate for replacing an Altivar 08 drive.
- Plate for EMC mounting, earthing the cable shielding.

Characteristics:
pages 2/8 to 2/11

References:
pages 2/12 to 2/15

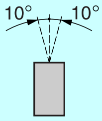
Dimensions:
pages 2/16 and 2/17

Schemes:
pages 2/18 and 2/19

Variable speed drives for asynchronous motors

Altivar 11

Environment characteristics

Conforming to standards					Altivar 11 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: EN 50178, EMC immunity and EMC conducted and radiated emissions.
	EMC immunity				■ IEC/EN 61000-4-2 level 3 ■ IEC/EN 61000-4-3 level 3 ■ IEC/EN 61000-4-4 level 4 ■ IEC/EN 61000-4-5 level 3 (power access) ■ IEC/EN 61800-3, environments 1 and 2
	EMC emissions for drives				
		Conducted and radiated emissions	All		■ IEC/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply) restricted distribution
			ATV 11●U05M2E to ATV 11●U18M2E		■ EN 55011, EN 55022 class B, 2 to 12 kHz for motor cable lengths ⩽ 5 m and class A (group 1), 2 to 16 kHz for lengths ⩽ 10 m
			ATV 11●U29M2E to ATV 11●U41M2E		■ EN 55011, EN 55022 class B, 4 to 16 kHz for motor cable lengths ⩽ 5 m and class A (group 1), 4 to 16 kHz for lengths ⩽ 10 m
		Conducted emissions	ATV 11HU05M2E to ATV 11HU41M2E		■ With additional EMC filter: EN 55011, class B, 2 to 16 kHz for motor cable lengths ⩽ 20 m and class A (group 1), 2 to 16 kHz for lengths ⩽ 50 m
			ATV 11HU05●●U to ATV 11HU41●●U and ATV 11HU05●●A to ATV 11HU41●●A		■ With additional EMC filter: EN 55011, class B, 2 to 16 kHz for motor cable lengths ⩽ 5 m and class A (group 1), 2 to 16 kHz for lengths ⩽ 50 m
CE marking					The drives bear CE marking in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives
Product certifications					UL, CSA, NOM 117 and C-TICK
Degree of protection					IP 20
Vibration resistance	Drive without ┐_┌ rail option				Conforming to IEC/EN 60068-2-6: - 1.5 mm peak from 3 to 13 Hz - 1 gn from 13 to 200 Hz
Shock resistance					15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity				**%**	5…93 without condensation or dripping water, conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage			**°C**	- 25…+ 65
	Operation			**°C**	- 10…+ 40 - 10…+ 50: removing the protective cover from the top of the drive Up to + 60 with current derating of 2.2 % per °C above 50 °C
Maximum operating altitude				**m**	1000 without derating (above this, derate the current by 1 % per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position					

Drive characteristics

Output frequency range	**Hz**	0…200
Switching frequency	**kHz**	2…16 *(1)*
Speed range		1…20
Transient overtorque		150…170 % of the nominal motor torque
Braking torque		- 20 % of the nominal motor torque without braking resistor at no-load with the “deceleration ramp adaptation” function enabled - 80 % of the nominal motor torque with braking resistor (available as an option) at no-load - Up to 150 % of the nominal motor torque with braking resistor (available as an option) at high inertia
Maximum transient current		- 150 % of the nominal drive current for 60 seconds for range E and A drives - 137…150 % for range U drives
Voltage/frequency ratio		Sensorless flux vector control with PWM type *(2)* motor control signal Factory-set for most constant torque applications
Frequency loop gain		Factory-set with the speed loop stability and gain Possible correction for machines with high resistive torque or high inertia, or for machines with fast cycles
Slip compensation		Factory-set, according to the rating of the drive (adjustment possible)

(1) If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10 % for 8 kHz, 20 % for 12 kHz and 30 % for 16 kHz.
(2) Pulse width modulation.

Presentation:
pages 2/6 and 2/7

References:
pages 2/12 to 2/15

Dimensions:
pages 2/16 and 2/17

Schemes:
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Variable speed drives for asynchronous motors

Altivar 11

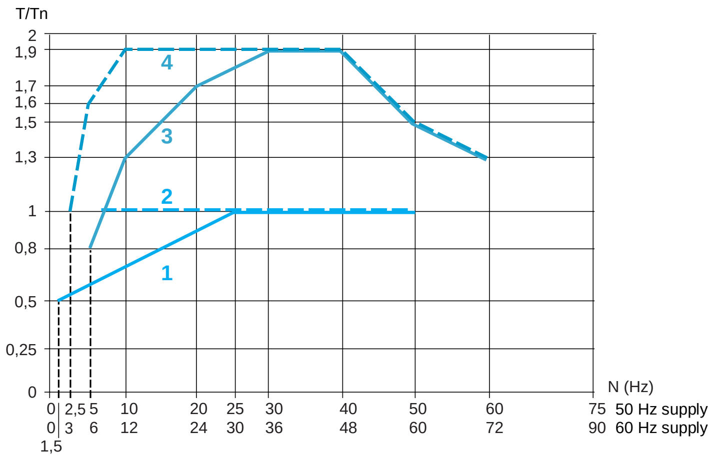
Electrical characteristics

Power supply	Voltage	**V**	200 - 15 % to 240 + 10 % single phase for ATV 11●U●●M2● 200 - 15 % to 230 + 15 % 3-phase for ATV 11●U●●M3● 100 - 15 % to 120 + 10 % single phase for ATV 11●U●●F1●
	Frequency	**Hz**	50 ± 5 % or 60 ± 5 %
	Isc	**A**	≤ 1000 (prospective short-circuit current at the connection point) for single phase power supply ≤ 5000 (prospective short-circuit current at the connection point) for 3-phase power supply
Output voltage			Maximum 3-phase voltage equal to: - the line supply voltage for ATV 11●U●●M●● - double the line supply voltage for ATV 11●U●●F1●
Maximum connection capacity of the power supply, the motor and the braking module	Drives ATV 11●U05●●●, U09●●●, U12M●●, U18M●●		1.5 mm^2 (AWG 14)
	Drives ATV 11●, U18F1●, U29●●●, U41●●●		4 mm^2 (AWG 10)
Max. length of motor cables		**m**	50, shielded cable 100, non-shielded cable
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Available internal supplies			Short-circuit and overload protection: - one + 5 V (0/+ 5 %) supply for the reference potentiometer (2.2 to 10 kΩ), maximum current 10 mA - one + 15 V (± 15 %) supply for the control inputs, maximum current 100 mA
Analog input AI1			1 configurable analog input Max. sampling time: 20 ms, resolution 0.4 %, linearity ± 5 %: - voltage 0-5 V (internal power supply only) or 0-10 V, impedance 40 kΩ - current 0-20 mA or 4-20 mA (without addition of a resistor), impedance 250 Ω
Logic inputs LI			4 assignable logic inputs, impedance 5 kΩ + 15 V internal or 24 V external power supply (min. 11 V, max. 30 V). Factory-set with 2-wire control in “transition” mode for machine safety, for Europe and America ranges: - LI1: forward - LI2: reverse - LI3/LI4: 4 preset speeds - local controls for the Asia range Multiple assignment makes it possible to mix several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	Positive logic E/U/A ranges		State 0 if < 5 V, state 1 if > 11 V Max. sampling time: 20 ms
	Negative logic A range		Available by programming on the Asia range only State 0 if > 11 V or logic input not wired, state 1 if < 5 V Max. sampling time: 20 ms
DO output			Factory setting: - 2 kHz PWM *(1)* open collector output. Can be used for electromagnetic galvanometer - max. current 10 mA - output impedance 1 kΩ, linearity ± 1 %, max. sampling time 20 ms Assignable as logic output: - open collector logic output, output impedance 100 Ω, 50mA max - internal voltage (see above, available internal supplies) - external voltage 30 V max: 50 mA
Relay outputs (RA-RC)			1 protected relay logic output (contact open on fault) Minimum switching capacity: 10 mA for ⎓ 24 V Maximum switching capacity: ■ On resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∼ 250 V or ⎓ 30 V ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∼ 250 V or ⎓ 30 V
Maximum I/O connection capacity			1.5 mm^2 (AWG 14)
Acceleration and deceleration ramps			Ramp profiles: linear from 0.1 to 99.9 s Automatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of braking module)
Braking to a standstill			By d.c. injection: automatically as soon as the estimated output frequency drops to < 0.2 Hz, period adjustable from 0.1 to 30 s or continuous, current adjustable from 0 to 1.2 In
Main protection and safety features of the drive			■ Thermal protection against overheating ■ Protection against short-circuits between output phases ■ Protection against overcurrent between output phases and earth, at power-up only ■ Line supply undervoltage and overvoltage safety circuits ■ Line supply phase loss safety function, for 3-phase supply
Motor protection (see page 2/24)			Thermal protection integrated in the drive by continuous calculation of the I^{2}t. Thermal memory reset on power down.
Insulation resistance to earth		**MΩ**	> 500 (electrical isolation)
Frequency resolution			Display units: 0.1 Hz Analog inputs: 10-bit A/D converter
Time constant for reference change		**ms**	5

(1) Pulse width modulation

Torque characteristics (typical curves)

The curves below define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.



1 Self-cooled motor: continuous useful torque
2 Force-cooled motor: continuous useful torque
3 Transient overtorque in factory settings (UFR = 50), with motor characteristics
4 Transient overtorque at UFR = 100 and motor characteristics

Special uses

Use with a motor with a different rating to that of the drive

The device can supply any motor which has a power rating lower than that for which it is designed.

For motor ratings slightly higher than that of the drive, check that the current taken does not exceed the continuous output current of the drive.

Connecting motors in parallel

The rating of the drive must be greater than or equal to the sum of the currents of the motors to be connected to the drive. In this case, provide external thermal protection for each motor using probes or thermal overload relays.

If the number of motors in parallel is greater than or equal to 3, it is advisable to install a 3-phase choke between the drive and the motors.

Nota : *please consult your Regional Sales Office for choke product references.*

Switching the motor at the drive output

Switching is possible with the drive locked. The "catch-on-the-fly" (automatic catching a spinning load) function must be configured for this type of use.

Presentation:
pages 2/6 and 2/7

References:
pages 2/12 to 2/15

Dimensions:
pages 2/16 and 2/17

Schemes:
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Variable speed drives for asynchronous motors

Altivar 11

Combinations for customer assembly

Function: to protect persons and equipment from any level of overcurrent which may be encountered (overload or short-circuit).
Type 1 coordination.

Standard power ratings of 3-phase 4-pole 50/60 Hz motors	Speed drive Reference *(1)*	Circuit-breaker			Contactor
		Telemecanique *(2)* *Merlin Gerin*	Adjustment range Rating	Maximum short-circuit current Icu	Reference
kW			A	kA	
M1	A1	Q1			KM1
Single phase supply voltage: 100…120 V 50/60 Hz					
0.18	**ATV 11HU05F1●**	**GV2 ME14**	6...10	> 50	**LC1 K09**
		DT40	10	6	**LC1 K09**
0.37	**ATV 11●U09F1●**	**GV2 ME14**	6...10	> 50	**LC1 K09**
		DT40	16	6	**LC1 K09**
0.75	**ATV 11HU18F1●**	**GV2 ME21**	17...23	> 15	**LC1 D25**
		DT40	20	6	**LC1 D25**
Single phase supply voltage: 200…240 V 50/60 Hz					
0.18	**ATV 11HU05M2●**	**GV2 ME08**	2.5...4	> 50	**LC1 K09**
		DT40	6	6	**LC1 K09**
0.37	**ATV 11●U09M2●**	**GV2 ME14**	6...10	> 50	**LC1 K09**
		DT40	10	6	**LC1 K09**
0.55	**ATV 11●U12M2E**	**GV2 ME14**	6...10	> 50	**LC1 K09**
		DT40	10	6	**LC1 K09**
0.75	**ATV 11●U18M2●**	**GV2 ME16**	9...14	> 15	**LC1 K12**
		DT40	16	6	**LC1 K12**
1.5	**ATV 11HU29M2E**	**GV2 ME20**	13...18	> 15	**LC1 D18**
		DT40	20	6	**LC1 D18**
1.5	**ATV 11HU29M2U** **ATV 11HU29M2A**	**GV2 ME21**	17...23	> 15	**LC1 D25**
		DT40	20	6	**LC1 D25**
2.2	**ATV 11HU41M2●**	**GV2 ME32**	24...32	> 10	**LC1 D32**
		DT40	32	6	**LC1 D32**
3-phase supply voltage: 200…230 V 50/60 Hz					
0.18	**ATV 11HU05M3●**	**GV2 ME07**	1.6...2.5	> 50	**LC1 K06**
		DT40	6	6	**LC1 K06**
0.37	**ATV 11●U09M3●**	**GV2 ME08**	2.5...4	> 50	**LC1 K06**
		DT40	6	6	**LC1 K06**
0.75	**ATV 11●U18M3●**	**GV2 ME14**	6...10	> 50	**LC1 K09**
		DT40	10	6	**LC1 K09**
1.5	**ATV 11HU29M3●**	**GV2 ME16**	9...14	> 15	**LC1 K12**
		DT40	16	6	**LC1 K12**
2.2	**ATV 11HU41M3●**	**GV2 ME20**	13...18	> 15	**LC1 D18**
		DT40	20	6	**LC1 D18**

Combinations of circuit-breakers and add-on modules

DT40	*Vigi TG40*		
Rating (A)	Rating (A)	Type *(3)*	Sensitivity
6	25	A "si"	30 mA
10	25	A "si"	30 mA
16	25	A "si"	30 mA
20	25	A "si"	30 mA
32	40	A "si"	30 mA

Recommendations for special uses:

- All RH10/RH21/RH99/RHU residual current protection devices with separate sensors are compatible as long as the type and sensitivity of the add-on modules given in the table above are observed.
- It is advisable to connect one residual current differential safety device per drive. In this case a type B device must not be located downstream of a type A or AC device.

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(1) Replace the dots in the reference according to the type of drive required, see pages 2/12 to 2/14.
(2) Replace "ME" with "P" for rotary knob control.
Type 2 coordination is provided by combining a GV2 circuit-breaker with an LC1 D●● contactor.
(3) For additional protection against direct contact, with a 3-phase power supply and access to the DC bus terminals (PA +/PC -), the add-on module must be type B with a sensitivity of 30 mA.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●E Europe range

ATV 11 HU18M2E

ATV 11 PU18M2E

ATV 11 HU41M2E

Drives with heatsink (frequency range from 0 to 200 Hz)

Motor	**Line supply** *(1)*	**Altivar 11**				
Power indicated on plate	**Max. line current for prospective Isc 1 kA**	**Continuous output current** *(2)*	**Max. transient current** *(3)*	**Power dissipated at nominal load**	**Reference** *(4)*	**Weight**
kW	**A**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18	2.9	1.1	1.6	12	**ATV 11HU05M2E**	0.900
0.37	5.3	2.1	3.1	20.5	**ATV 11HU09M2E**	1.000
0.55	6.3	3	4.5	29	**ATV 11HU12M2E**	1.100
0.75	8.6	3.6	5.4	37	**ATV 11HU18M2E**	1.100
1.5	14.8	6.8	10.2	72	**ATV 11HU29M2E** *(5)*	1.800
2.2	20.8	9.6	14.4	96	**ATV 11HU41M2E** *(5)*	1.800

Drives on base plate (frequency range from 0 to 200 Hz)

Motor	**Line supply** *(1)*	**Altivar 11**				
Power indicated on plate	**Max. line current for prospective Isc 1 kA**	**Continuous output current** *(2)*	**Max. transient current** *(3)*	**Power dissipated at nominal load**	**Reference** *(4)*	**Weight**
kW	**A**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37	5.3	2.1	3.1	20.5	**ATV 11PU09M2E**	0.900
0.55	6.3	3	4.5	29	**ATV 11PU12M2E**	0.900
0.75	8.6	3.6	5.4	37	**ATV 11PU18M2E**	0.900

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(1) Line voltage 230 V.
(2) The current value is given for a 4 kHz switching frequency. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10 % for 8 kHz, 20 % for 12 kHz and 30 % for 16 kHz.
(3) For 60 seconds.
(4) Drive supplied with an integrated EMC filter which cannot be disconnected.
(5) With integrated fan.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●U America range

ATV 11HU18M2U

ATV 11PU18M2U

ATV 11HU41M2U

ATV 11HU41M3U

Drives with heatsink (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	**Max. line current** *(1)*	**Continuous output current** *(2)*	**Max. transient current** *(3)*	**Power dissipated at nominal load**	**Reference** *(4)*	**Weight**
kW/*HP*	**A**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 100…120 V 50/60 Hz						
0.18/*0.25*	6	1.6 *(6)*	2.4	14.5	**ATV 11HU05F1U**	0.900
0.37/*0.5*	9	2.4 *(6)*	3.6	23	**ATV 11HU09F1U**	1.000
0.75/*1*	18	4.6 *(6)*	6.3	43	**ATV 11HU18F1U** *(5)*	1.800
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18/*0.25*	3.3	1.6	2.4	14.5	**ATV 11HU05M2U**	0.900
0.37/*0.5*	6	2.4	3.6	23	**ATV 11HU09M2U**	1.000
0.75/*1*	9.9	4.6	6.3	43	**ATV 11HU18M2U** *(5)*	1.100
1.5/*2*	17.1	7.5	11.2	77	**ATV 11HU29M2U** *(5)*	1.800
2.2/*3*	24.1	10.6	15	101	**ATV 11HU41M2U** *(5)*	1.800
3-phase supply voltage: 200…230 V 50/60 Hz						
0.18/*0.25*	1.8	1.6	2.4	13.5	**ATV 11HU05M3U**	0.900
0.37/*0.5*	3.6	2.4	3.6	24	**ATV 11HU09M3U**	1.000
0.75/*1*	6.3	4.6	6.3	38	**ATV 11HU18M3U** *(5)*	1.100
1.5/*2*	11	7.5	11.2	75	**ATV 11HU29M3U** *(5)*	1.800
2.2/*3*	15.2	10.6	15	94	**ATV 11HU41M3U** *(5)*	1.800

Drives on base plate (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	**Max. line current** *(1)*	**Continuous output current** *(2)*	**Max. transient current** *(3)*	**Power dissipated at nominal load**	**Reference** *(4)*	**Weight**
kW/*HP*	**A**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 100…120 V 50/60 Hz						
0.37/*0.5*	9	2.4	3.6	23	**ATV 11PU09F1U**	0.900
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37/*0.5*	6	2.4	3.6	23	**ATV 11PU09M2U**	0.900
0.75/*1*	9.9	4.6	6.3	43	**ATV 11PU18M2U**	0.900
3-phase supply voltage: 200…230 V 50/60 Hz						
0.37/*0.5*	3.6	2.4	3.6	24	**ATV 11PU09M3U**	0.900
0.75/*1*	6.3	4.6	6.3	38	**ATV 11PU18M3U**	0.900

(1) The line current value is given for the measurement conditions indicated in the table below.

Drive rating	Prospective Isc	Line voltage
ATV 11●UF1U	1 kA	100 V
ATV 11●UM2U	1 kA	208 V
ATV 11●UM3U	5 kA	208 V

(2) The current value is given for a 4 kHz switching frequency. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10 % for 8 kHz, 20 % for 12 kHz and 30 % for 16 kHz.
(3) For 60 seconds.
(4) Drive supplied without EMC filter. To order an EMC filter separately, see page 2/15.
(5) With integrated fan.
(6) Current given for the power supply for a 230 V 3-phase motor.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●A Asia range

ATV 11HU18M2A

ATV 11PU18M2A

ATV 11HU41M2A

ATV 11HU41M3A

Drives with heatsink (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	**Max. line current** *(1)*	**Continuous output current** *(2)*	**Max. transient current** *(3)*	**Power dissipated at nominal load**	**Reference** *(4)*	**Weight**
kW	**A**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 100…120 V 50/60 Hz						
0.18	6	1.4 *(6)*	2.1	14	**ATV 11HU05F1A**	0.900
0.37	9	2.4 *(6)*	3.6	25	**ATV 11HU09F1A**	1.000
0.75	18	4 *(6)*	6	40	**ATV 11HU18F1A** *(5)*	1.800
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18	3.3	1.4	2.1	14	**ATV 11HU05M2A**	0.900
0.37	6	2.4	3.6	25	**ATV 11HU09M2A**	1.000
0.75	9.9	4	6	40	**ATV 11HU18M2A**	1.100
1.5	17.1	7.5	11.2	78	**ATV 11HU29M2A** *(5)*	1.800
2.2	24.1	10	15	97	**ATV 11HU41M2A** *(5)*	1.800
3-phase supply voltage: 200…230 V 50/60 Hz						
0.18	1.8	1.4	2.1	13.5	**ATV 11HU05M3A**	0.900
0.37	3.6	2.4	3.6	24	**ATV 11HU09M3A**	1.000
0.75	6.3	4	6	38	**ATV 11HU18M3A**	1.100
1.5	11	7.5	11.2	75	**ATV 11HU29M3A** *(5)*	1.800
2.2	15.2	10	15	94	**ATV 11HU41M3A** *(5)*	1.800

Drives on base plate (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	**Max. line current** *(1)*	**Continuous output current** *(2)*	**Max. transient current** *(3)*	**Power dissipated at nominal load**	**Reference** *(4)*	**Weight**
kW	**A**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 100…120 V 50/60 Hz						
0.37	9	2.4	3.6	25	**ATV 11PU09F1A**	0.900
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37	6	2.4	3.6	25	**ATV 11PU09M2A**	0.900
0.75	9.9	4	6	40	**ATV 11PU18M2A**	0.900
3-phase supply voltage: 200…230 V 50/60 Hz						
0.37	3.6	2.4	3.6	24	**ATV 11PU09M3A**	0.900
0.75	6.3	4	6	38	**ATV 11PU18M3A**	0.900

(1) The line current value is given for the measurement conditions indicated in the table below.

Drive rating	Prospective Isc	Line voltage
ATV 11●UF1A	1 kA	100 V
ATV 11●UM2A	1 kA	200 V
ATV 11●UM3A	5 kA	200 V

(2) The current value is given for a 4 kHz switching frequency. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10 % for 8 kHz, 20 % for 12 kHz and 30 % for 16 kHz.
(3) For 60 seconds.
(4) Drive supplied without EMC filter. To order an EMC filter separately, see page 2/15.
(5) With integrated fan.
(6) Current given for the power supply for a 230 V 3-phase motor.

Presentation:
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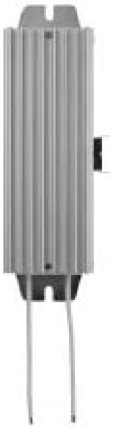
Variable speed drives for asynchronous motors

Altivar 11

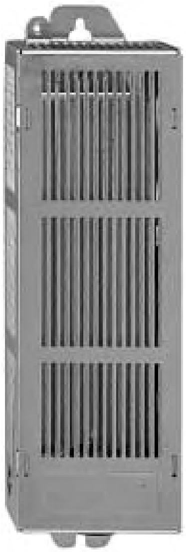


VW3 A5870●

Options

Description	For drives	Reference	Weight kg
PowerSuite software workshop	All ratings	See page 3/3	–
Converter, supplied without cable or CD-ROM, for communicating with the PowerSuite software workshop (see page 3/3)	All ratings	**VW3 A11301**	0.070
EMC input filters	**ATV 11HU05M2E, HU09M2E** **ATV 11HU12M2E, HU18M2E** **ATV 11HU05F1U/A, HU09F1U/A** **ATV 11HU05M2U/A, U09M2U/A** **ATV 11HU18M2U/A**	**VW3 A11401**	0.650
	ATV 11HU29M2E, HU41M2E **ATV 11HU18F1U/A, HU29M2U/A** **ATV 11HU41M2U/A**	**VW3 A11402**	0.850
	ATV 11HU05M3U/A, HU09M3U/A **ATV 11HU18M3U/A**	**VW3 A11403**	0.650
	ATV 11HU29M3U/A, HU41M3U/A	**VW3 A11404**	0.850
Braking module connected to the DC bus	All ratings	**VW3 A11701**	0.250

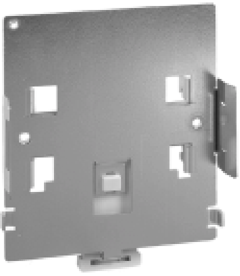
Description	Ohmic value	Power W	For drives	Reference	Weight kg
Braking resistors Not protected (IP 00) *(3)*	100 Ω	32	**ATV 11HU05●●●** *(1)* **ATV 11●U09●●●** *(1)* **ATV 11●U12M2E** *(1)* **ATV 11●U18●●●** *(1)* **ATV 11HU29●●●** *(2)*	**VW3 A58702**	0.600
	68 Ω	32	**ATV 11HU41●●●** *(2)*	**VW3 A58704**	0.600
Braking resistors Protected (IP 30) *(3)*	100 Ω	32	**ATV 11HU05●●●** *(1)* **ATV 11●U09●●●** *(1)* **ATV 11●U12M2E** *(1)* **ATV 11●U18●●●** *(1)* **ATV 11HU29●●●** *(2)*	**VW3 A58732**	2.000
	68 Ω	32	**ATV 11HU41●●●** *(2)*	**VW3 A58733**	2.000



VW3 A5873●

Accessories

Description	For drives	Reference	Weight kg
Plates for mounting on ⊔ rail (width 35 mm)	**ATV 11HU05●●●** **ATV 11HU09●●●** **ATV 11HU12M2E** **ATV 11HU18M●●**	**VW3 A11851**	0.220
	ATV 11HU18F1● **ATV 11HU29●●●** **ATV 11HU41●●●**	**VW3 A11852**	0.300
Adaptor plate for replacing Altivar 08	**ATV 11HU05M2●** **ATV 11●U09M2●** **ATV 11●U12M2E** **ATV 11●U18M2●**	**VW3 A11811**	0.220
Earthing plate for EMC mounting	All ratings	**VW3 A11831**	0.100
Fan kit *(4)*	**ATV 11HU18F1●** **ATV 11HU18M●U** **ATV 11HU29●●●** **ATV 11HU41●●●**	**VW3 A11821**	0.070



VW3 A11852

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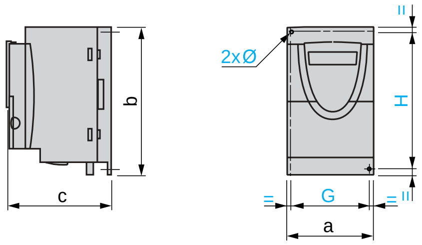
(1) Minimum value of the resistor to be connected: 75 ohms.
(2) Minimum value of the resistor to be connected: 51 ohms.
(3) If a resistor other than those specified is being used, add a thermal protection device.
(4) Low-noise" fan.

Variable speed drives for asynchronous motors

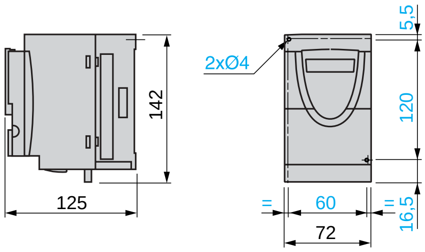
Altivar 11

ATV 11HU05●●E/U/A, ATV 11PU●●●●E/U/A

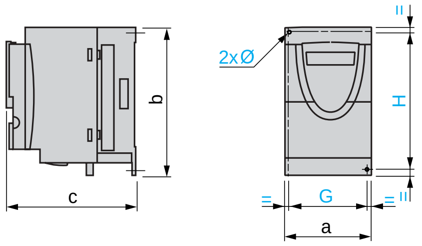


ATV 11	a	b	c	G	H	Ø
HU05●●E/U, PU●●●●E/U	72	142	101	60±1	131±1	4
HU05●●A, PU●●●●A	72	142	108	60±1	131±1	4

ATV 11HU09M2E

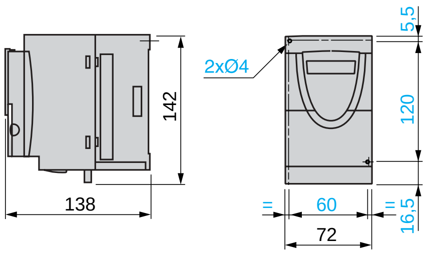


ATV 11HU09●●U/A

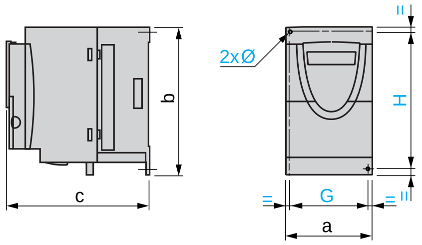


ATV 11	a	b	c	G	H	Ø
HU09●●U	72	142	125	60±1	131±1	4
HU09●●A	72	142	132	60±1	131±1	4

ATV 11HU12M2E, ATV 11HU18M2E

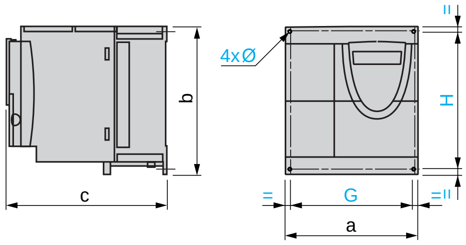


ATV 11HU18M●U/A



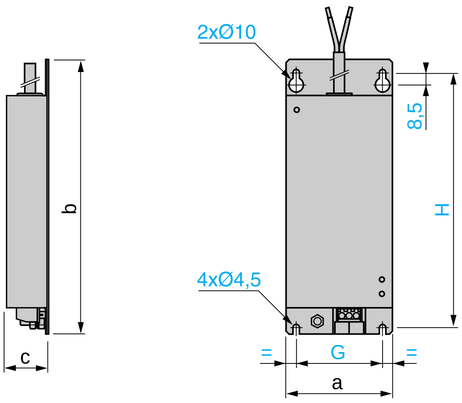
ATV 11	a	b	c	G	H	Ø
HU18M●U	72	147	138	60±1	131±1	4
HU18M●A	72	142	145	60±1	131±1	4

ATV 11HU18F1U/A, ATV 11HU29M●E/U/A, ATV 11HU41M●E/U/A



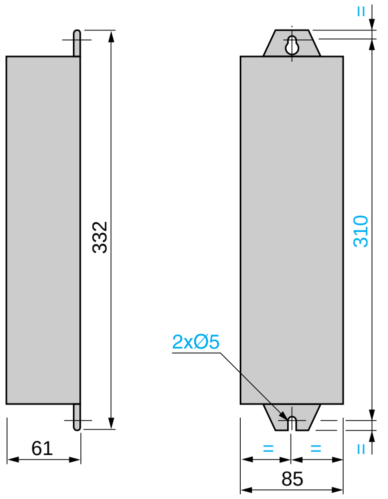
ATV 11	a	b	c	G	H	Ø
HU18F1U, HU29M●E/U, HU41M●E/U	117	142	156	106±0,5	131±1	4
HU18F1A, HU29M●A, HU41M●A	117	142	163	106±0,5	131±1	4

EMC input filters VW3 A11401 to A11404



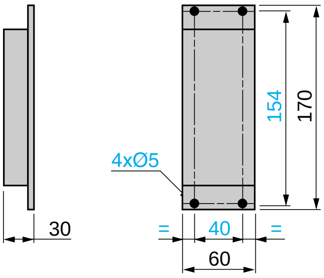
VW3	a	b	c	G	H
A11401	75	194	30	61	180
A11402	117	184	40	97	170
A11403	75	194	40	61	180
A11404	117	190	40	97	170

Protected braking resistors VW3 A58732 and A58733



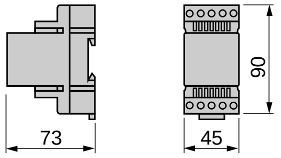
Non protected braking resistors VW3 A58702 and A58704

(2-wire output, length 0.5 m)



Braking module VW3 A11701

(for mounting on AM1-ED rail)



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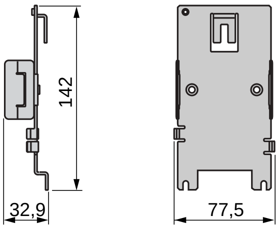
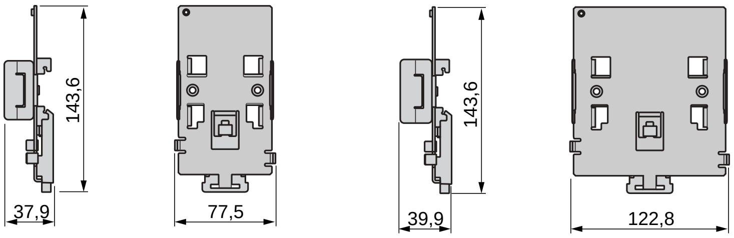
Variable speed drives for asynchronous motors
Altivar 11

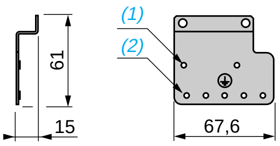
ATV 08 adaptor plate VW3 A11811



Plates for mounting on ⌴ rail VW3 A11851 and A11852

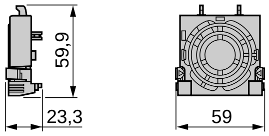


EMC earthing plate VW3 A11831



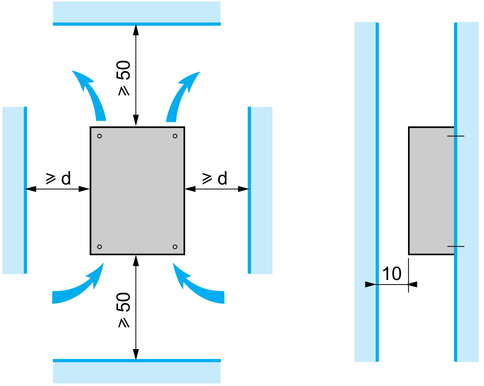
(1) 2 screws supplied for fixing the earthing plate.
(2) 5 x Ø M4 mm screws for fixing EMC clamps.

Ventilation kit VW3 A11821



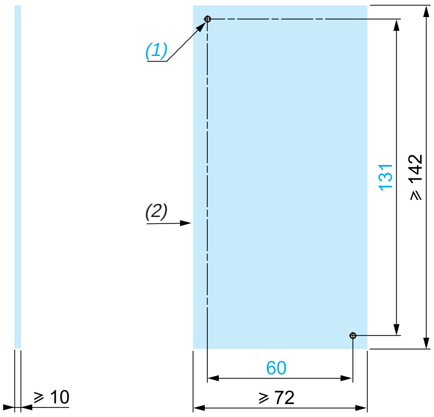
Mounting recommendations

- Install the unit vertically, at ± 10°.
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate, by natural convection or by ventilation, from the bottom to the top of the unit.
- Free space in front of unit: 10 mm minimum.



-10 °C to 40 °C
d ≥ 50 mm: no special precautions.
d = 0 (mounted side by side): remove the protective cover from the top of the drive.
40 °C to 50 °C
d ≥ 50 mm: remove the protective cover from the top of the drive.
50 °C to 60 °C
d ≥ 50 mm: remove the protective cover from the top of the drive, and derate the nominal current of the drive by 2.2 % per °C above 50 °C.

Recommendations for mounting on a machine frame (specific to ATV 11PU●●●●● drives)



(1) 2 x Ø M4 tapped holes.
(2) Minimum machined area

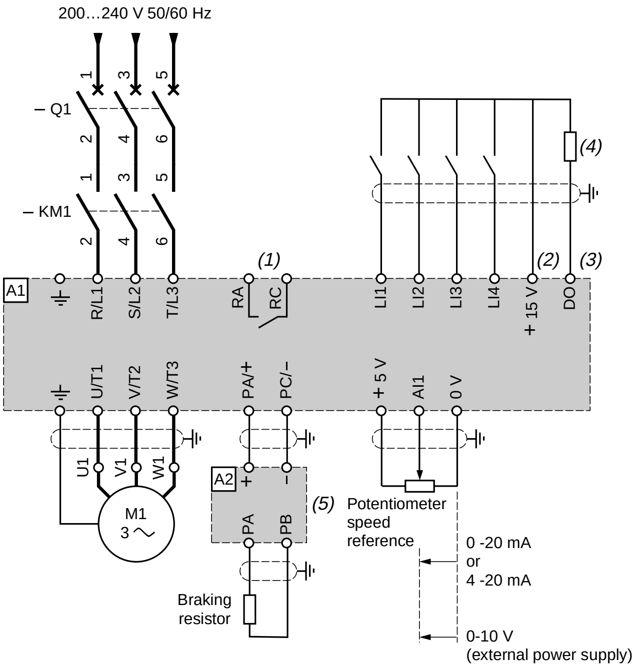
ATV 11PU●●●●● drives can be mounted on (or in) a steel or aluminium machine frame, observing the following conditions:

- maximum ambient temperature: 40 °C,
- vertical mounting ± 10°,
- the drive must be fixed at the centre of a support (frame) which is a minimum of 10 mm thick and with a minimum cooling area of 0.12 m^2 for steel and 0.09 m^2 for aluminium, exposed to the open air,
- support area for the drive (142 x 72 min) machined on the frame with a surface smoothness of 100 µm max and an unevenness of 3.2 µm max,
- mill the tapped holes lightly in order to remove any burrs,
- coat the whole drive support area with thermal contact grease (or equivalent),

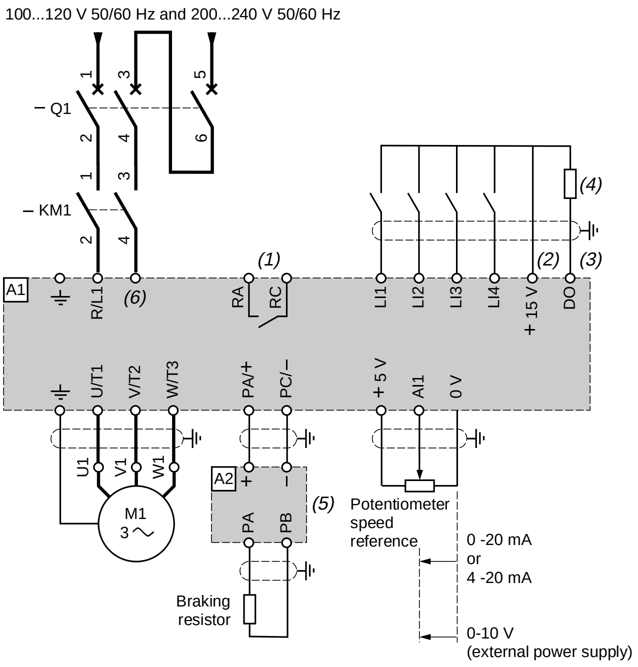
When the operating conditions are close to the maximum limits (power, cycle and temperature), this type of use must be checked beforehand, by monitoring the thermal state of the drive.

Schemes with contactor

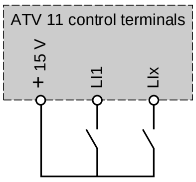
3-phase power supply ATV 11●●●●M3●



Single phase power supply ATV 11●●●●F1● and ATV 11●●●●M2●

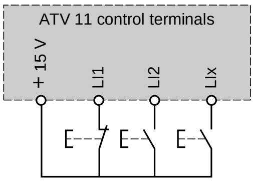


2-wire control



LI1: Forward
LIx: Reverse

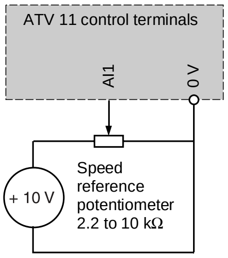
3-wire control



LI1: Stop
LI2: Forward
LIx: Reverse

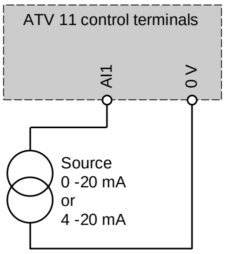
Analog voltage input

External 10 V use



Analog current input

0-20 mA or 4-20 mA



For combinations of KM1, Q1, etc, components (see the table on page 2/11).

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(1) Fault relay contact: for remote signalling of drive status.
(2) Internal +15 V. If an external +24 V supply is used, connect the 0 V on the external supply to the 0 V terminal, do not use the + 15 terminal on the drive, and connect the common of the LI inputs to the + 24 V of the external supply.
(3) DO output: can be configured as an analog or a logic output. Internal voltage + 15 V or external + 24 V.
(4) Galvanometer or low level relay.
(5) Braking module VW3 A11701, if braking resistor VW3 A587●● is used.
(6) N for ATV 11●●●●F1,
S/L2 for ATV 11●●●●M2●.

Nota : *fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Variable speed drives for asynchronous motors

Altivar 11

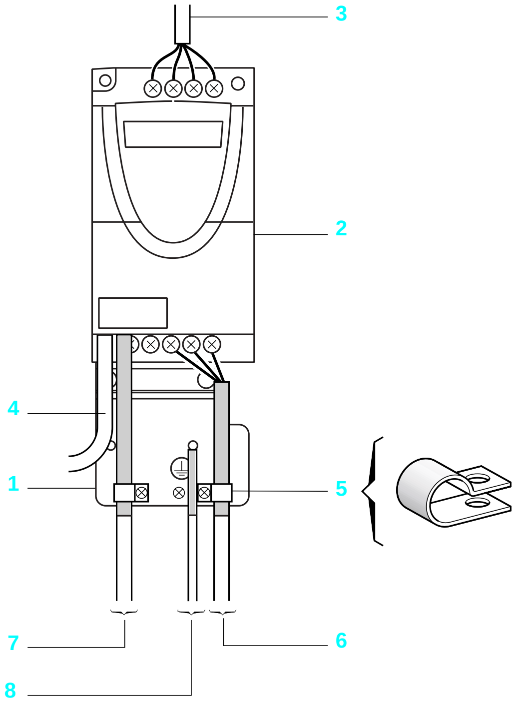
Electromagnetic compatibility

Connections to meet the requirements of EMC standards

Principle

■ Earths between the drive, the motor and the cable shielding must have "high frequency" equipotentiality.
■ Use shielded cables with shielding connected to earth at 360° at both ends for the motor cables, and if necessary the braking module and resistor and control-signalling cables. Conduit or metal ducting can be used for part of the shielding length provided that there is no break in continuity.
■ Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram for ATV 11●U●●●●E/U/A



1 Earthing plate VW3 A11831 to be fitted on the drive.
2 Altivar 11.
3 Non-shielded power supply cable.
4 Non-shielded cable for fault relay contacts output.
5 Fix and earth the shielding of cables 6 and 7 as close as possible to the drive:
  - strip the shielding,
  - use cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the earthing plate,
  - the shielding must be clamped tightly enough to the earthing plate to ensure good contact,
  - types of clamp: non-oxidizing metal.
6 Shielded cable *(1)* for connecting the motor.
7 Shielded cable *(1)* for connecting the control/signalling system. For applications which require a large number of conductors, small cross-sections must be used (0.5 mm^2).
8 PE cable.

---

(1) The shielding of cables (6, 7 and 8) must be connected to earth at both ends. The shielding must be continuous and if intermediate terminals are used, they must be in EMC metal boxes.

Nota : *if using an additional input filter, it must be mounted under the drive and connected directly to the line supply via a non-shielded cable. Link 3 on the drive is then via the filter output cable.*
Although there is an HF equipotential earth connection between the drive, the motor and the cable shielding, it is still necessary to connect the PE protective conductors (green-yellow) to the appropriate terminals on each of the devices.

Variable speed drives for asynchronous motors
Altivar 11

Summary of functions

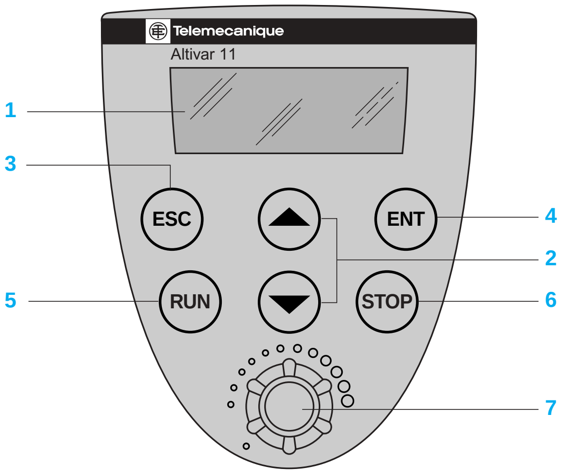
Drive factory setting

To facilitate the setting up of the drive, the functions have been programmed to the meet the requirements of the most common applications.

Drive functions and I/O:

- ■ 2-wire control on transition:
  - □ logic input LI1: forward,
  - □ logic input LI2: reverse.
- ■ Preset speeds:
  - □ logic input LI3: preset speeds,
  - □ logic input LI4: preset speeds.
- ■ Analog input AI1: 0-5 V speed reference.
- ■ Logic/analog output DO: motor frequency (analog).
- ■ Deceleration ramp adaptation.
- ■ Automatic d.c. current injection for 0.5 s to standstill.

Functions of the display and the keys



1 Information is displayed in the form of codes or values in three "7-segment" displays
2 Buttons for scrolling through the menus or modifying values
3 “ESC”: button for exiting the menus (no confirmation).
4 “ENT”: validation button for entering a menu or confirming the new value selected.

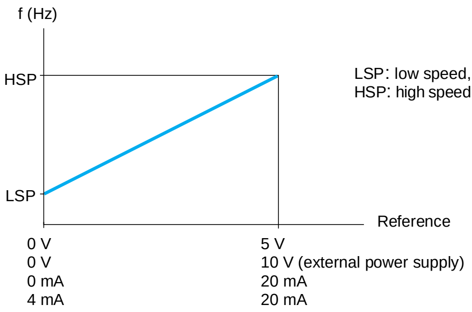
■ Only on the Asia range:
5 “RUN”: local control of motor operation.
6 “STOP”: local control of motor stopping.
7 Speed reference potentiometer.

Variable speed drives for asynchronous motors

Altivar 11

■ Operating speed range

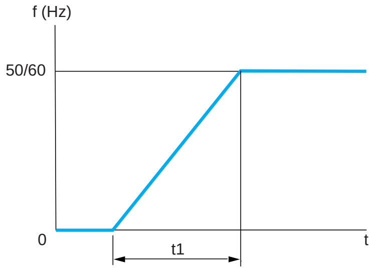
Used to determine the 2 frequency limits which define the speed range permitted by the machine under actual operating conditions.



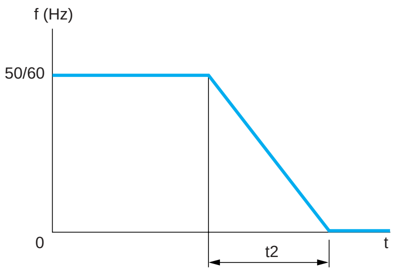
LSP: low speed, from 0 to HSP, factory setting 0
HSP: high speed, from LSP to 200 Hz, factory setting 50/60 Hz

■ Acceleration and deceleration ramp times

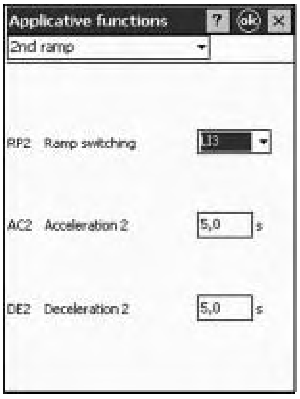
Used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp
Adjustment of t1: 0.1 to 99.9 s, factory setting 3 s.



Linear deceleration ramp
Adjustment of t2: 0.1 to 99.9 s, factory setting 3 s.



2nd ramp

RP2 Ramp switching LI3

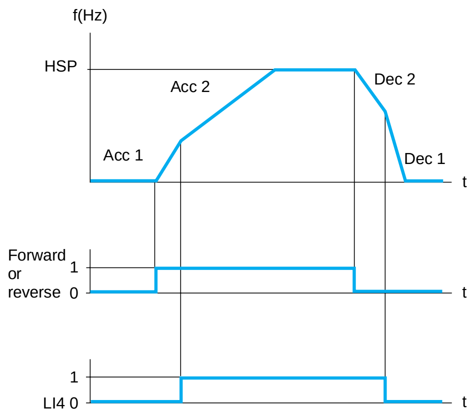
AC2 Acceleration 2 5,0 s

DE2 Deceleration 2 5,0 s

Adjustment of second ramp with PowerSuite Pocket PC

■ Second ramp

Used to switch 2 acceleration or deceleration ramp times, which can be adjusted separately. Enabled by means of 1 reassignable logic input.
It is suitable for machines with fast continuous speed correction and high speed lathes with acceleration and deceleration limiting above certain speeds.



Acceleration 1 (Acc 1) and deceleration 1 (Dec 1):
- adjustment 0.1 to 99.9 s
- factory setting 3 s

Acceleration 2 (Acc 2) and deceleration 2 (Dec 2):
- adjustment 0.1 to 99.9 s
- factory setting 5 s

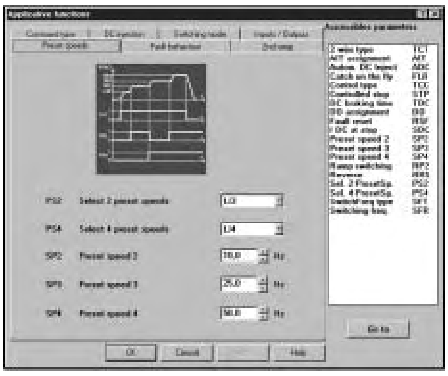
HSP: high speed

Example of switching using logic input LI4

■ Deceleration ramp adaptation

Used to automatically increase the deceleration ramp time if the initial setting is too low when the load inertia is taken into account. This function prevents the drive locking if there is an **overvoltage on deceleration** fault.
If this function is disabled, an appropriate braking module and resistor can be used.

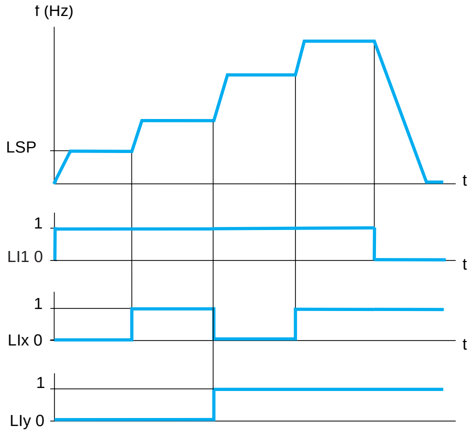
Variable speed drives for asynchronous motors
Altivar 11



PS2 Select 2 preset speeds LI3
PS4 Select 4 preset speeds LI4
SP2 Preset speed 2 10.0 Hz
SP3 Preset speed 3 25.0 Hz
SP4 Preset speed 4 50.0 Hz

Adjusting the preset speeds with the PowerSuite software workshop for PC

■ **Preset speeds**
Used to switch preset speed references.
Choice between 2 or 4 preset speeds.
Enabled via 1 or 2 logic inputs.
The preset speeds can be adjusted in increments of 0.1 Hz from 0 Hz to 200 Hz.
They take priority over the reference given via the analog input or, for the Asia range, on the drive's potentiometer.



The speed obtained with inputs LIx and LIy at state 0 is LSP or the speed reference, depending on the level of analog input AI1.

Factory settings:

1st speed : LSP (low speed or reference)

2th speed: 10 Hz

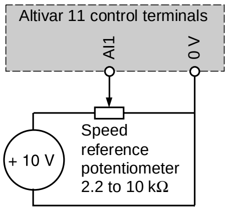
3th speed: 25 Hz

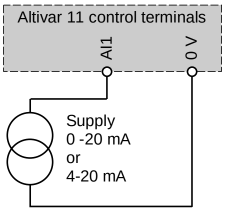
4th speed: 50 Hz

Example of operation with 4 preset speeds.

■ **Configuration of analog input AI1**
This is used to modify the characteristics, for either voltage or current, of analog input AI1.
Factory setting: 0-5 V (internal power supply only).
Other possible values via external power supplies: 0-10 V, 0-20 mA, 4-20 mA.

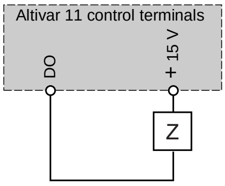
Analog voltage input	Analog current input
Use with external 10 V	0-20 mA or 4-20 mA use

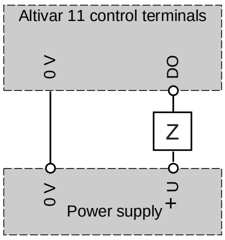




■ **Analog or logic output DO**
Output DO can be programmed to be a logic output or an analog output. It enables remote signalling of the following information as required:
- ☐ frequency threshold reached (logic output),
- ☐ reference reached (logic output),
- ☐ current threshold reached (logic output),
- ☐ current in the motor (analog output),
- ☐ motor frequency (analog output).

Diagram with internal power supply	Diagram with external power supply





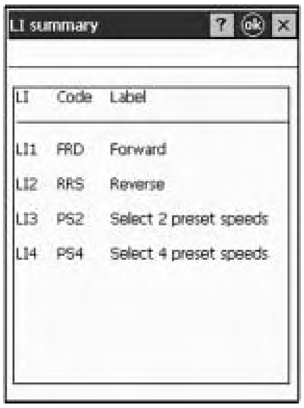
If it is a logic output: Z is a relay or a low level input.
If it is an analog output: Z can be, for example, a galvanometer.
For a galvanometer with resistance R, the maximum voltage supplied will be:

$$Ux\frac{R(\Omega)}{R(\Omega)+1000(\Omega)}$$

■ **Direction of operation**: **forward/reverse**
In 2-wire control, forward operation cannot be reassigned to any logic input other than LI1.
In 3-wire control, stopping cannot be reassigned to any logic input other than LI1, and forward operation cannot be reassigned to any logic input other than LI2.
Reverse operation can be disabled for applications with a single direction of motor rotation, by not assigning any logic input to reverse operation.

Variable speed drives for asynchronous motors

Altivar 11



LI	Code	Label
LI1	FRD	Forward
LI2	RRS	Reverse
LI3	PS2	Select 2 preset speeds
LI4	PS4	Select 4 preset speeds

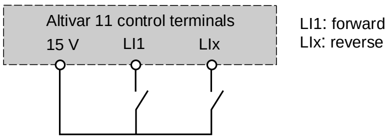
Assignment of logic inputs with PowerSuite Pocket PC

■ 2-wire control

Used to control the direction of operation by means of a maintained contact.
Run (forward or reverse) and stop are controlled by the same logic input.
Enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all non-reversing and reversing applications.

3 operating modes are possible:

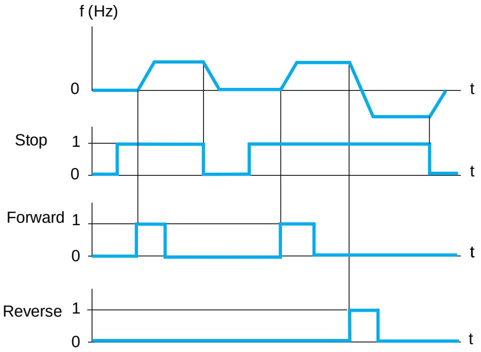
- ☐ detection of the state of the logic inputs,
- ☐ detection of a change in state of the logic inputs,
- ☐ detection of the state of the logic inputs with forward operation always having priority over reverse.



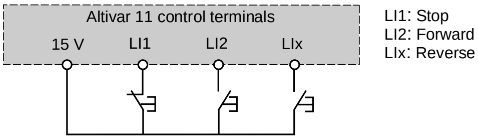
Wiring diagram for 2-wire control

■ 3-wire control

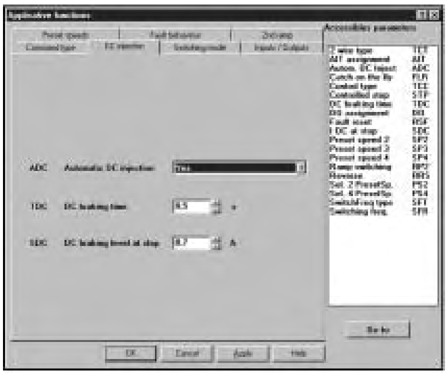
Used to control the operating direction and stopping by means of pulsed contacts.
Run (forward or reverse) and stop are controlled by 2 different logic inputs.
Enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.



Example of operation with 3-wire control



Wiring diagram for 3-wire control



Adjustment of the "d.c. injection" function using the PowerSuite software workshop for PC

■ Automatic d.c. injection

Enables d.c. injection to standstill, which is adjustable from 0 to 1.2 times the value of the drive nominal current (preset at 0.7 In), as soon as operation is no longer controlled and the motor speed is zero:

- ☐ either for a period of time, which is adjustable from 0.1 to 30 s (preset at 0.5 s)
- ☐ or continuously.

Factory setting: function active with d.c. injection for 0.5 s.
In 3-wire control, d.c. injection is only active if logic input LI1 is active (stop).

■ Switching frequency, noise reduction

High frequency switching of the intermediate d.c. voltage can be used to supply the motor with a current wave with low harmonic distortion.
There are 3 ranges of switching frequency:

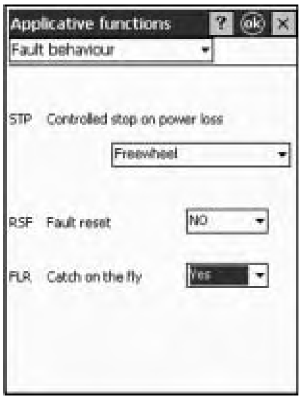
- ☐ random switching frequency around 2 or 4 kHz (avoids resonance),
- ☐ fixed low frequency adjustable to 2 or 4 kHz,
- ☐ fixed high frequency adjustable to 8, 12 or 16 kHz.

Factory setting: low frequency set at 4 kHz.
This function is suitable for all applications which require low motor noise.

■ Fault relay, unlocking

The fault relay is energised when the drive is powered up and is not faulty.
It opens in the event of a fault or when the drive is powered down.
The drive can be unlocked after a fault in one of the following ways:

- ☐ powering down the drive until the display disappears completely, then powering back up,
- ☐ activating the logic input associated with the “fault reset” function, if the function is enabled,
- ☐ enabling the “automatic restart” function.



Fault behaviour

STP Controlled stop on power loss: Freewheel

RSF Fault reset: NO

FLR Catch on the fly: Yes

Adjustment of the behaviour at a fault with PowerSuite Pocket PC

- **Fault reset**

Used to clear the stored fault and restart the drive if the cause of the fault has disappeared.
The fault is cleared by a transition of the logic input LI which is assigned to this function.
Factory setting: function inactive.
The restart conditions after a reset to zero are the same as those of a normal power-up.
The following faults can be reset: drive thermal overload, motor thermal overload, line supply overvoltage, overvoltage on deceleration, overspeed, line phase loss *(1)*, line supply undervoltage *(2)*.

- **Automatic restart**

Enables the drive to be restarted automatically after locking following a fault if this fault has disappeared and if the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods: 1 s, 5 s, 10 s, then 1 minute for the following periods.
If the drive has not restarted after 6 minutes, the drive locks and the procedure is abandoned until the drive is powered down and back up again.
Factory setting: function inactive.

Restart authorised with the following faults: drive thermal overload, motor thermal overload, line supply overvoltage, overvoltage on deceleration, line phase loss *(1)*, line supply undervoltage *(2)*.
If the function is enabled, the drive's safety relay remains activated until one of these faults appears. This function requires the speed reference and the direction of operation to be maintained, and is only compatible with 2-wire level control.
This function is suitable for machines or installations in continuous operation or without monitoring, and where a restart will not endanger equipment or personnel in any way.

- **Automatic catching a spinning load with speed detection** ("catch-on-the-fly")

Used to restart the motor smoothly after one of the following events:
- ☐ loss of line supply or power off,
- ☐ fault reset or automatic restart,
- ☐ "freewheel stop" triggered by a fault.

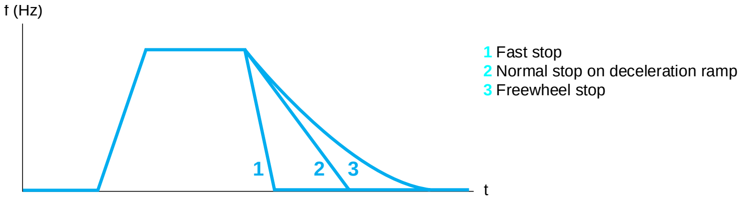
On restarting, the effective speed of the motor is detected in order to restart on the ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
Factory setting: function inactive.

This function requires the activation of 2-wire level control and is not compatible with the continuous d.c. injection function.
This function is suitable for machines for which the loss of motor speed is negligible during the line supply loss time (machines with high inertia).

- **Controlled stop on loss of line supply**

Used to define the drive stopping modes at a "loss of line supply" fault.
Three stopping modes are available for selection:
- ☐ "freewheel" stop: the drive locks and the motor stops in accordance with the inertia and the resistive torque,
- ☐ normal stop: stop with valid deceleration ramp time (deceleration 1 or 2),
- ☐ fast stop: the stopping time depends on the inertia and the braking ability of the drive.

Factory setting: "freewheel" stop.



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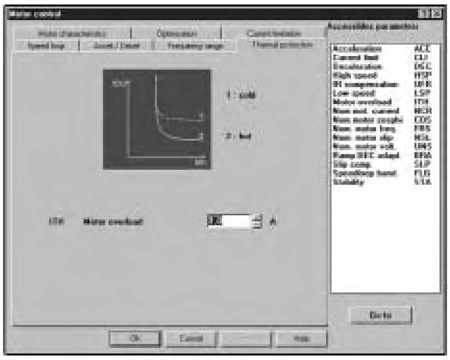
(1) The "line supply phase loss" fault is only accessible on drives with 3-phase power supply, if monitoring of the fault has been enabled (factory setting: enabled).
(2) The drive will restart as soon as the undervoltage fault disappears, whether or not the function is active.

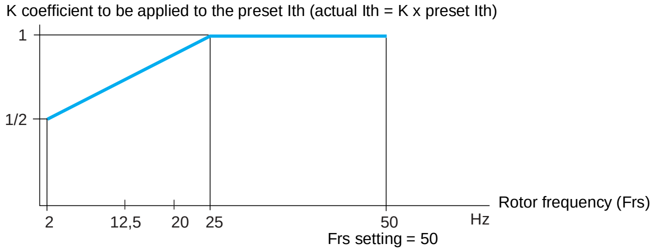


Adjusting the thermal protection with the PowerSuite software workshop for PC

■ **Thermal protection of drive**
Direct protection by thermistor, integrated in the drive's power module. This protects the components, even in the event of poor ventilation or excessive ambient temperature.
When the fault is detected, it locks the drive.

■ **Motor thermal protection**
Motor thermal protection is implemented via continuous calculation of its theoretical temperature rise.
The drive is locked on a fault if this temperature rise exceeds 118% of the nominal temperature rise.
This function is suitable for applications with self-cooled motors and thermal derating based on the rotor frequency.

Nota : the thermal state of the motor is not stored when the drive is powered down.



■ **Monitoring**
The display shows the state of the drive or, if selected, one of the following values:
- ☐ frequency reference,
- ☐ output frequency applied to the motor,
- ☐ motor current,
- ☐ line voltage,
- ☐ motor thermal state,
- ☐ drive thermal state.

Incompatible functions

The choice of the last function configured is enabled, whatever the configuration of the previous functions.
Application functions can be assigned to the same logic input, in which case one logic input enables a number of functions (for example: direction of operation and 2nd ramp).

A check must be carried out to ensure that the functions are compatible.

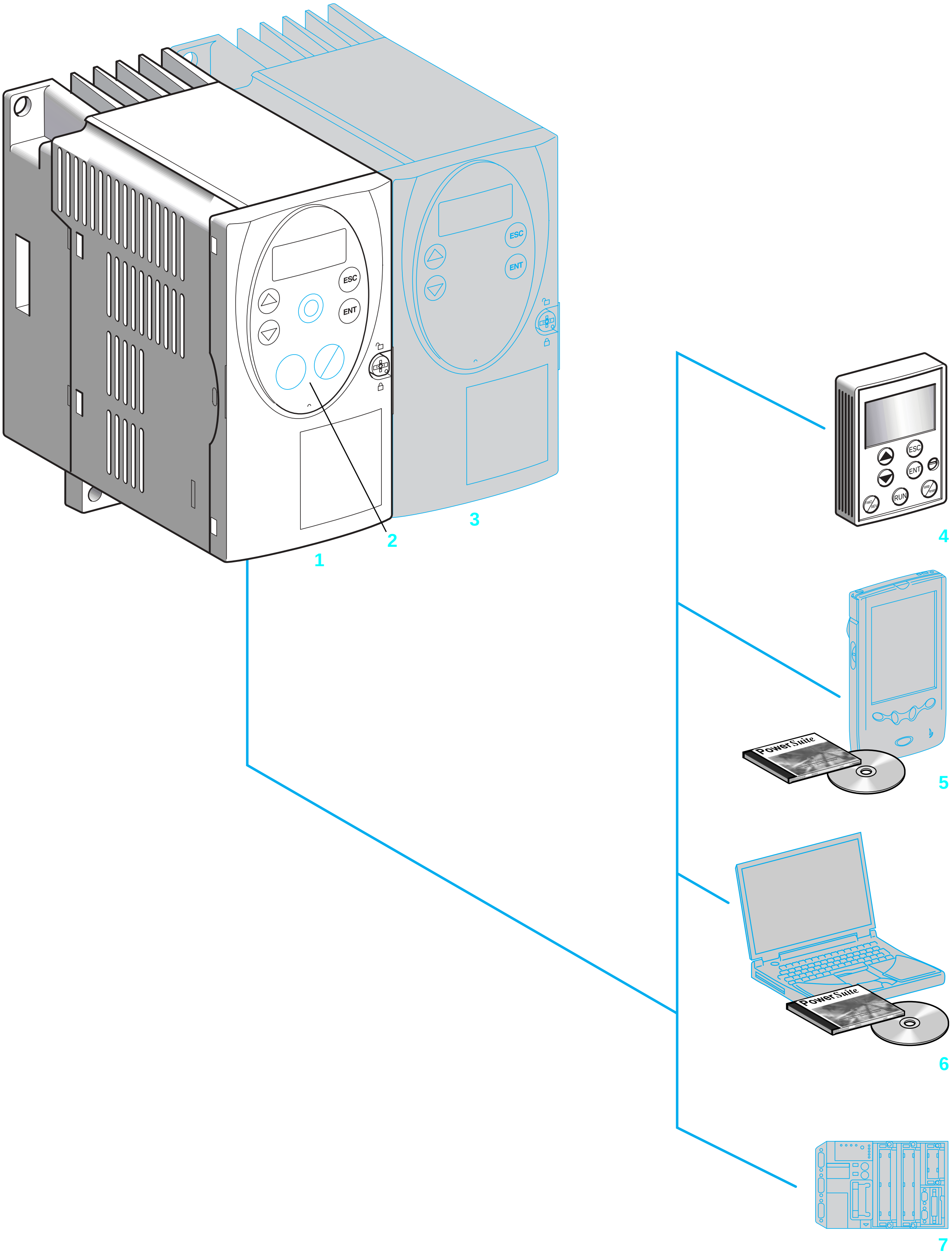
- ■ **Direction of operation and 2-wire control**: forward operation can only be assigned to LI1.
- ■ **Direction of operation and 3-wire control**: forward operation can only be assigned to LI2.
- ■ **Automatic restart**: requires the configuration of 2-wire level control. Changing the configuration of the type of control disables automatic restart.
- ■ **Automatic catching a spinning load with speed detection**:
- ☐ requires the configuration of 2-wire level control. Changing the configuration of the type of control disables automatic catching a spinning load.
- ☐ not compatible with continuous d.c. injection braking to a standstill. Configuring this function disables automatic catching a spinning load.

Functions specific to the Asia range

■ **Local control**:
The keypad on the Asia range has 2 additional keys (RUN and STOP) and a potentiometer (speed reference).
☐ The keys and the potentiometer are active if local control is enabled.
The logic and analog inputs are inactive if local control is enabled.
☐ **Reverse**: if local control is active, the reverse function is not visible.
Factory setting: function active.
■ **Logic inputs**:
It is possible to choose the active level of the logic input.
Positive logic: the inputs are active if the signal is ≥ 11 V.
Negative logic: the inputs are active if the signal is ≤ 5 V.
Factory setting: positive logic.

Variable speed drives for asynchronous motors

Altivar 31



Variable speed drives for asynchronous motors

Altivar 31

Applications

The Altivar 31 drive is a frequency inverter for 3-phase squirrel cage asynchronous motors. The Altivar 31 is robust, compact, easy to use and conforms to EN 50178, IEC/EN 61800-2, IEC/EN 61800-3 standards, UL/CSA certification and to CE marking.

It incorporates functions that are suitable for the most common applications, including:

- Materials handling (small conveyors, hoists, etc),
- Packing and packaging machines,
- Specialist machines (mixers, kneaders, textile machines, etc.),
- Pumps, compressors, fans.

Altivar 31 drives communicate on Modbus and CANopen industrial buses. These two protocols are integrated as standard into the drive.

Altivar 31 drives are supplied with a heatsink for normal environments and ventilated enclosures. Multiple units can be mounted side by side 3 to save space.

Drives are available for motor ratings between 0.18 kW and 15 kW, with four types of power supply:

- 200 V to 240 V single phase, 0.18 kW to 2.2 kW
- 200 V to 240 V 3-phase, 0.18 kW to 15 kW
- 380 V to 500 V 3-phase, 0.37 kW to 15 kW
- 525 V to 600 V 3-phase, 0.75 kW to 15 kW

Altivar 31 drives are available with a choice of two different Human/Machine interfaces:

- 1 **ATV 31H●●●●** with displays and menu navigation keys
- 2 **ATV 31H●●●●A** with displays, menu navigation keys and local control (Run/Stop and speed reference set by a potentiometer).

Electromagnetic compatibility EMC

The incorporation of level A EMC filters (conducted and radiated) in **ATV 31H●●M2** and **ATV 31H●●N4** drives simplifies the installation of machines and provides an economical means of meeting CE marking requirements.

ATV 31H●●M3X and **ATV 31H●●S6X** drives are available without EMC filter. Filters are available as an option for customer assembly, if conformity to EMC standards is required.

Functions

The Altivar 31 drive has six logic inputs, three analog inputs, one logic/analog output and two relay outputs.

The main functions integrated in the drive are as follows:

- Motor and drive protection
- Linear, S, U and customised acceleration and deceleration ramps
- +/- speed
- 16 preset speeds
- PI references and regulator
- 2-wire/3-wire control
- Brake sequence
- Automatic catching a spinning load with speed detection and automatic restart
- Fault configuration and stop type configuration
- Saving the configuration in the drive

Several functions can be assigned to one logic input.

Options and accessories

The following options and accessories can be used with the Altivar 31 drive:

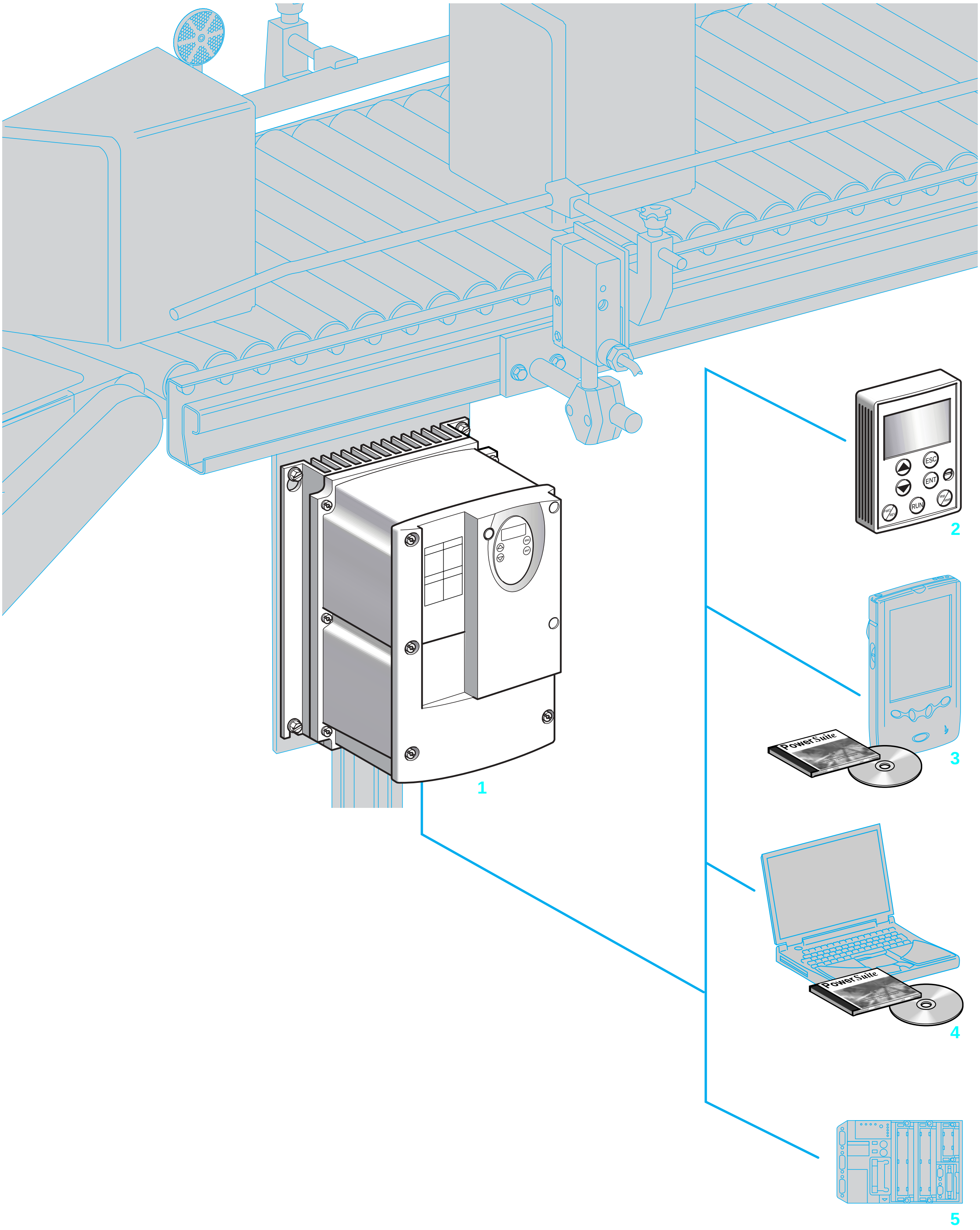
- Braking resistors
- Line chokes
- EMC radio interference input filters and output filters
- Plates for mounting on ⊔ rail
- UL Type 1 conformity kit
- Adaptor plate for replacing an Altivar 28 drive

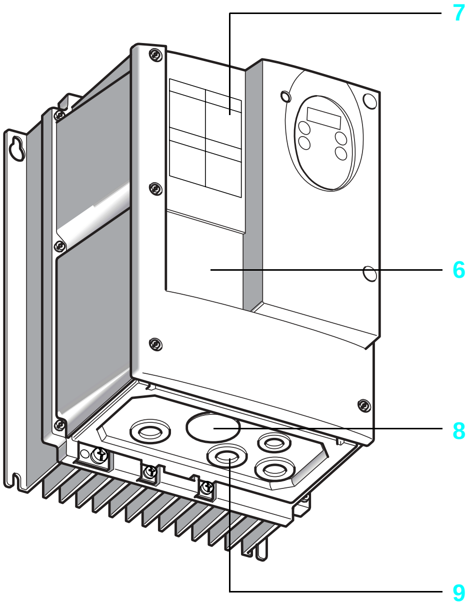
Various dialogue and communication options 4, 5, 6, 7 can be used with the drive, see pages 2/31 and 2/32.

Variable speed drives for asynchronous motors

Altivar 31

Enclosed drives





Applications

The enclosed Altivar 31 drive is suitable for applications requiring:
- IP 55 degree of protection in a hostile environment
- a drive that is ready for use in a motor starter

Once it has been customised, the enclosure can be installed next to the motor.
Enclosed drives are available in power ratings from 0.18 kW to 4 kW.
There are two types of power supply:
- 200 V to 240 V single phase, 0.18 kW and 2.2 kW
- 380 V to 500 V 3-phase, 0.37 kW and 4 kW

Customisable enclosed drive

This range allows full customisation of the Human/Machine interface of an enclosure.
The IP 55 enclosure includes:
- a drive 1 with external heatsink
- removable covers for installation of the following components:

6 Vario switch disconnector or GV2 circuit-breaker
7 3 buttons and/or LEDs with plastic flange Ø 22, and 1 speed reference potentiometer
8 button for the RJ45 connector with IP 55 cable
9 cable glands for cable routing

The combinations (drive, circuit-breaker, contactor) required for the motor starter function can be found on pages 2/62 and 2/63.
Example references:
- 3-pole Vario switch disconnector (V●● + KC● 1●Z)
- Selector switch with 3 fixed positions XB5 D33
- LED XB5 AV●●
- 2.2 kΩ potentiometer

These references can be found in our specialist catalogues.
All components must be ordered separately and wired by the customer.

Electromagnetic compatibility EMC

The incorporation of level A EMC filters (conducted and radiated) in **ATV 31C●●M2** and **ATV 31C●●N4** drives simplifies the installation of machines and provides an economical means of meeting CE marking requirements.

Options and accessories

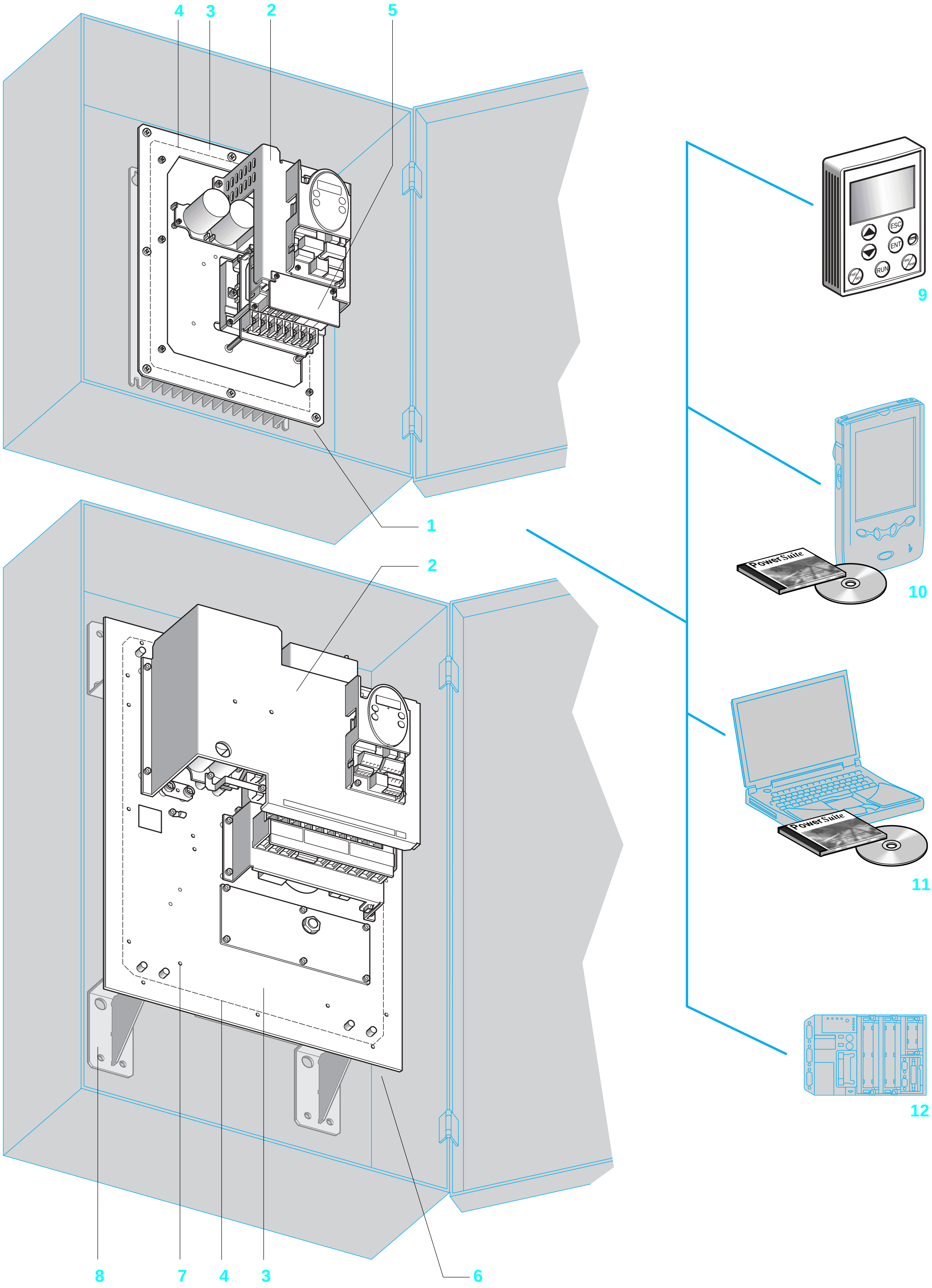
The following options and accessories can be used with the enclosed Altivar 31 drive:
- Braking resistors
- Line chokes
- RJ45 connector with IP 55 cable

Various dialogue and communication options 2, 3, 4, 5 can be used with the drive, see pages 2/31 and 2/32.

Variable speed drives for asynchronous motors

Altivar 31

Drive kits



Variable speed drives for asynchronous motors

Altivar 31

Drive kits

Applications

The drive kit is a new addition to the Altivar 31 drives range.
The drive kit comprises:

- Altivar 31 drive elements (heatsink, power and control subassemblies)
- EMC filter
- Mechanical fittings
- Seals required for use in difficult environments (IP 55)

The kit is mounted on a metal fixing support with no flange or protective cover.
The Altivar 31 drive kit can be built into a floor-standing or wall-mounted enclosure or a machine frame.

The drive kit is available for power ratings from 0.18 kW to 15 kW.
There are two types of power supply:

- 200 V to 240 V single phase, 0.18 kW to 2.2 kW
- 380 V to 500 V 3-phase, 0.37 kW to 15 kW

Electromagnetic compatibility EMC

The incorporation of level A EMC filters (conducted and radiated) in **ATV 31K●●M2** and **ATV 31K●●N4** drives simplifies the installation of machines and provides an economical means of meeting CE marking requirements. The drives have been sized to conform to the following standard: IEC/EN61800-3, domestic and industrial environments.

Description

- Drive kit for power ratings ⩽ 4 kW 1

The Altivar 31 drive components (heatsink, power and control subassemblies) are fixed by mechanical adaptors 2 and protective fittings.
The unit is supported by a metal plate 3 fixed to the heatsink.
The plate is sealed on all sides 4.
Once the support has been cut out, the drive kit is fixed to the base of the floor-standing or wall-mounted enclosure by means of this plate.
The power terminals 5 are protected (IP 20).

- Drive kit for power ratings ⩾ 5.5 kW 6

The Altivar 31 drive components (heatsink, power and control subassemblies) are fixed by mechanical adaptors 2 and protective fittings.
The metal support plate 3 for the components is fitted with brackets 8 for mounting in a floor-standing or wall-mounted enclosure.
The plate is sealed on all sides 4.
Two fans are fitted behind the plate under the heatsink.
Additional fixing holes 7 are provided for component mounting (GV2 circuit-breaker, Vario switch disconnector, additional plate, etc.).

Drive kits are supplied with:

- A drilling and cutting template to assist with installation
- A user’s manual with installation instructions and safety precautions.

Options and accessories

The following options and accessories can be used with the Altivar 31 drive kit:

- Braking resistors
- Line chokes

Various dialogue and communication options 9, 10, 11, 12 can be used with the drive, see pages 2/31 and 2/32.

Variable speed drives for asynchronous motors

Altivar 31

Dialogue options

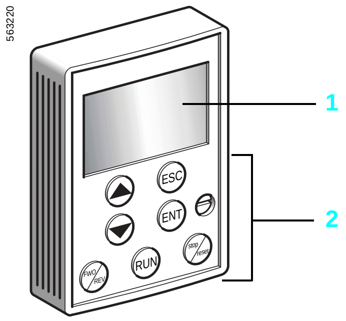
The Altivar 31 drive communicates with the following options:
- Remote terminal
- PowerSuite software workshop
- Ethernet/Modbus bridge
- Communication gateways

The communication function provides access to the drive's configuration, adjustment, control and signalling functions.

Remote terminal

The Altivar 31 can be connected to a remote terminal.
The remote terminal can be mounted on the door of an enclosure with IP 65 protection on the front panel.
The terminal provides access to the same functions as the display and integral keys on the drive (see page 2/67).

It can be used:
- to control, adjust and configure the drive remotely
- for visible remote signalling
- to save and download configurations (4 configuration files can be saved)



Description

1 Display
- ☐ Four 7-segment displays visible at 5 m
- ☐ Displays numeric values and codes
- ☐ The display flashes when a value is stored.
- ☐ The display flashes to indicate a fault on the drive.

2 Use of keys:
- ☐ Navigation arrows and ENT, ESC for settings and configurations
- ☐ FWD/REV key: reverses the direction of rotation of the motor
- ☐ RUN key: motor run command
- ☐ STOP/RESET key: motor stop command or drive fault reset

Variable speed drives for asynchronous motors

Altivar 31

Communication options

PowerSuite software workshop

PowerSuite advanced dialogue solutions offer the following advantages:

- Display messages in plain text and multiple languages
- Prepare work in design office without connecting the Altivar to the PC
- Save configurations and settings to floppy disk or hard disk and download them to the drive
- Print out settings
- Read and import Altivar 28 files into the Altivar 31.

See pages 3/2 and 3/3.

Ethernet/Modbus bridge

The Altivar 31 can be connected to an Ethernet network via an Ethernet/Modbus bridge.

Ethernet communication is primarily intended for the following applications:

- Coordination between PLCs
- Local or centralised supervision
- Communication with production management software
- Communication with remote I/O
- Communication with industrial control products

See pages 2/50 and 2/51.

Communication gateways

The Altivar 31 can connect to other communication buses by means of the following gateways:

- Fipio/Modbus,
- DeviceNet/Modbus
- Profibus DP/Modbus

See pages 2/50 and 2/51.

LUF P1

LA9 P307

Characteristics:
pages 2/34 to 2/37
References:
pages 2/38 to 2/41
Dimensions:
pages 2/52 to 2/57
Schemes:
pages 2/58 to 2/61
Functions:
pages 2/66 to 2/81

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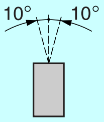
Environment characteristics

Conforming to standards			Altivar 31 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low-voltage EN 50178, EMC immunity and EMC conducted and radiated emissions.
	EMC immunity		■ IEC/EN 61000-4-2 level 3 ■ IEC/EN 61000-4-3 level 3 ■ IEC/EN 61000-4-4 level 4 ■ IEC/EN 61000-4-5 level 3 (power access) ■ IEC/EN 61800-3, environments 1 and 2
	EMC conducted and radiated emissions for drives		
	All		■ IEC/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply) restricted distribution
	ATV 31H018M2...HU15M2, ATV 31C018M2...CU15M2, ATV 31H037N4...HU40N4, ATV 31C037N4...CU40N4		■ EN 55011 class A group 1, EN 61800-3 category C2 With additional EMC filter: ■ EN 55022 class B group 1, EN 61800-3 category C1
	ATV 31HU22M2, ATV 31CU22M2, ATV 31HU55N4...HD15N4.		■ EN 55011 class A group 2, EN 61800-3 category C3 With additional EMC filter *(1)*: ■ EN 55022 class A group 1, EN 61800-3 category C2 ■ EN 55022 class B group 1, EN 61800-3 category C1
	ATV 31H018M3X...HD15M3X, ATV 31H075S6X....HD15S6X		With additional EMC filter (*1*): ■ EN 55011 class A group 1, EN 61800-3 category C2 ■ EN 55022 class B group 1, EN 61800-3 category C1
CE marking			The drives bear CE marking in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives
Product certifications			UL, CSA, NOM 117 and C-Tick
Degree of protection	ATV 31H●●●M2, ATV 31H●●●N4, ATV 31H●●●M3X, ATV 31H●●●S6X		■ IP 31 and IP 41 on upper part and IP 21 on connection terminals ■ IP 20 without cover plate on upper part of cover
	ATV 31C●●●M2, ATV 31C●●●N4		■ IP 55
Degree of pollution			2
Climatic treatment			TC
Vibration resistance	Drive without ⌴ rail option		Conforming to IEC/EN 60068-2-6: 1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity		**%**	5…95 without condensation or dripping water, conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage	**°C**	- 25…+ 70
	Operation		
	ATV 31H●●●	**°C**	- 10…+ 50 without derating, with protective cover on top of the drive - 10…+ 60 with derating, without protective cover on top of the drive (see derating curves, page 2/58)
	ATV 31C●●●, ATV 31K●●●	**°C**	- 10…+ 40 without derating
Maximum operating altitude		**m**	1000 without derating (above this, derate the current by 1% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Drive characteristics

Output frequency range		**Hz**	0…500
Switching frequency		**kHz**	2…16 adjustable during operation
Speed range			1…50
Transient overtorque			170-200% of nominal motor torque (typical value)
Braking torque	With braking resistor		100% of nominal motor torque continuously and up to 150% for 60 s
	Without braking resistor		Value of nominal motor torque (typical value) according to ratings: 30% for > ATV 31●U15●● 50% for ⩽ ATV 31●U15●● 100% for ⩽ ATV 31●075●● 150% for ⩽ ATV 31●018M2
Maximum transient current			150% of the nominal drive current for 60 seconds (typical value)
Voltage/frequency ratio			Sensorless flux vector control with PWM *(pulse width modulation)* type motor control signal. Factory-set for most constant torque applications. Possible options: specific ratios for pumps and fans, energy saving or constant torque U/f for special motors.
Frequency loop gain			Factory-set with the speed loop stability and gain Possible options for machines with high resistive torque or high inertia, or for machines with fast cycles.
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted.

(1) See table on page 2/47 to check authorised cable lengths

Variable speed drives for asynchronous motors

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Electrical characteristics

Power supply	Voltage	**V**	200 - 15% to 240 + 10% single phase for ATV 31●●●●M2● 200 - 15% to 240 + 10% 3-phase for ATV 31●●●●M3X 380 - 15% to 500 + 10% 3-phase for ATV 31●●●●N4● 525 - 15% to 600 + 10% 3-phase for ATV 31●●●●S6X
	Frequency	**Hz**	50 - 5% to 60 + 5%
Prospective short-circuit current ICC	For drives		
	ATV 31●●●●M2	**A**	≤ 1000 (ICC at connection point) for single phase power supply
	ATV 31H018M3X...HU40M3X, ATV 31●037N4...●U40N4, ATV 31H075S6X...HU40S6X	**A**	≤ 5000 (ICC at connection point) for 3-phase power supply
	ATV 31HU55M3X...HD15M3X, ATV 31HU55N4...HD15N4, ATV 31KU55N4...KD15N4, ATV 31HU55S6X...HD15S6X	**A**	≤ 22000 (ICC at connection point) for 3-phase power supply
Output voltage			Maximum 3-phase voltage equal to line supply voltage.
Maximum connection capacity and tightening torque of the power supply terminals, motor, braking module and DC bus	For drives		
	ATV 31H018M2...H075M2, ATV 31H018M3X...HU15M3X		2.5 mm^2 (AWG 14) 0.8 Nm
	ATV 31HU11M2...HU22M2, ATV 31HU22M3X...HU40M3X, ATV 31H037N4...HU40N4, ATV 31H075S6X...HU40S6X		5 mm^2 (AWG 10) 1.2 Nm
	ATV 31HU55M3X, HU75M3X, ATV 31HU55N4, HU75N4, ATV 31HU55S6X, HU75S6X		16 mm^2 (AWG 6) 2.2 Nm
	ATV 31HD11M3X, HD15M3X, ATV 31HD11N4, HD15N4, ATV 31HD11S6X, HD15S6X		25 mm^2 (AWG 3) 4 Nm
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Internal supplies available			Short-circuit and overload protection: - One +10 V (0/+ 8%) supply for the reference potentiometer (2.2 to 10 kΩ), maximum current 10 mA - One + 24 V supply (min. 19 V, max. 30 V) for logic inputs, maximum current 100 mA
Configurable analog inputs			3 configurable analog inputs AI1, AI2, AI3. ■ AI1: analog voltage input 0 to +10V, impedance 30 kΩ (maximum safe voltage 30 V) ■ AI2: analog bipolar voltage input ±10 V, impedance 30 kΩ (maximum safe voltage 30 V) ■ AI3: analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 250 Ω AIP: potentiometer reference for ATV31●●●A only Max. sampling time: 8 ms 10-bit resolution Precision ± 4.3% Linearity ± 0.2% of maximum value Use: - 100 m maximum with shielded cable - 25 m maximum with unshielded cable
Analog output configurable for voltage, current and logic output			1 analog output configurable for voltage, current. ■ AOC: analog current output 0 to 20 mA, maximum load impedance 800 Ω ■ AOV: analog voltage output 0 to +10V, minimum load impedance 470 Ω 8-bit resolution Precision ± 1% Linearity ± 0.2% Only analog output AOC is configurable as a logic output. ■ AOC: operation as logic output 24 V 20 mA max. Max. sampling time: 8 ms
Configurable relay outputs	R1A, R1B, R1C		1 relay logic output, one “N/C” contact and one “N/O” contact with common point. Minimum switching capacity: 10 mA for ⎓ 5 V. Maximum switching capacity: ■ on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∿ 250 V or ⎓ 30 V ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∿ 250 V or ⎓ 30 V Max. sampling time: 8 ms Switching: 100,000 operations
	R2A, R2B		1 relay logic output, one “N/C” contact, contact open on fault. Minimum switching capacity: 10 mA for ⎓ 5 V. Maximum switching capacity: ■ on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∿ 250 V or ⎓ 30 V ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∿ 250 V or ⎓ 30 V Max. sampling time: 8 ms Switching: 100,000 operations

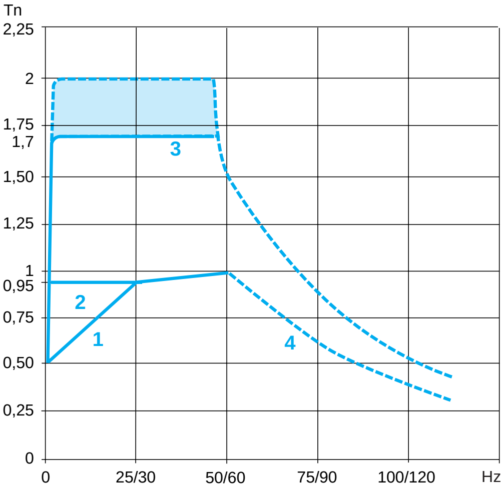
Variable speed drives for asynchronous motors
Altivar 31

Electrical characteristics (continued)

Logic inputs LI			6 programmable logic inputs Impedance 3.5 kΩ + 24 V internal or 24 V external power supply (min. 19 V, max. 30 V) Max. current: 100 mA Max. sampling time: 4 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	Positive logic		State 0 if < 5 V or logic input not wired, state 1 if > 11 V
	Negative logic		State 0 if > 19 V or logic input not wired, state 1 if < 13 V
	CLI position		Connection to PLC output (see diagram page 2/58)
Maximum I/O connection capacity and tightening torque			2.5 mm² (AWG 14) 0.6 Nm
Acceleration and deceleration ramps			Ramp profiles: ■ linear, can be adjusted separately from 0.1 to 999.9 s ■ S, U or customised Automatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of braking resistor).
Braking to a standstill			By d.c. injection: ■ by a signal on a programmable logic input ■ automatically as soon as the estimated output frequency drops to < 0.5 Hz, period adjustable from 0 to 30 s or continuous, current adjustable from 0 to 1.2 In
Main protection and safety features of the drive			■ Thermal protection against overheating ■ Protection against short-circuits between motor phases ■ Protection against input phase breaks ■ Protection against motor phase breaks ■ Protection against overcurrent between output phases and earth ■ Line supply undervoltage and overvoltage safety circuits ■ Line supply phase loss safety function, for 3-phase supply
Motor protection (see page 2/70)			Thermal protection integrated in the drive by continuous calculation of the I²t
Dielectric strength	Between earth and power terminals		⎓ 2040 V for ATV 31●●●●M2 and M3X, ⎓ 2410 V for ATV 31●●●●N4, ⎓ 2550 V for ATV 31●●●●S6X
	Between control and power terminals		∿ 2880 V for ATV 31●●●●M2 and M3X, ∿ 3400 V for ATV 31●●●●N4, ∿ 3600 V for ATV 31●●●●S6X
Insulation resistance to earth			> 500 MΩ (electrical isolation) ⎓ 500 V for 1 minute
Signalling			1 red LED on front: LED lit indicates the presence of drive voltage Display coded by four 7-segment display units displaying the CANopen bus status (RUN and ERR).
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.1 to 100 Hz (calculate (high speed – low speed) /1024)
Time constant for reference change		**ms**	5
Communication			Modbus and CANopen are integrated into the drive and available via an RJ45 connector
	Modbus		RS 485 multidrop serial link ■ Modbus in RTU mode ■ Services supported: decimal function codes 03, 06, 16, 23 and 43 ■ Broadcasting ■ Number of addresses: drive address can be configured via the integrated terminal from 1 to 247 ■ Maximum number of Altivar 31 drives connected: 31 (two 470 Ω master pulldown resistors) ■ Transmission speed: 4800, 9600 or 19200 bps Used for connecting: ■ the remote terminal (option) ■ the PowerSuite software workshop ■ a PLC ■ a microprocessor card ■ a PC
	CANopen		To connect the ATV31 drive on the CANopen bus, use the VW3 CANTAP2 adapter. ■ Services supported: ☐ Implicit exchange of Process Data Object - 2 PDOs depending on DSP 402 velocity mode - 2 configurable PDOs (data and transmission type) - PDOs can be exchanged between slaves. ☐ Explicit exchange of Service Data Object - 1 receive SDO and 1 transmit SDO ☐ Boot-up messages, emergency messages, node guarding and producer and consumer heartbeat, sync and NMT ■ Number of addresses: drive address can be configured via the integrated terminal from 1 to 127 ■ Maximum number of Altivar 31 drives connected: 127 ■ Transmission speed: 10, 20, 50, 125, 250, 500 kbps or 1 Mbps

Variable speed drives for asynchronous motors

Altivar 31



1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Transient overtorque 1.7 to 2 Tn
4 Torque in overspeed at constant power *(2)*

Torque characteristics (typical curves)

The curves below define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed

Special uses

Use with a motor with a different rating to that of the drive

The device can supply any motor which has a power rating lower than that for which it is designed.
For motor ratings slightly higher than that of the drive, check that the current taken does not exceed the continuous output current of the drive.

Test on a low power motor or without a motor

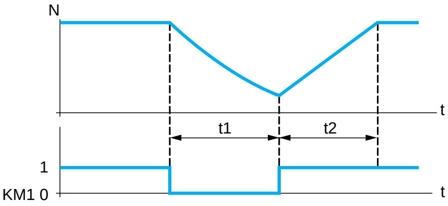
In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of motor phase loss detection.

Connecting motors in parallel

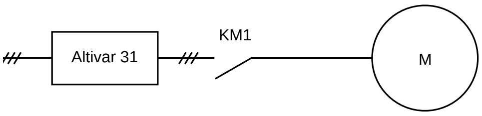
The rating of the drive must be greater than or equal to the sum of the currents of the motors to be connected to the drive.
In this case, external thermal protection must be provided for each motor using probes or LR2 thermal bimetal overload relays designed for a 1.2 In motor.
If the number of motors in parallel is greater than or equal to 3, it is advisable to install a 3-phase choke between the drive and the motors.

Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp.
This use requires configuration of automatic catching a spinning load (“catch on the fly”) and activation of the function which manages the presence of a downstream contactor.



Example: breaking of downstream contactor



t1: deceleration without ramp (freewheel)
t2: acceleration with ramp
Typical applications: breaking safety circuit at drive outputs, "bypass" function, switching of motors connected in parallel.

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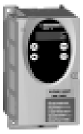
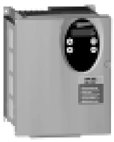
(1) For power ratings ≤ 250 W, motor derating is less important (20% instead of 50% at very low frequencies).
(2) The nominal frequency of the motor and the maximum output frequency can be adjusted between 40 and 500 Hz.
***Note**: Check the mechanical overspeed characteristics of the selected motor with the manufacturer.*

Variable speed drives for asynchronous motors

Altivar 31



ATV 31H037M2



ATV 31HU40M3X

ATV 31HU75N4

ATV 31HD15N4A

Drives with heatsink (frequency range from 0.5 to 500 Hz)

Motor		Line supply				Altivar 31				
Power indicated on rating plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc *(4)*	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference *(5)*	Weight
		at U1	at U2 *(3)*			4 kHz				
kW	*HP*	A	A	kVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz, with integrated EMC filters										
0.18	*0.25*	3.0	2.5	0.6	1	1.5	2.3	24	**ATV 31H018M2** *(6)*	1.500
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31H037M2** *(6)*	1.500
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31H055M2** *(6)*	1.500
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31H075M2** *(6)*	1.500
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31HU11M2** *(6)*	1.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31HU15M2** *(6)*	1.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31HU22M2** *(6)*	3.100
3-phase supply voltage: 200…240 V 50/60 Hz, without EMC filters *(7)*										
0.18	*0.25*	2.1	1.9	0.7	5	1.5	2.3	23	**ATV 31H018M3X** *(6)*	1.300
0.37	*0.5*	3.8	3.3	1.3	5	3.3	5	38	**ATV 31H037M3X** *(6)*	1.300
0.55	*0.75*	4.9	4.2	1.7	5	3.7	5.6	43	**ATV 31H055M3X** *(6)*	1.300
0.75	*1*	6.4	5.6	2.2	5	4.8	7.2	55	**ATV 31H075M3X** *(6)*	1.300
1.1	*1.5*	8.5	7.4	3	5	6.9	10.4	71	**ATV 31HU11M3X** *(6)*	1.700
1.5	*2*	11.1	9.6	3.8	5	8	12	86	**ATV 31HU15M3X** *(6)*	1.700
2.2	*3*	14.9	13	5.2	5	11	16.5	114	**ATV 31HU22M3X** *(6)*	1.700
3	*–*	19.1	16.6	6.6	5	13.7	20.6	146	**ATV 31HU30M3X** *(6)*	2.900
4	*5*	24.2	21.1	8.4	5	17.5	26.3	180	**ATV 31HU40M3X** *(6)*	2.900
5.5	*7.5*	36.8	32	12.8	22	27.5	41.3	292	**ATV 31HU55M3X** *(6)*	6.400
7.5	*10*	46.8	40.9	16.2	22	33	49.5	388	**ATV 31HU75M3X** *(6)*	6.400
11	*15*	63.5	55.6	22	22	54	81	477	**ATV 31HD11M3X** *(6)*	10.500
15	*20*	82.1	71.9	28.5	22	66	99	628	**ATV 31HD15M3X** *(6)*	10.500
3-phase supply voltage: 380…500 V 50/60 Hz, with integrated EMC filters										
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31H037N4** *(6)*	1.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31H055N4** *(6)*	1.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31H075N4** *(6)*	1.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31HU11N4** *(6)*	1.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31HU15N4** *(6)*	1.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31HU22N4** *(6)*	3.100
3	*–*	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31HU30N4** *(6)*	3.100
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31HU40N4** *(6)*	3.100
5.5	*7.5*	21.9	16.5	15	22	14.3	21.5	232	**ATV 31HU55N4** *(6)*	6.500
7.5	*10*	27.7	21	18	22	17	25.5	269	**ATV 31HU75N4** *(6)*	6.500
11	*15*	37.2	28.4	25	22	27.7	41.6	397	**ATV 31HD11N4** *(6)*	11.000
15	*20*	48.2	36.8	32	22	33	49.5	492	**ATV 31HD15N4** *(6)*	11.000
3-phase supply voltage: 525…600 V 50/60 Hz, without EMC filters *(7)*										
0.75	*1*	8	2.4	2.5	5	1.7	2.6	36	**ATV 31H075S6X**	1.700
1.5	*2*	8	4.2	4.4	5	2.7	4.1	48	**ATV 31HU15S6X**	1.700
2.2	*3*	6.4	5.6	5.8	5	3.9	5.9	62	**ATV 31HU22S6X**	2.900
4	*5*	10.7	9.3	9.7	5	6.1	9.2	94	**ATV 31HU40S6X**	2.900
5.5	*7.5*	16.2	14.1	15	22	9	13.5	133	**ATV 31HU55S6X**	6.200
7.5	*10*	21.3	18.5	19	22	11	16.5	165	**ATV 31HU75S6X**	6.200
11	*15*	27.8	24.4	25	22	17	25.5	257	**ATV 31HD11S6X**	10.000
15	*20*	36.4	31.8	33	22	22	33	335	**ATV 31HD15S6X**	10.000

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(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curve on page 2/60.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V; 525-600 V).
(4) If line Isc is greater than the values in the table, add line chokes (see page 2/45).
*(5) To order a drive intended for wire guiding applications, add a **T** to the end of the reference.*
*(6) The drive can also be ordered complete with potentiometer. In this case add the letter **A** to the reference for the drive you require (e.g. **ATV 31H018M2A**).*
(7) Optional EMC filter, see pages 2/46 and 2/47.

ATV 31C/H●●●●

Customisable enclosed drives (frequency range from 0.5 to 500 Hz)

Motor		Line supply				Altivar 31				
Power indicated on rating plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc *(3)*	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference *(4)*	Weight
		at U1	at U2			4 kHz				
kW	*HP*	A	A	KVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V *(5)* 50/60 Hz with integrated EMC filters										
0.18	*0.25*	3	2.5	0.6	1	1.5	2.3	24	**ATV 31C018M2**	6.300
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31C037M2**	6.300
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31C055M2**	6.300
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31C075M2**	6.300
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31CU11M2**	8.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31CU15M2**	8.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31CU22M2**	10.700
3-phase supply voltage: 380…500 V *(5)* 50/60 Hz with integrated EMC filters										
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31C037N4**	8.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31C055N4**	8.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31C075N4**	8.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31CU11N4**	8.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31CU15N4**	8.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31CU22N4**	10.700
3	–	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31CU30N4**	10.700
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31CU40N4**	10.700

Ready-assembled enclosed drives (frequency range from 0.5 to 500 Hz)

Please consult your Regional Sales Office.

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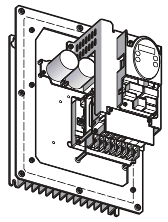
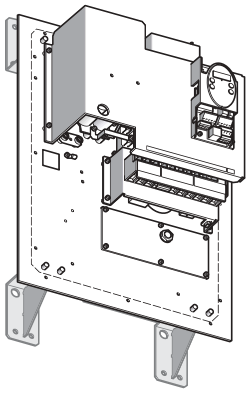
(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curve on page 2/60.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) If line Isc is greater than the values in the table, add line chokes (see page 2/45).
*(4) To order a drive intended for wire guiding applications, add a **T** to the end of the reference.*
(5) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V).



ATV 31K●●●●●



ATV 31K●●●●●

Drive kits (frequency range from 0.5 to 500 Hz)

Motor		Line supply				Altivar 31				
Power indicated on rating plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc *(3)*	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference *(4)*	Weight
		at U1	at U2			4 kHz				
kW	*HP*	A	A	KVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V *(5)* 50/60 Hz with integrated filters										
0.18	*0.25*	3	2.5	0.6	1	1.5	2.3	24	**ATV 31K018M2**	6.300
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31K037M2**	6.300
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31K055M2**	6.300
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31K075M2**	6.300
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31KU11M2**	8.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31KU15M2**	8.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31KU22M2**	10.700
3-phase supply voltage: 380…500 V *(5)* 50/60 Hz with integrated filters										
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31K037N4**	8.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31K055N4**	8.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31K075N4**	8.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31KU11N4**	8.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31KU15N4**	8.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31KU22N4**	10.700
3	–	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31KU30N4**	10.700
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31KU40N4**	10.700
5.5	*7.5*	21.9	16.5	15	22	14.3	21.5	232	**ATV 31KU55N4**	16.500
7.5	*10*	27.7	21	18	22	17	25.5	269	**ATV 31KU75N4**	16.500
11	*15*	37.2	28.4	25	22	27.7	41.6	397	**ATV 31KD11N4**	23.000
15	*20*	48.2	36.8	32	22	33	49.5	492	**ATV 31KD15N4**	23.000

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(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curve on page 2/60.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) If line Isc is greater than the values in the table, add line chokes (see page 2/45).
(4) To order a drive intended for wire guiding applications, add a ***T*** *to the end of the reference.*
(5) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V).

Variable speed drives for asynchronous motors

Altivar 31

Accessories

Plates for mounting on ⌴ rail

Description	For drives	Reference	Weight kg
Plate for mounting on ⌴ rail, width 35 mm	ATV 31H018M2,ATV 31H037M2, ATV 31H055M2, ATV 31H075M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A11851**	0.200
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31HU22M3X, ATV 31H037N4, ATV 31H055N4, ATV 31H075N4, ATV 31HU11N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31852**	0.220

UL Type 1 conformity kits *(1)*

Description	For drives	Reference	Weight kg
Mechanical device fixing to the underside of the Altivar 31	ATV 31H018M2,ATV 31H037M2, ATV 31H055M2, ATV 31H075M2	**VW3 A31812**	0.400
	ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A31811**	0.400
	ATV 31HU11M3X, ATV 31HU15M3X	**VW3 A31813**	0.400
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU22M3X, ATV 31H037N4, ATV 31H055N4, ATV 31H075N4, ATV 31HU11N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31814**	0.500
	ATV 31HU22M2, ATV 31HU30M3X, ATV 31HU40M3X, ATV 31HU22N4, ATV 31HU30N4, ATV 31HU40N4, ATV 31HU22S6X, ATV 31HU40S6X	**VW3 A31815**	0.500
	ATV 31HU55M3X, ATV 31HU75M3X, ATV 31HU55N4, ATV 31HU75N4, ATV 31HU55S6X, ATV 31HU75S6X	**VW3 A31816**	0.900
	ATV 31HD11M3X, ATV 31HD15M3X, ATV 31HD11N4, ATV 31HD15N4, ATV 31HD11S6X, ATV 31HD15S6X	**VW3 A31817**	1.200

(1) This device allows cables to be connected directly to the drive using conduits or cable glands.

Altivar 28 substitution kits

Description	For drives	Reference	Weight kg
Mechanical adapters allowing an ATV 31 to be used in place of an ATV 28 of the same rating (using the same fixing holes)	ATV 31H018M2,ATV 31H037M2, ATV 31H055M2, ATV 31H075M2 ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A31821**	–
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31HU22M3X, ATV 31H037N4, ATV 31HU15N4 ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31822**	–
	ATV 31HU55N4, ATV 31HU75N4, ATV 31HU55M3X, ATV 31HU75M3X, ATV 31HU55S6X, ATV 31HU75S6X	**VW3 A31823**	–

Remote terminal

VW3 A31101

Description	Reference	Weight kg
For ATV 31 drives of all ratings, assembly comprising: - terminal, cable fitted with 2 connectors - seal and screws for IP 65 mounting on an enclosure door	**VW3 A31101**	–

Documentation

Description		Reference	Weight kg
Simplified ATV 31 user's manual and CD-ROM, comprising: - a User's manual for the drives - a User's manual for Modbus and CANopen	Supplied with the drive	–	–
International Technical Manual (ITM)	CD-ROM	**DCI CD39811**	0.150

Variable speed drives for asynchronous motors

Altivar 31

Options: braking resistors

Presentation

The resistor enables the Altivar 31 drive to operate while braking to a standstill or in braked operation, by dissipating the braking energy.

Two types of resistor are available:

- enclosed model (IP 30 enclosure) designed to comply with EMC regulations and protected by a temperature-controlled switch or thermal relay
- non-protected model (IP00) for low power ratings only

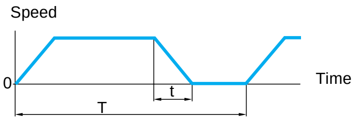
They are designed for machine applications with high inertia, driving loads, machines with fast cycles.

Characteristics

Type of drive			VW3 A58702 to VW3 A58704	VW3 A58732 to VW3 A58735	VW3 A58736 and VW3 A58737	VW3 A66704
Ambient air temperature		°C	40			
Degree of protection of enclosure			IP 00	IP 30		IP 23
Resistor protection			None	By temperature-controlled switch *(1)*		By thermal relay *(2)*
Temperature-controlled switch	Trip temperature	°C	–	130 ± 5%	260 ± 14%	–
	Max. voltage - max. current		–	∼ 110 V - 0.3 A	∼ 220 V - 6 A	–
	Min. voltage - min. current		–	⎓ 24 V - 0.01 A		–
	Maximum contact resistance	mΩ	–	150	50	–
Load factor of resistors			The value of the average power that can be dissipated by the resistor in the enclosure at 40 °C is determined for a braking load factor corresponding to the majority of common applications: - braking for 2 seconds with a torque of 0.6 Tn every 40 seconds - braking for 0.8 second with a torque of 1.5 Tn every 40 seconds			
Load factor of drives			The internal circuits for drives used for braking on external resistors are sized for the following cycles. If they are exceeded, the drive will lock and display a fault. - 1.5 Tn for 60 seconds per 140-second cycle - Tn continuously			

(1) The contact must be connected in sequence (used for signalling or for controlling the line contactor).
(2) To be ordered separately, 8 A rating.

Load factor and determining the nominal power



Load factor: $\frac{t}{T}$

t: braking time in s

T: cycle time in s

The value of the average power that can be dissipated by the resistor in the enclosure at 40 °C is determined for a braking load factor corresponding to the majority of common applications. This load factor is defined above.

For a specific application (e.g. handling), the nominal resistor power has to be redefined by taking account of the new load factor.

Chart 1

Graph of the average power as a function of the braking torque for a load factor.

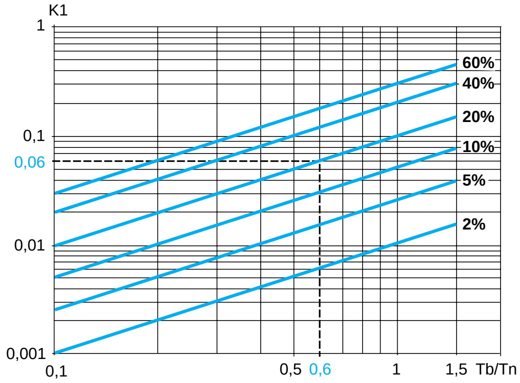
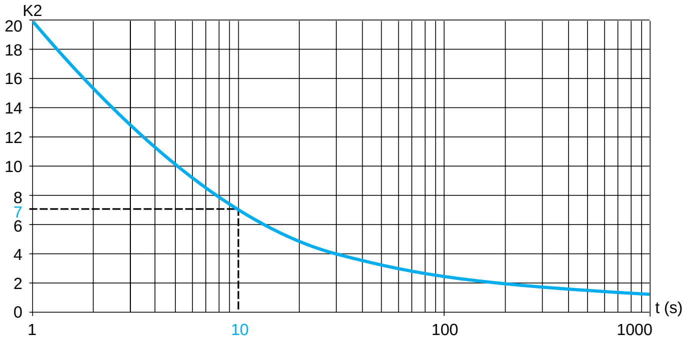


Chart 2

Permissible resistor overload as a function of time (characteristic curve).



Example:

Motor of power Pm = 4 kW

Motor efficiency η = 0.85

Braking torque Tb = 0.6 Tn

Braking time t = 10 s

Cycle time T = 50 s

Load factor Lf = $\frac{t}{T}$ = 20%

Use chart 1 to determine the coefficient K1 corresponding to a braking torque of 0.6 Tn and a load factor of 20%. K1 = 0.06

Use chart 2 to determine the coefficient K2 corresponding to a braking time of 10 seconds.

K2 = 7

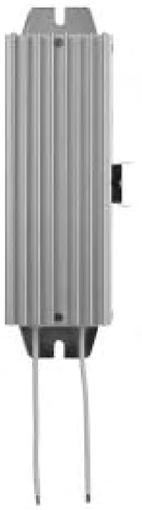
The nominal resistor power (Pn) must be greater than:

$$Pn = Pm \times K1 \times \eta\left(1 + \frac{1}{K2 \times Lf}\right) = 4{,}10^{3} \times 0{,}06 \times 0{,}85\left(1 + \frac{1}{7 \times 0{,}2}\right) = 350W$$

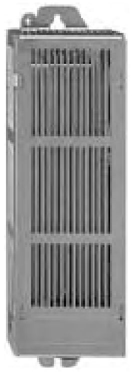
Variable speed drives for asynchronous motors

Altivar 31

Options: braking resistors



VW3 A58702



VW3 A5873●

For drives	**Min. resistor value** *(1)*	**Ohmic value**	**Average power available at** **40°C***(2)*	**50°C**	**Reference**	**Weight**
	Ω	**Ω**	**W**	**W**		**kg**
Non-protected braking resistors						
ATV 31H/C/K018M2, ATV 31H/C/K037M2,	40	100	32	28	**VW3 A58702**	0.600
ATV 31H/C/K055M2, ATV 31H/C/K075M2	40					
ATV 31H/C/KU11M2, ATV 31H/C/KU15M2,	27					
ATV 31H018M3X, ATV 31H037M3X,	40					
ATV 31H055M3X, ATV 31H075M3X,	40					
ATV 31HU11M3X, ATV 31HU15M3X,	27					
ATV 31H/C/K037N4, ATV 31H/C/K055N4,	80					
ATV 31H/C/K075N4,	80					
ATV 31H/C/KU11N4, ATV 31H/C/KU15N4,	54					
ATV 31H/C/KU22N4	54					
ATV 31H075S6X	96					
ATV 31HU15S6X, ATV31HU22S6X	64					
ATV 31H/C/KU30N4,	55	100	40	35	**VW3 A58703**	0.850
ATV 31H/C/KU40N4	36					
ATV 31HU40S6X	44					
ATV 31H/C/KU22M2,	25	68	32	28	**VW3 A58704**	0.600
ATV 31HU22M3X,	25					
ATV 31HU30M3X	16					
Protected braking resistors						
ATV 31H/C/K018M2, ATV 31H/C/K037M2,	40	100	32	28	**VW3 A58732**	2.000
ATV 31H/C/K055M2, ATV 31H/C/K075M2,	40					
ATV 31H/C/KU11M2, ATV 31H/C/KU15M2,	27					
ATV 31H018M3X, ATV 31H037M3X,	40					
ATV 31H055M3X, ATV 31H075M3X,	40					
ATV 31HU11M3X, ATV 31HU15M3X,	27					
ATV 31H/C/K037N4, ATV 31H/C/K055N4,	80					
ATV 31H/C/K075N4,	80					
ATV 31H/C/KU11N4, ATV 31H/C/KU15N4,	54					
ATV 31H/C/KU22N4	54					
ATV 31H/C/KU22M2,	25	68	32	28	**VW3 A58733**	2.000
ATV 31HU22M3X,	25					
ATV 31HU30M3X	16					
ATV 31H/C/KU30N4,	55	100	40	35	**VW3 A58734**	2.000
ATV 31H/C/KU40N4	36					
ATV 31H/KU55N4,	29	60	80	69	**VW3 A58735**	3.400
ATV 31H/KU75N4	19					
ATV 31HU55S6X	34					
ATV 31HU75S6X	23					
ATV 31HU40M3X	16	28	200	173	**VW3 A58736**	5.100
ATV 31H/KD11N4, ATV 31H/KD15N4	20					
ATV 31HD11S6X, ATV 31HD15S6X	24					
ATV 31HU55M3X, ATV 31HU75M3X	8	14	400	346	**VW3 A58737**	6.100
ATV 31HD11M3X, ATV 31HD15M3X	5	10	1000	866	**VW3 A66704** *(3)*	17.000

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(1) Depends on the drive rating.
(2) Power that can be dissipated by the resistor at the maximum temperature of 115 °C, corresponding to a maximum temperature rise of 75 °C in a 40 °C environment.
(3) The various ohmic values are obtained as a function of the connection, described in the resistor instructions.

Variable speed drives for asynchronous motors

Altivar 31

Options: line chokes

Presentation

These chokes provide improved protection against overvoltages on the line supply and reduce harmonic distortion of the current produced by the drive.

The recommended chokes are used to limit the line current.
They have been developed to conform to standard EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply).

The values of the chokes are defined for a voltage drop between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.

The use of line chokes is recommended in particular under the following circumstances:

- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases > 1.8 % of nominal voltage
- Drive supplied with power by a line with very low impedance (in the vicinity of power transformers 10 times more powerful than the drive rating)

The prospective short-circuit current at the point of connection of the drive must not exceed the maximum value indicated in the tables of references. The use of line chokes allows connection on the following networks:

- Max. Isc 22 kA for 200/240 V
- Max. Isc 65 kA for 380/500 V and 525/600 V

- Installation of a large number of frequency converters on the same line
- Reduction of overload in cos φ correction capacitors, if the installation has a power factor correction unit

Type of line choke			**VZ1 L00 4M010**	**VZ1 L00 7UM50**	**VZ1 L01 8UM20**	**VW3 A6 6501**	**VW3 A6 6502**	**VW3 A6 6503**	**VW3 A6 6504**	**VW3 A6 6505**	**VW3 A6 6506**
Characteristics											
Conforming to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply)								
Voltage drop			Between 3 and 5% of the nominal line voltage. Values higher than this will cause loss of torque.								
Degree of protection	Choke		IP 00								
	Terminals		IP 20						IP 10		IP 00
Value of choke		**mH**	10	5	2	10	4	2	1	0.5	0.3
Nominal current		**A**	4	7	18	4	10	16	30	60	100
Loss		W	17	20	30	45	65	75	90	80	–

Variable speed drives for asynchronous motors

Altivar 31

Options: line chokes

VW3 A6650●

Altivar 31					Choke	
Single phase or 3-phase	**Line current**				**Reference**	**Weight**
	without choke		**with choke**			
	at U min.	**at U max.**	**at U min.**	**at U max.**		
	A	**A**	**A**	**A**		**kg**
Single phase supply voltage: 200…240 V *(1)* 50/60 Hz						
ATV 31H/C/K018M2	3.0	2.5	2.1	1.8	**VZ1 L004M010**	0.630
ATV 31H/C/K037M2	5.3	4.4	3.9	3.3		
ATV 31H/C/K055M2	6.8	5.8	5.2	4.3	**VZ1 L007UM50**	0.880
ATV 31H/C/K075M2	8.9	7.5	7.0	5.9		
ATV 31H/C/KU11M2	12.1	10.2	10.2	8.6	**VZ1 L018UM20**	1.990
ATV 31H/C/KU15M2	15.8	13.3	13.4	11.4		
ATV 31H/C/KU22M2	21.9	18.4	19.2	16.1		
3-phase supply voltage: 200…240 V *(1)* 50/60 Hz						
ATV 31H018M3X	2.1	1.9	1	0.9	**VW3 A66501**	1.500
ATV 31H037M3X	3.8	3.3	1.9	1.6		
ATV 31H055M3X	4.9	4.2	2.5	2.2		
ATV 31H075M3X	6.4	5.6	3.3	2.9		
ATV 31HU11M3X	8.5	7.4	4.8	4.2	**VW3 A66502**	3.000
ATV 31HU15M3X	11.1	9.6	6.4	5.6		
ATV 31HU22M3X	14.9	13	9.2	8	**VW3 A66503**	3.500
ATV 31HU30M3X	19.1	16.6	12.3	10.7		
ATV 31HU40M3X	24.2	21.1	16.1	14	**VW3 A66504**	6.000
ATV 31HU55M3X	36.8	32	21.7	19		
ATV 31HU75M3X	46.8	40.9	29	25.2		
ATV 31HD11M3X	63.5	55.6	41.6	36.5	**VW3 A66505**	11.000
ATV 31HD15M3X	82.1	71.9	55.7	48.6		
3-phase supply voltage: 380…500 V *(1)* 50/60 Hz						
ATV 31H/C/K037N4	2.2	1.7	1.1	0.9	**VW3 A66501**	1.500
ATV 31H/C/K055N4	2.8	2.2	1.4	1.2		
ATV 31H/C/K075N4	3.6	2.7	1.8	1.5		
ATV 31H/C/KU11N4	4.9	3.7	2.6	2		
ATV 31H/C/KU15N4	6.4	4.8	3.4	2.6		
ATV 31H/C/KU22N4	8.9	6.7	5	4.1	**VW3 A66502**	3.000
ATV 31H/C/KU30N4	10.9	8.3	6.5	5.2		
ATV 31H/C/KU40N4	13.9	10.6	8.5	6.6		
ATV 31H/KU55N4	21.9	16.5	11.7	9.3	**VW3 A66503**	3.500
ATV 31H/KU75N4	27.7	21	15.4	12.1		
ATV 31H/KD11N4	37.2	28.4	22.5	18.1	**VW3 A66504**	6.000
ATV 31H/KD15N4	48.2	36.8	29.6	23.3		
3-phase supply voltage: 525…600 V *(1)* 50/60 Hz						
ATV 31H075S6X	2.5	2.4	1.4	1.4	**VW3 A66501**	1.500
ATV 31HU15S6X	4.4	4.2	2.4	2.3		
ATV 31HU22S6X	5.8	5.6	3.8	3.6		
ATV 31HU40S6X	9.7	9.3	6	5.8	**VW3 A66502**	3.000
ATV 31HU55S6X	14.7	14.1	7.8	7.5		
ATV 31HU75S6X	19.3	18.5	11	10.7	**VW3 A66503**	3.500
ATV 31HD11S6X	25.4	24.4	15	14.4		
ATV 31HD15S6X	33.2	31.8	21.1	20.6	**VW3 A66504**	6.000

(1) Nominal supply voltage: U min.…U max.

Variable speed drives for asynchronous motors

Altivar 31

Options: additional EMC input filters

Presentation

Function

The Altivar 31 has built-in radio interference input filters to meet EMC "product" standards for variable speed drives IEC/EN 61800-3 and to comply with the European EMC (electromagnetic compatibility) directive.

The additional filters enable the drives to meet more stringent requirements: these filters are designed to reduce conducted emissions on the line supply below the limits of standards EN 55011 class A *(1)* or EN 55022 class B.

These additional filters are installed underneath ATV 31H drives. They can be installed at the side of the product in the case of ATV 31C and K drives. They act as supports for the drives and are fixed to them via tapped holes.

Use according to the type of network

Use of these additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

The standard IEC 61800-3, annex D2.1, indicates that on IT (impedance earthed or isolated neutral) networks the filters can randomise the operation of insulation monitors.

The efficiency of additional filters on this type of network also depends on the nature of the impedance between neutral and earth and is therefore unpredictable.

If a machine is to be installed on an IT network, one solution is to insert an isolation transformer and to connect locally to the machine on a TN or TT network.

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(1) See page 2/47.

Characteristics

Conforming to standards			EN 133200
Degree of protection			IP 21 and IP 41 on upper part
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3
Ambient air temperature around the device	Operation	**°C**	- 10…+ 60
	Storage	**°C**	- 25…+ 70
Maximum operating altitude	Without derating	**m**	1000 (above this, derate the current by 1% per additional 100 m)
Vibration resistance	Conforming to IEC 60068-2-6		1.5 mm peak to peak from 3 to 13 Hz 1 gn peak from 13 to 150 Hz
Shock resistance	Conforming to IEC 60068-2-27		15 gn for 11 ms
Max. nominal voltage	50/60 Hz single phase	**V**	240 + 10%
	50/60 Hz 3-phase	**V**	240 + 10% 500 + 10% 600 + 10%

Variable speed drives for asynchronous motors

Altivar 31

Options: additional EMC input filters

For drives	Filter					
Reference	**Maximum length of shielded cable**		**In** *(2)*	**Il** *(3)*	**Reference**	**Weight**
	EN 55011 **class A** *(1)*	**EN 55022** **class B** *(1)*				
	m	**m**	**A**	**mA**		**kg**
Single phase supply voltage: 200…240 V 50/60 Hz						
ATV 31H/C/K018M2	50	20	9	100	**VW3 A31401**	0.600
ATV 31H/C/K037M2						
ATV 31H/C/K055M2						
ATV 31H/C/K075M2						
ATV 31H/C/KU11M2	50	20	16	150	**VW3 A31403**	0.775
ATV 31H/C/KU15M2						
ATV 31H/C/KU22M2	50	20	22	80	**VW3 A31405**	1.130
3-phase supply voltage: 200…240 V 50/60 Hz						
ATV 31H018M3X	5	–	7	7	**VW3 A31402**	0.650
ATV 31H037M3X						
ATV 31H055M3X						
ATV 31H075M3X						
ATV 31HU11M3X	5	–	15	15	**VW3 A31404**	1.000
ATV 31HU15M3X						
ATV 31HU22M3X						
ATV 31HU30M3X	5	–	25	35	**VW3 A31406**	1.650
ATV 31HU40M3X						
ATV 31HU55M3X	5	–	47	45	**VW3 A31407**	3.150
ATV 31HU75M3X						
ATV 31HD11M3X	5	–	83	15	**VW3 A31408**	5.300
ATV 31HD15M3X						
3-phase supply voltage: 380…500 V 50/60 Hz						
ATV 31H/C/K037N4	50	20	15	15	**VW3 A31404**	1.000
ATV 31H/C/K055N4						
ATV 31H/C/K075N4						
ATV 31H/C/KU11N4						
ATV 31H/C/KU15N4						
ATV 31H/C/KU22N4	50	20	25	35	**VW3 A31406**	1.650
ATV 31H/C/KU30N4						
ATV 31H/C/KU40N4						
ATV 31H/KU55N4	50	20	47	45	**VW3 A31407**	3.150
ATV 31H/KU75N4						
ATV 31H/KD11N4	50	20	49	45	**VW3 A31409**	4.750
ATV 31H/KD15N4						

(1) The filter selection tables show the length limits for the shielded cables connecting the motors to the drives for a switching frequency of 2 to 16 kHz. These limits are given as examples only as they vary depending on the interference capacity of the motors and the cables used. If motors are connected in parallel, it is the total length that should be taken into account.

(2) In: Nominal filter current.

(3) Il: Maximum earth leakage current at 50 Hz.

Variable speed drives for asynchronous motors

Altivar 31

Options: output filters and motor chokes

Presentation

By inserting an output filter between the drive and the motor, it is possible to:

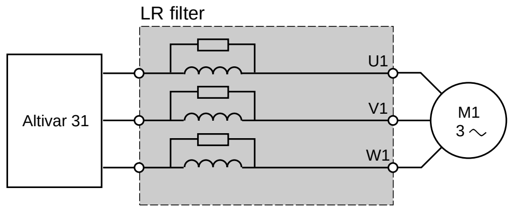
- Limit the dv/dt at the motor terminals (500 to 1500 V/µs), for cables longer than 50 m
- Filter interference caused by opening a contactor placed between the filter and the motor
- Reduce the motor earth leakage current

When using a downstream contactor between the drive and the motor, ferrite suppressors should be fitted to each motor cable for certain drive ratings supplied with a single phase or 3-phase 200 V supply.

Principle

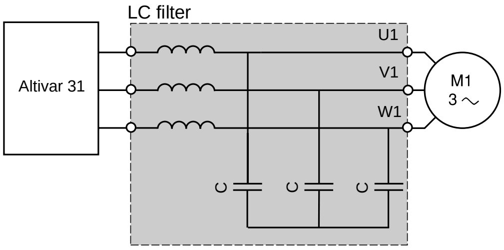
LR filter cell

This cell comprises 3 high frequency chokes and 3 resistors.



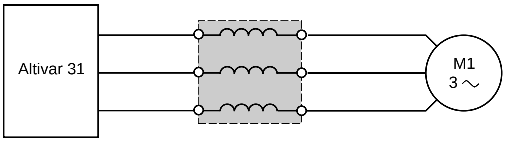
LC filter cell

This cell comprises 3 high frequency chokes and 3 capacitors.

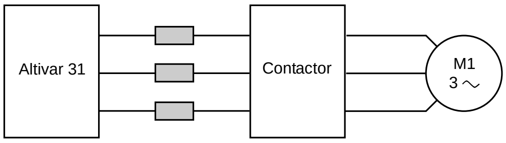


Motor choke

For standard motor cables longer than 100 m (50 m for shielded cables), a choke can be used to limit overvoltages at the motor terminals.



Ferrite suppressors for downstream contactor opening



Characteristics *(1)*

			LR filter cells *(2)*	LC filter cells		Motor chokes
			VW3 A5845●	**VW3 A6641●**		**VW3 A6650●**
Drive switching frequency		**kHz**	0.5 ... 4 max.	2 or 4	12	4
Length of motor cable	Shielded cables	**m**	⩽ 100	⩽ 100	⩽ 50	⩽ 100
	Unshielded cables	**m**	–	⩽ 200	⩽ 100	–
Degree of protection			IP 20	IP 00	IP 00	IP 20

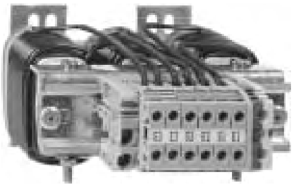
(1) Filter performance is ensured if the cable lengths between the motor and the drive given in the above table are not exceeded.
For an application with several motors connected in parallel, the cable length must include all tap-offs. If a cable longer than that recommended is used, the filters may overheat.

(2) Please consult your Regional Sales Office for frequencies greater than 4 kHz or cables longer than 100 m.

Variable speed drives for asynchronous motors

Altivar 31

Options: output filters and motor chokes



VW3 A58451

LR filter cells

For drives	Loss	Nominal current	Reference	Weight
	W	A		kg
ATV 31H/C/K018M2 ATV 31H/C/K037M2 ATV 31H/C/K055M2 ATV 31H/C/K075M2 ATV 31H/C/KU11M2 ATV 31H/C/KU15M2 ATV 31H018M3X ATV 31H037M3X ATV 31H055M3X ATV 31H075M3X ATV 31HU11M3X ATV 31HU15M3X ATV 31H/C/K037N4 ATV 31H/C/K055N4 ATV 31H/C/K075N4 ATV 31H/C/KU11N4 ATV 31H/C/KU15N4 ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4 ATV 31H/KD11N4 ATV 31H/KD15N4 ATV 31H075S6X ATV 31HU15S6X, ATV 31HU22S6X ATV 31HU40S6X, ATV 31HU55S6X	150	10	**VW3 A58451**	7.400
ATV 31H/C/KU22M2 ATV 31HU22M3X ATV 31HU30M3X ATV 31H/KU55N4 ATV 31HU75S6X	180	16	**VW3 A58452**	7.400
ATV 31HU40M3X ATV 31HU55M3X ATV 31HU75M3X ATV 31H/KU75N4 ATV 31HD11S6X ATV 31HD15S6X	220	33	**VW3 A58453**	12.500

LC filter cells

For drives	Reference	Weight kg
ATV 31HD11M3X ATV 31HD15M3X	**VW3 A66412**	3.500

Motor chokes

For drives	Loss	Nominal current	Reference	Weight
	W	A		kg
ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4 ATV 31HU40S6X, ATV 31HU55S6X	65	10	**VW3 A66502**	3.000
ATV 31H/C/KU22M2, ATV 31HU22M3X ATV 31HU30M3X, ATV 31H/KU55N4 ATV 31HU75S6X	75	16	**VW3 A66503**	3.500
ATV 31HU40M3X ATV 31HU55M3X ATV 31HU75M3X ATV 31H/KU75N4 ATV 31H/KD11N4 ATV 31HD11S6X ATV 31HD15S6X	90	30	**VW3 A66504**	6.000
ATV 31H/KD15N4	80	60	**VW3 A66505**	11.000
ATV 31HD11M3X ATV 31HD15M3X	–	100	**VW3 A66506**	16.000

Ferrite suppressors for downstream contactor opening

For drives	Sold in lots of	Unit reference	Weight kg
ATV 31H018M2	3	**VW3 A31451**	–
ATV 31H037M2, ATV 31H018M3 ATV 31H037M3	3	**VW3 A31452**	–
ATV 31H055M2, ATV 31H075M2 ATV 31HU11M2, ATV 31HU15M2 ATV 31H055M3, ATV 31H075M3	3	**VW3 A31453**	–

Variable speed drives for asynchronous motors

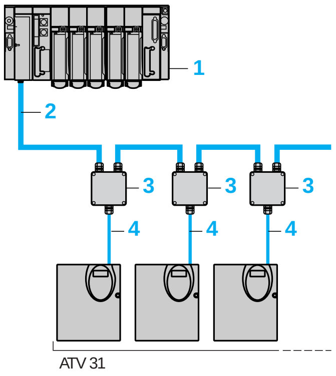
Altivar 31

Communication options

Modbus and CANopen communication buses

The Altivar 31 can be connected directly to Modbus and CANopen buses by means of an RJ45 connector, which supports both protocols.
The communication function provides access to the drive's configuration, adjustment, control and monitoring functions.

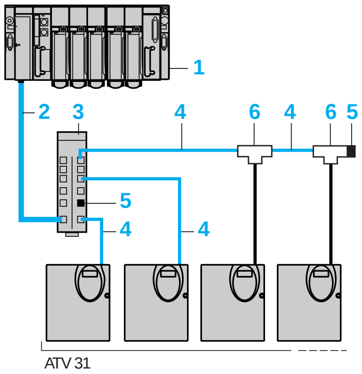
CANopen



1 PLC *(1)*
2 CANopen trunk cable
3 CANopen tap junction **VW3 CAN TAP2**
4 CANopen drop cable **VW3 CAN CA RR●●**

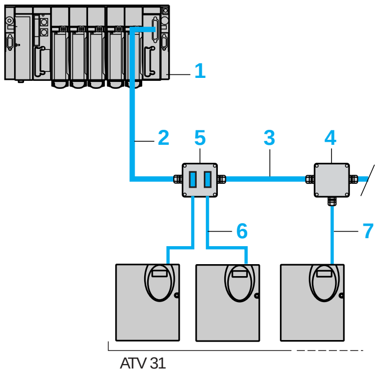
Modbus

Connections via splitter blocks and RJ45 connectors



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus splitter block **LU9 GC3**
4 Modbus drop cables **VW3 A8 306 R●●**
5 Line terminators **VW3 A8 306 RC**
6 Modbus T-junction boxes **VW3 A8 306 TF●●** (with cable)

Connections via junction boxes



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus cables **TSX CSA●00**
4 T-junction box **TSX SCA 50**
5 Subscriber socket **TSX SCA 62**
6 Modbus drop cables **VW3 A8 306**
7 Modbus drop cables **VW3 A8 306 D30**

Connections via screw terminals

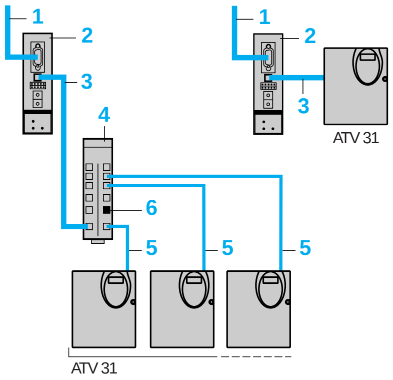
In this case, use a Modbus drop cable **VW3 A8 306 D30** and line terminators **VW3 A8 306 DRC**.

Other communication buses

The Altivar 31 can also be connected to the following networks via a module (bridge or gateway):

- Ethernet
- Fipio
- Profibus DP
- DeviceNet

The communication function provides access to the drive's configuration, adjustment, control and monitoring functions.



1 To network
2 Communication modules
3 Cables **VW3 A8 306 R●●**, **VW3 P07 306 R10** or **VW3 A8 306 D30**, depending on the type of module.
4 Modbus splitter block **LU9 GC3**
5 Modbus drop cables **VW3 A8 306 R●●**
6 Line terminator **VW3 A8 306 RC**

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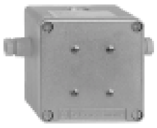
(1) Please consult our specialist catalogues.



TSX SCA 50

TSX SCA 62

Modbus and CANopen communication buses

Connection accessories

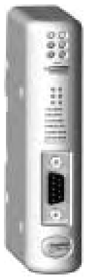
Description			Unit reference	Weight kg
CANopen bus junction box			**VW3 CAN TAP2**	–
Modbus junction box 3 screw terminals, RC line terminator To be connected using cable VW3 A8 306 D30			**TSX SCA 50**	0.520
Modbus subscriber socket 2 female 15-way SUB-D connectors and 2 screw terminals, RC line terminator To be connected using cable VW3 A8 306			**TSX SCA 62**	0.570
Modbus splitter block 10 RJ45 connectors and 1 screw terminal			**LU9 GC3**	0.500
Modbus line terminators (1)	For RJ45 connector	R = 120 Ω, C = 1 nF	**VW3 A8 306 RC**	0.200
		R = 150 Ω	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nF	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	**VW3 A8 306 DR**	0.200
Modbus T-junction boxes		With integrated cable (0.3 m)	**VW3 A8 306 TF03**	–
		With integrated cable (1 m)	**VW3 A8 306 TF10**	–

Connecting cables

Description	Length m	Connectors	Reference	Weight kg
Cables for CANopen bus	0.3 m	2 RJ45 connectors	**VW3 CAN CA RR03**	0.050
	1 m	2 RJ45 connectors	**VW3 CAN CA RR1**	0.500
Cables for Modbus bus	3	1 RJ45 connector and one end stripped	**VW3 A8 306 D30**	0.150
	3	1 RJ45 connector and 1 male 15-way SUB-D connector for TSX SCA 62	**VW3 A8 306**	0.150
	0.3	2 RJ45 connectors	**VW3 A8 306 R03**	0.050
	1	2 RJ45 connectors	**VW3 A8 306 R10**	0.050
	3	2 RJ45 connectors	**VW3 A8 306 R30**	0.150
Cables for Profibus DP gateway LA9 P307	1	2 RJ45 connectors	**VW3 P07 306 R10**	0.050
RS 485 double shielded twisted pair cables	100	Supplied without connector	**TSX CSA 100**	–
	200	Supplied without connector	**TSX CSA 200**	–
	500	Supplied without connector	**TSX CSA 500**	–

Other communication buses

Description	Cables to be connected	Reference	Weight kg
Ethernet/Modbus bridge with 1 x Ethernet 10baseT port (RJ45)	VW3 A8 306 D30	**174 CEV 300 20** *(2)*	0.500
Fipio/Modbus gateway *(3)*	VW3 A8 306 R●●	**LUF P1**	0.240
DeviceNet/Modbus gateway *(3)*	VW3 A8 306 R●●	**LUF P9**	0.240
Profibus DP/Modbus gateway Parameters set using standard Profibus DP configurator *(4)*	VW3 P07 306 R10	**LA9 P307**	0.240
Profibus DP/Modbus gateway Parameters set using ABC Configurator software *(3)*	VW3 A8 306 R●●	**LUF P7**	0.240

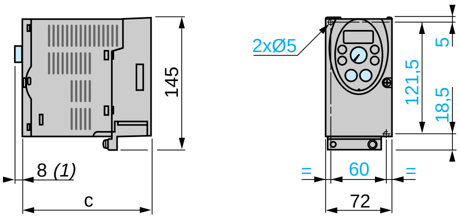


LUF P1

LA9 P307

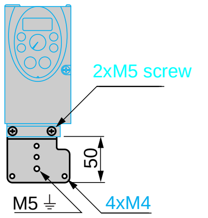
(1) Sold in lots of 2.
(2) Please consult our specialist catalogue.
(3) See pages 4/22 and 4/23.
(4) See pages 4/24 and 4/25.

ATV 31H0●●M3X/MXA, ATV 31H0●●M2/M2A



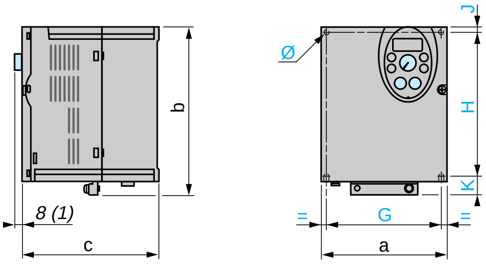
ATV 31H	c
018M3X, 037M3X	120
055M3X, 075M3X	130
018M2, 037M2	130
055M2, 075M2	140

Plate for EMC mounting
(supplied with the drive)



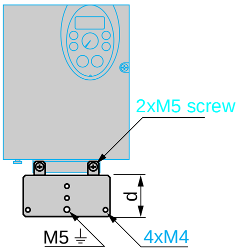
(1) Only for drives whose reference ends in ***A***.

ATV 31HU●●M2/M2A, ATV 31HU1●M3X/M3XA to ATV 31HU4●M3X/M3XA, ATV 31H0●●N4/N4A to ATV 31HU40N4/N4A, ATV 31H075S6X to ATV 31HU40S6X



ATV 31H	a	b	c	d	G	H	J	K	Ø
U1●M3X	105	143	130	49	93	121.5	5	16.5	2x5
U1●M2, U22M3X 037N4 to U15N4 U75S6X, U15S6X	105	143	150	49	93	121.5	5	16.5	2x5
U22M2, HU●0M3X U22N4 to U40N4 U22S6X, U40S6X	140	184	150	48	126	157	6.5	20.5	4x5

Plate for EMC mounting
(supplied with the drive)



(1) Only for drives whose reference ends in ***A***.

ATV 31HU55M3X/M3XA, ATV 31HU75M3X/M3XA, ATV 31HU55N4/N4A, ATV 31HU75N4/N4A, ATV 31HU55S6X, ATV 31HU75S6X

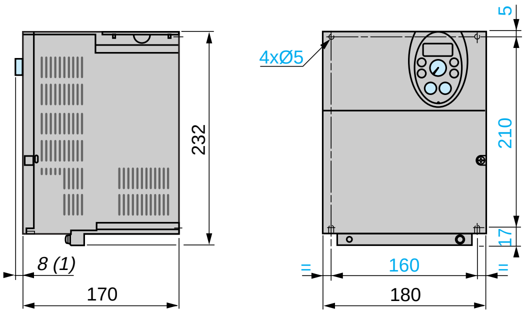
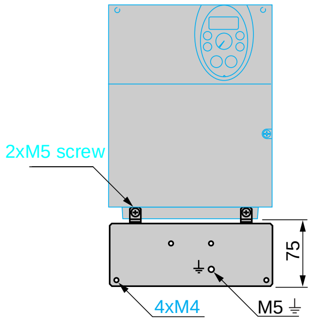


Plate for EMC mounting
(supplied with the drive)



(1) Only for drives whose reference ends in ***A***.

ATV 31HD1●M3X/M3XA, ATV 31HD1●N4/N4A, ATV 31HD1●S6X

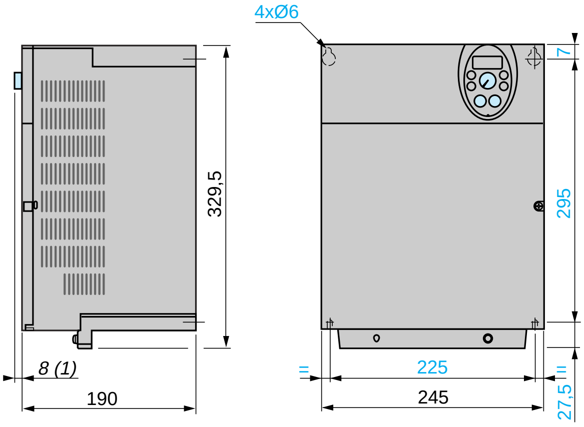
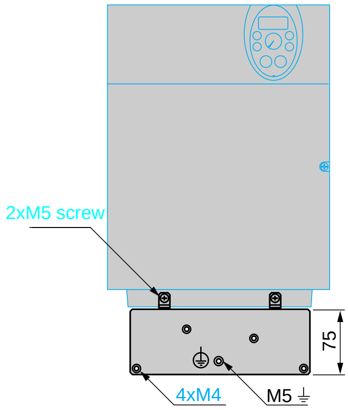


Plate for EMC mounting
(supplied with the drive)



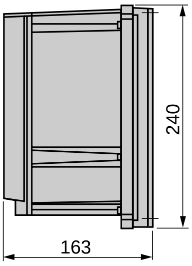
(1) Only for drives whose reference ends in ***A***.

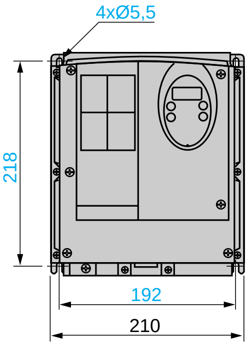
Variable speed drives for asynchronous motors

Altivar 31

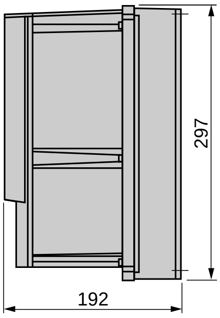
Enclosed drives

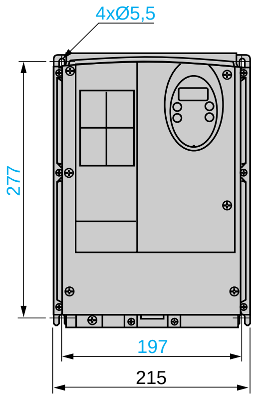
ATV 31C0●●M2



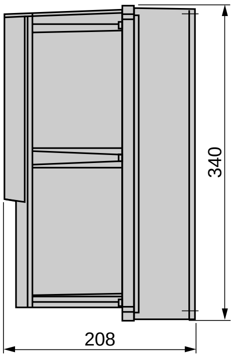


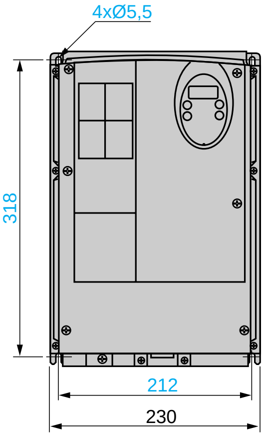
ATV 31CU11M2, ATV 31CU15M2, ATV 31C0●●N4, ATV 31CU11N4, ATV 31CU15N4





ATV 31CU22M2, ATV 31CU22N4, ATV 31CU30N4, ATV 31CU40N4



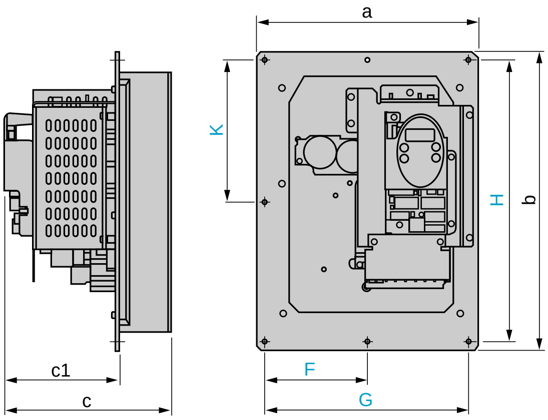


Variable speed drives for asynchronous motors

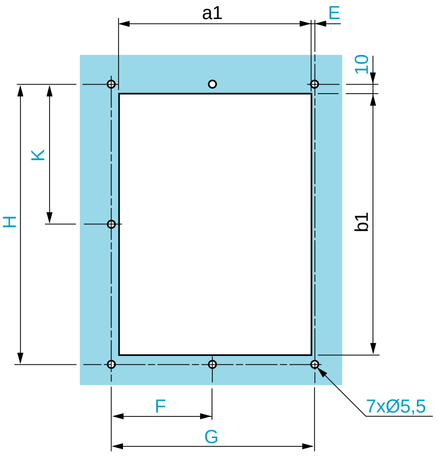
Altivar 31

Drive kits

ATV 31K●●●M2, ATV 31K0●●N4, ATV 31KU22N4, ATV 31KU●0N4



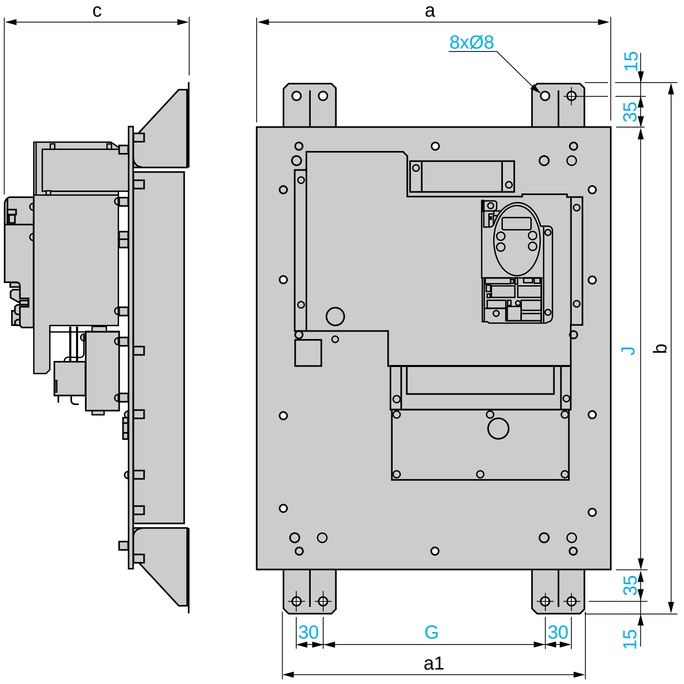
Mounting



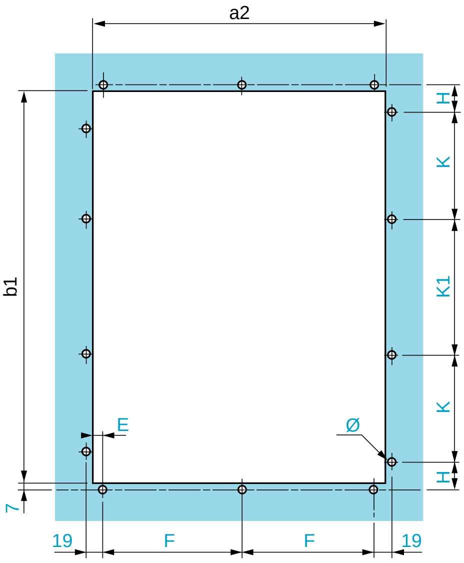
ATV 31K	a	a1	b	b1	c	c1	E	F	G	H	K
0●●M2	254	214	280	240	153	123	10	117	234	260	130
U1●M2, 0●●N4, U1●N4	250	219	337	297	186	127	1	115	230	317	158.5
U22M2, U●●N4	265	234	380	340	209	134	1	122.5	245	360	180

Note: *product supplied with drilling template.*

ATV 31KU55N4, ATV 31KU75N4, ATV 31KD1●N4/●M2



Mounting



ATV 31K	a	a1	a2	b	b1	c	E	F	G	H	J	K	K1	Ø
U55N4, U75N4	400	340	334	600	444	243	12	155	250	49	500	180	0	12 x 6
D11N4, D15N4	450	370	386	700	546	267	13	180	280	39	600	150	180	14 x 6

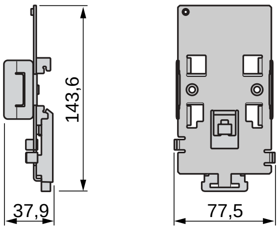
Note: *product supplied with drilling template.*

Variable speed drives for asynchronous motors

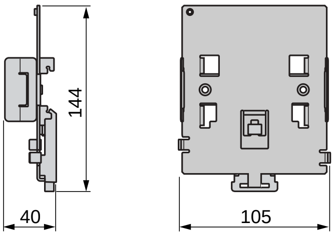
Altivar 31

Plates for mounting on ⊔ rail

VW3 A11851

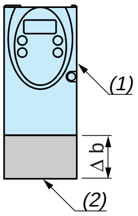


VW3 A31852



UL NEMA Type 1 conformity kits

VW3 A31811 to VW3 A31817



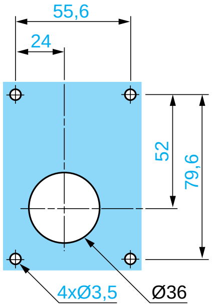
VW3	Δb
A31812	77
A31813 and A31814	107
A31815	138
A31816	179
A31817	244

(1) Drive
(2) Kit for ***VW3 A3181●***

Remote terminal

VW3 A31101

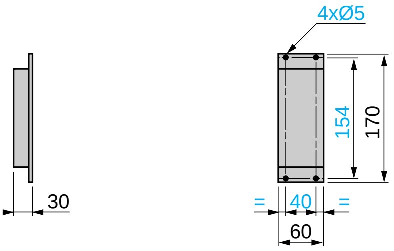
Mounting



Bare braking resistors

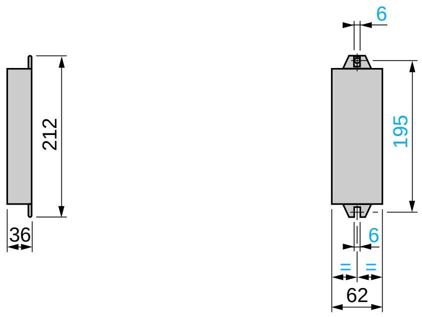
VW3 A58702 and A58704

2-wire output, length 0.5 m



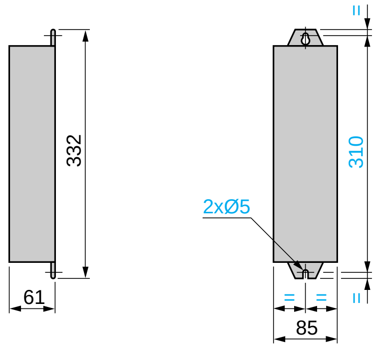
VW3 A58703

2-wire output, length 0.5 m

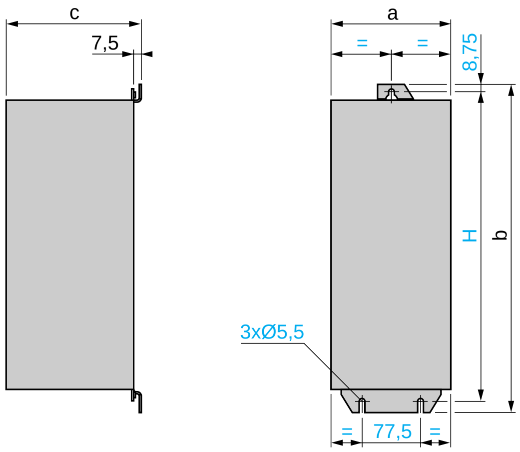


Protected braking resistors

VW3 A58732 to VW3 A58734

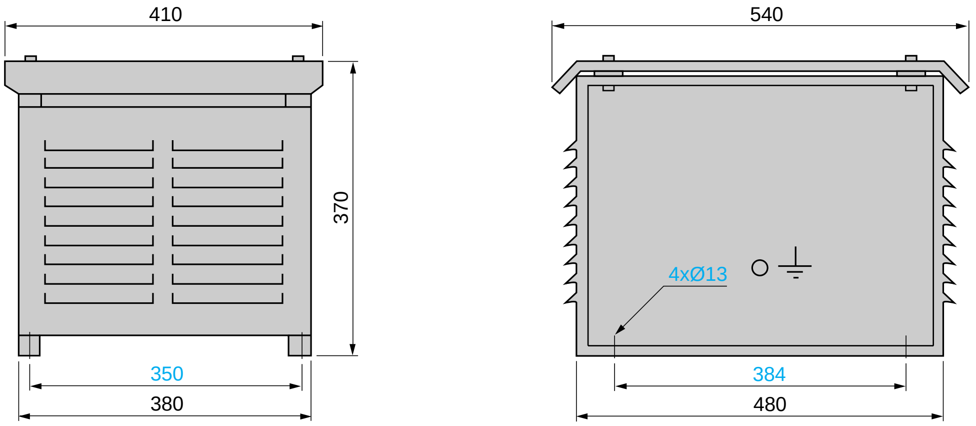


VW3 A58735 to VW3 A58737



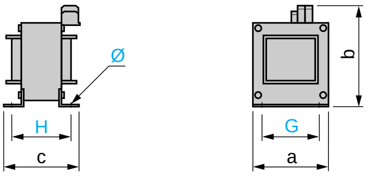
VW3	a	b	c	H
A58735	163	340	61	320
A58736, A58737	156	434	167	415

VW3 A66704



Single phase chokes

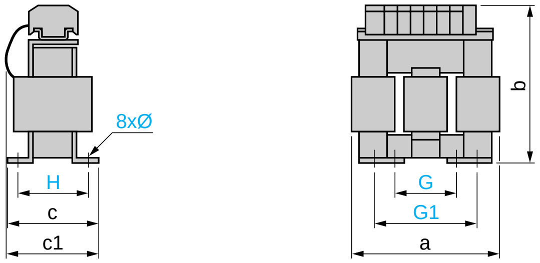
VZ1 L●●●●●●●



VZ1	a	b	c	G	H	Ø
L004M010	60	100	80	50	44	4 x 9
L007UM50	60	100	95	50	60	4 x 9
L018UM20	85	120	105	70	70	5 x 11

3-phase chokes

VW3 A66501 to VW3 A66506

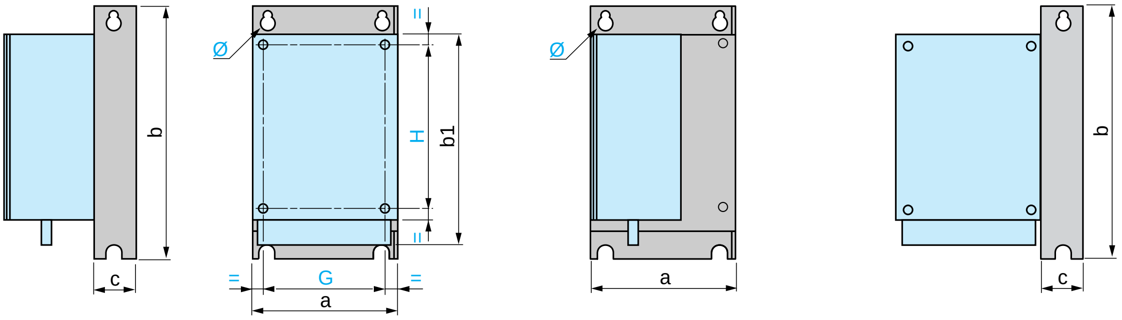


VW3	a	b	c	c1	G	G1	H	Ø
A66501	100	135	55	60	40	60	42	6 x 9
A66502	130	155	85	90	60	80.5	62	6 x 12
A66503	130	155	85	90	60	80.5	62	6 x 12
A66504	155	170	115	135	75	107	90	6 x 12
A66505	180	210	125	165	85	122	105	6 x 12
A66506	275	210	130	160	105	181	100	11 x 22

Additional EMC input filters

Mounting of filter underneath the drive

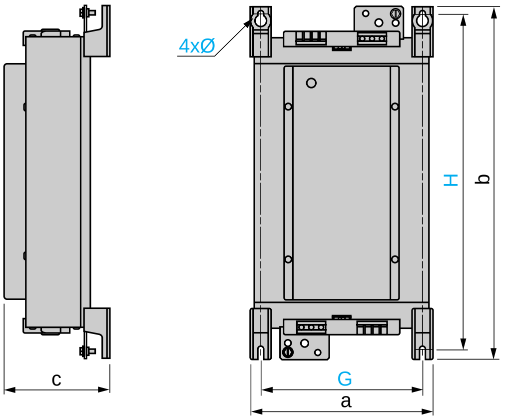
Mounting of filter adjacent to drive



VW3	a	b	b1	c	G	H	Ø
A31401, A31402	72	185	–	50	60	121.5	2 x M4
A31403, A31404	105	185	–	60	93	121.5	2 x M4
A31405, A31406	140	225	–	60	126	157	4 x M4
A31407	180	275	–	60	210	160	4 x M4
A31408, A31409	245	365	–	60	225	295	4 x M5

Output filters

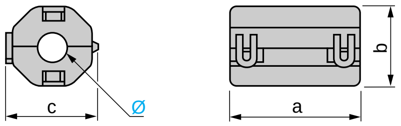
VW3 A58451 to VW3 A58453



VW3	a	b	c	G	H	Ø
A58451 **A58452**	169.5	340	123	150	315	7
A58453	239	467.5	139.5	212	444	7

Ferrite suppressors for downstream contactor opening

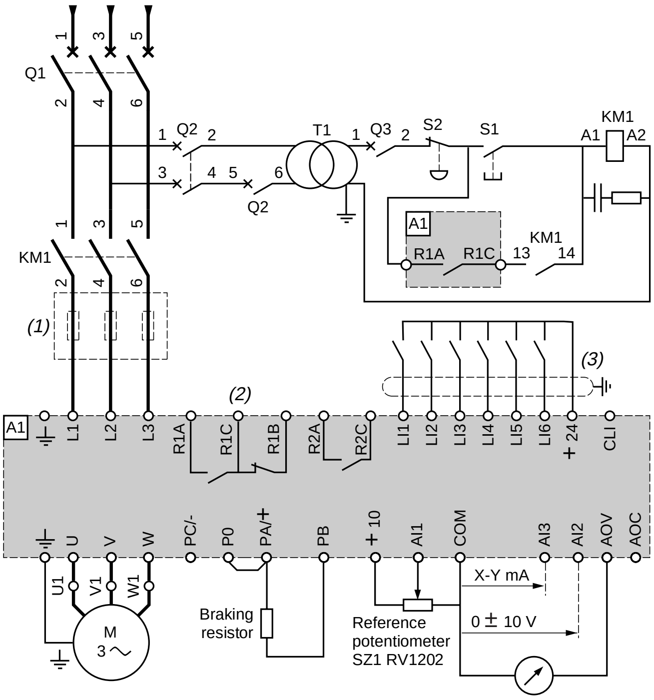
VW3 A31451 to VW3 A31452



VW3	a	b	c	Ø
A31451	33.5	33	33	13
A31452	33	21.5	22.5	9
A31453	30	19	19	6

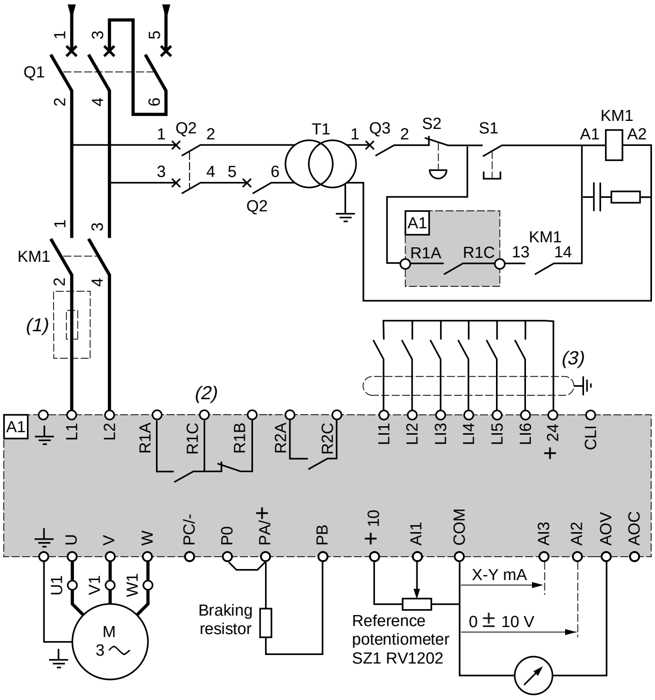
ATV 31●●●●M3X, ATV 31●●●●N4, ATV 31●●●●S6X

3-phase power supply



ATV 31●●●●M2

Single phase power supply



(1) Line choke (single phase or 3-phase).
(2) Fault relay contacts. For remote signalling of drive status.
(3) Shared connection of the logic inputs depends on the position of a switch, see diagrams below.

***Note:** all terminals are located at the bottom of the drive.*
Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

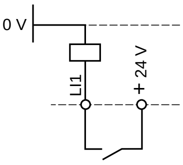
Compatible components (for full references, please consult our specialist catalogue)

Code	Description
Q1	GV2 L or Compact NS (see pages 2/62 to 2/65)
KM1	LC1 ●●● + LA4 DA2U (see pages 2/62 to 2/65)
S1, S2	XB2 B or XA2 B pushbuttons
T1	100 VA transformer 220 V secondary
Q2	GV2 L rated at twice the nominal primary current of T1
Q2	GB2 CB05

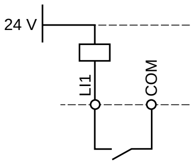
Examples of recommended circuit diagrams

Logic input switches

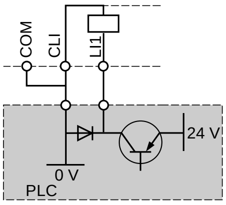
"Source" position

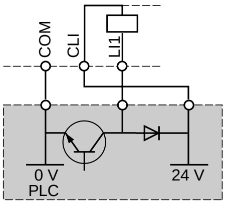


"Sink" position



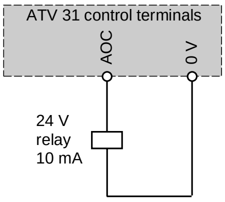
CLI position with PLC transistor outputs



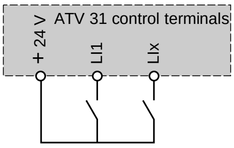


AOC output

Wired as logic output

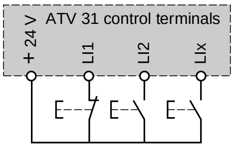


2-wire control



LI1: Forward
LIx: Reverse

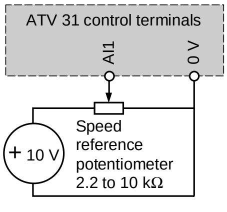
3-wire control



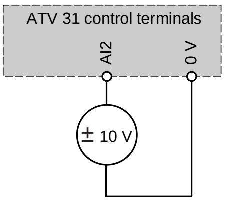
LI1: Stop
LI2: Forward
LIx: Reverse

Analog voltage inputs

+ 10 V external

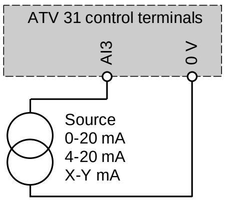


± 10 V external



Analog current input

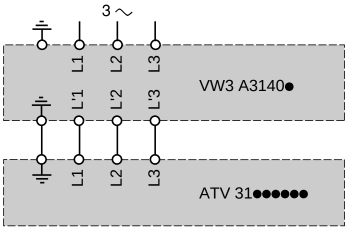
0-20 mA, 4-20 mA, X-Y mA



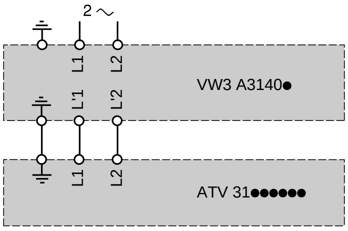
Schemes

Additional radio interference suppression input filters VW3 A3140●

3-phase power supply



Single phase power supply

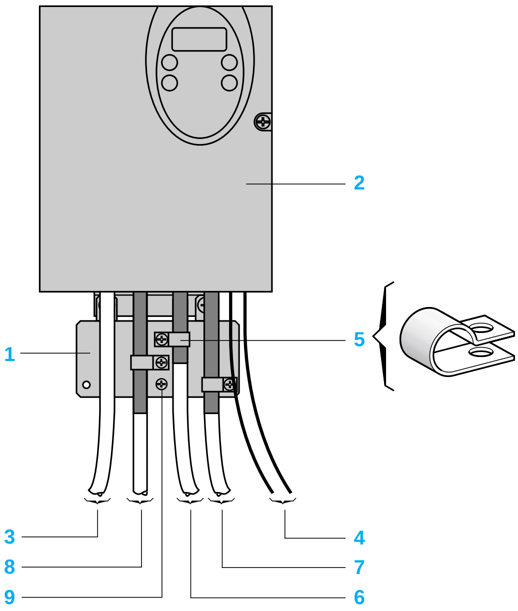


Connections to meet the requirements of EMC standards

Principle

- Grounds between the drive, motor and cable shielding must have “high frequency” equipotentiality.
- Use shielded cables with the shielding connected to ground throughout 360° at both ends for the motor cable, the braking resistor cable and the control/command cables. Metal ducting or conduit can be used for part of the shielding length provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram for ATV 31H●●● drives



1 Steel plate supplied with the drive, to be fitted on it (machine ground)
2 Altivar 31
3 Non-shielded power supply wires or cable
4 Non-shielded wires for the output of the safety relay contacts.
5 Fix and ground the shielding of cables 6, 7 and 8 as close as possible to the drive:
- strip the shielding,
- use cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the plate 1.
The shielding must be clamped tightly enough to the metal plate to ensure good contact.
Cable clamps must be made from stainless steel.
6 Shielded cable for connecting the motor.
7 Shielded cable for connecting the control/command wiring. For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
8 Shielded cable for connecting the braking resistor.
6, 7, 8, the shielding must be connected to ground at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal cases.
9 Ground screw for the motor cable with low ratings, as the screw on the heatsink is inaccessible.

***Note:** the HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.*
If using an additional input filter, it should be mounted beneath the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is then via the filter output cable.

Operation on an IT system

IT system: isolated or impedance earthed neutral.
Use a permanent insulation monitor compatible with non-linear loads, e.g. Merlin Gerin type XM200.

ATV 31●●●M2 and N4 drives feature built-in RFI filters. There are two ways of isolating these filters from ground for operation on an IT system:
- ATV 31H018M2 to ATV 31HU22M2 and ATV 31H037N4 to ATV 31HU40N4, pull out a jumper to disconnect the filter.
- ATV 31HU55N4 to ATV 31HD15N4, move the cable tag to disconnect the filter.

Variable speed drives for asynchronous motors

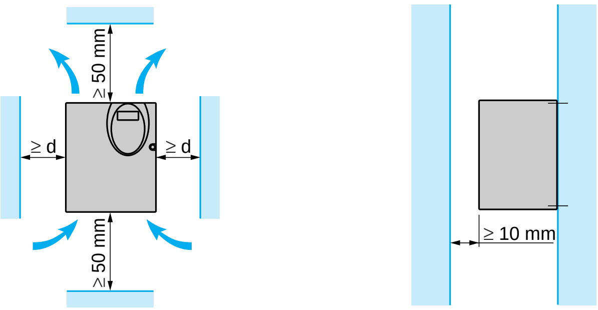
Altivar 31

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.

Mounting recommendations for ATV 31H drives

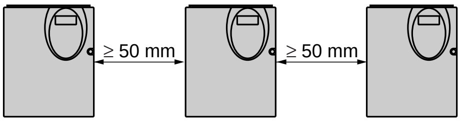
Install the unit vertically, at ± 10°.

- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

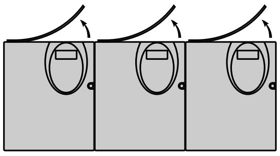


Types of mounting

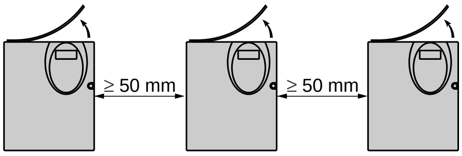
- **Type A mounting**

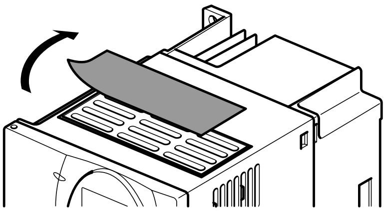


- **Type B mounting**



- **Type C mounting**

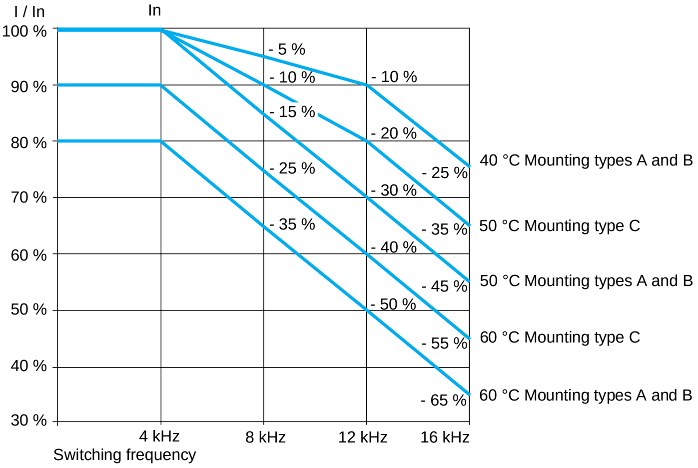




Removing the protective cover

Removing the protective cover from the top of the drive (as shown opposite) changes the degree of protection to IP 20.

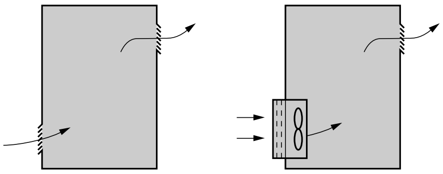
Derating curves for the nominal drive current (In) as a function of the temperature, switching frequency and type of mounting.



For intermediate temperatures (e.g. 55 °C), interpolate between 2 curves.

Variable speed drives for asynchronous motors

Altivar 31



Specific recommendations for mounting ATV 31 drives in a wall-mounted or floor-standing enclosure

Observe the mounting recommendations on the opposite page.
To ensure proper air circulation in the drive:

- Fit ventilation grilles.
- Ensure that there is sufficient ventilation. If there is not, install forced ventilation with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see the table below).
- Use special filters with IP 54 protection.
- Remove the protective cover from the top of the drive.

Fan flow rate depending on the drive rating

ATV 31	Flow rate m^3/min
H018M2, H037M2, H055M2, H018M3X, H037M3X, H055M3X, H037N4, H055N4, H075N4, HU11N4, H075S6X, HU15N6X	0.3
H075M2, HU11M2, HU15M2, H075M3X, HU11M3X, HU15M3X, HU15N4, HU22N4, HU22S6X, HU40N6X	0.55
HU22M2, HU22M3X, HU30M3X, HU40M3X, HU30N4, HU40N4, HU55S6X, HU75S6X	1.55
HU55M3X, HU55N4, HU75N4, HD11S6X	1.7
HU75M3X, HD11M3X, HD11N4, HD15N4, HD15S6X	2.8
HD15M3X	3.6

Dust and damp proof metal wall-mounted or floor-standing enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof enclosure in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
This enables the drive to be used in an enclosure where the maximum internal temperature can reach 50 °C.

Calculating the size of the enclosure

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta° - \theta e}{P}$$

θ = maximum temperature inside enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by drive: see page 2/38.
Add the power dissipated by the other equipment components.

Useful heat dissipation surface of enclosure S (m^2)

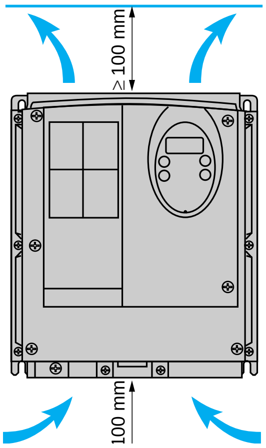
(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

K = thermal resistance per m^2 of enclosure.

For metal enclosures: K = 0.12 with internal fan, K = 0.15 without fan

***Note:** do not use insulated enclosures as they have a poor level of conductivity.*



Mounting recommendations for ATV 31 drives

Install the unit vertically, at ± 10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Variable speed drives for asynchronous motors

Altivar 31

Motor starters

Applications

The combinations suggested below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.

The circuit-breaker provides protection against accidental short-circuits, isolation, and padlocking if required.

The contactor provides control and management of any safety features and isolation of the motor on stopping.

The Altivar 31 variable speed drive is electronically protected against short-circuits between phases and between phase and earth; it therefore provides continuity of service and thermal protection of the motor.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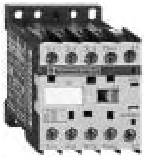

803714


531250

GV2 L
+
LC1 K
+
ATV 31H●●●●●●

Motor starter for drive with heatsink

Variable speed drive Reference	**Standard power rating of 4-pole 50/60 Hz motors** *(1)*		**Circuit-breaker** *(2)*		**Max. prosp. line Isc**	**Contactor** *(3)* **Add the voltage number to the basic reference to obtain the full reference** *(4)*
			Reference	**Rating**		
	kW	***HP***		**A**	**kA**	
Single phase supply voltage: 200…240 V						
ATV 31H018M2	0.18	*0.25*	**GV2 L08**	4	1	**LC1 K0610●●**
ATV 31H037M2	0.37	*0.5*	**GV2 L10**	6.3	1	**LC1 K0610●●**
ATV 31H055M2	0.55	*0.75*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31H075M2	0.75	*1*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31HU11M2	1.1	*1.5*	**GV2 L16**	14	1	**LC1 K0610●●**
ATV 31HU15M2	1.5	*2*	**GV2 L20**	18	1	**LC1 K0610●●**
ATV 31HU22M2	2.2	*3*	**GV2 L22**	25	1	**LC1 D09●●**
3-phase supply voltage: 200…240 V						
ATV 31H018M3X	0.18	*0.25*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31H037M3X	0.37	*0.5*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31H055M3X	0.55	*0.75*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31H075M3X	0.75	*1*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU11M3X	1.1	*1.5*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU15M3X	1.5	*2*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU22M3X	2.2	*3*	**GV2 L20**	18	5	**LC1 K0610●●**
ATV 31HU30M3X	3	–	**GV2 L22**	25	5	**LC1 D09●●**
ATV 31HU40M3X	4	*5*	**GV2 L22**	25	5	**LC1 D09●●**
ATV 31HU55M3X	5.5	*7.5*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HU75M3X	7.5	*10*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HD11M3X	11	*15*	**NS80HMA**	80	22	**LC1 D40●●**
ATV 31HD15M3X	15	*20*	**NS100HMA**	100	22	**LC1 D40●●**
3-phase supply voltage: 380…500 V						
ATV 31H037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31H055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31H075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31HU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31HU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU30N4	3	–	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU55N4	5.5	*7.5*	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31HU75N4	7.5	*10*	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31HD11N4	11	*15*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HD15N4	15	*20*	**NS80HMA**	50	22	**LC1 D32●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: product sold under the Merlin Gerin brand.
(3) Composition of contactors
LC1-K06: 3 poles + 1 "N/O" auxiliary contact
LC1-D09/D32/D40: 3 poles + 1 "N/O" auxiliary contact
(4) Usual control circuit voltages.

a.c. control circuit

	Volts ∿	**24**	**48**	**110**	**220**	**230**	**240**
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∿	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 31

Motor starters

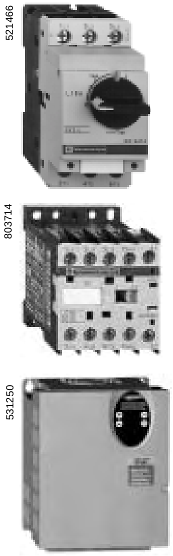
Applications

The combinations suggested below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.

The circuit-breaker provides protection against accidental short-circuits, isolation, and padlocking if required.

The contactor provides control and management of any safety features and isolation of the motor on stopping.

The Altivar 31 variable speed drive is electronically protected against short-circuits between phases and between phase and earth; it therefore provides continuity of service and thermal protection of the motor.



GV2 L
+
LC1 K
+
ATV 31H●●●●●●

Motor starter for drive with heatsink

Variable speed drive Reference	**Standard power rating of 4-pole 50/60 Hz motors** *(1)*		**Circuit-breaker** *(2)*		**Max. prosp. line Isc**	**Contactor** *(3)* **Add the voltage number to the basic reference to obtain the full reference** *(4)*
			Reference	**Rating**		
	kW	***HP***		**A**	**kA**	
3-phase supply voltage: 525…600 V						
ATV 31H075S6X	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31HU15S6X	1.5	*2*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31HU22S6X	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU40S6X	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU55S6X	5.5	*7.5*	**GV2 L20**	18	22	**LC1 K0610●●**
ATV 31HU75S6X	7.5	*10*	**GV2 L22**	25	22	**LC1 K0610●●**
ATV 31HD11S6X	11	*15*	**GV2 L32**	32	22	**LC1 D09●●**
ATV 31HD15S6X	15	*20*	**NS80HMA**	32	22	**LC1 D09●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: product sold under the Merlin Gerin brand.
(3) Composition of contactors
LC1-K06: 3 poles + 1 "N/O" auxiliary contact
LC1-D09/D32/D40: 3 poles + 1 "N/O" auxiliary contact
(4) Usual control circuit voltages.

a.c. control circuit

	Volts ∿	**24**	**48**	**110**	**220**	**230**	**240**
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∿	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 31

Motor starters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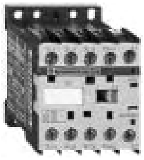
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GV2 L
+
LC1 K
+
ATV 31C●●●●●

Applications

The combinations suggested below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.

The circuit-breaker provides protection against accidental short-circuits, isolation, and padlocking if required.

The contactor provides control and management of any safety features and isolation of the motor on stopping.

The Altivar 31 variable speed drive is electronically protected against short-circuits between phases and between phase and earth; it therefore provides continuity of service and thermal protection of the motor.

Motor starter for customisable enclosed drive

Variable speed drive Reference	**Standard power rating of 4-pole 50/60 Hz motors** *(1)*		**Circuit-breaker**		**Max. prosp. line Isc**	**Contactor Add the voltage number to the basic reference to obtain the full reference** *(2)*
			Reference	**Rating**		
	kW	***HP***		**A**	**kA**	
Single phase supply voltage: 200…240 V						
ATV 31C018M2	0.18	*0.25*	**GV2 L08**	4	1	**LC1 K0610●●**
ATV 31C037M2	0.37	*0.5*	**GV2 L10**	6.3	1	**LC1 K0610●●**
ATV 31C055M2	0.55	*0.75*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31C075M2	0.75	*1*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31CU11M2	1.1	*1.5*	**GV2 L16**	14	1	**LC1 K0610●●**
ATV 31CU15M2	1.5	*2*	**GV2 L20**	18	1	**LC1 K0610●●**
ATV 31CU22M2	2.2	*3*	**GV2 L22**	25	1	**LC1 D09●●**
3-phase supply voltage: 380…500 V						
ATV 31C037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31C055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31C075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31CU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31CU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31CU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31CU30N4	3	*3*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31CU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) Usual control circuit voltages.

a.c. control circuit

	Volts ∼	**24**	**48**	**110**	**220**	**230**	**240**
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∼	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 31

Motor starters

Applications

The combinations suggested below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.

The circuit-breaker provides protection against accidental short-circuits, isolation, and padlocking if required.

The contactor provides control and management of any safety features and isolation of the motor on stopping.

The Altivar 31 variable speed drive is electronically protected against short-circuits between phases and between phase and earth; it therefore provides continuity of service and thermal protection of the motor.

Motor starter for drive kit

Variable speed drive Reference	**Standard power rating of 4-pole 50/60 Hz motors** *(1)*		**Circuit-breaker Reference**	**Circuit-breaker Rating**	**Max. prosp. line Isc**	**Contactor Add the voltage number to the basic reference to obtain the full reference** *(2)*
	kW	***HP***		**A**	**kA**	
Single phase supply voltage: 200…240 V						
ATV 31K018M2	0.18	*0.25*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31K037M2	0.37	*0.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31K055M2	0.55	*0.75*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31K075M2	0.75	*1*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU11M2	1.1	*1.5*	**GV2 L14**	14	22	**LC1 K0610●●**
ATV 31KU15M2	1.5	*2*	**GV2 L20**	18	22	**LC1 K0610●●**
ATV 31KU22M2	2.2	*3*	**GV2 L22**	25	22	**LC1 D09●●**
3-phase supply voltage: 380…500 V						
ATV 31K037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31K055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31K075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31KU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31KU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU30N4	3	*3*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31KU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31KU55N4	5.5	*7.5*	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31KU75N4	7.5	*10*	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31KD11N4	11	*15*	**NS80 HMA**	50	22	**LC1 D32●●**
ATV 31KD15N4	15	*20*	**NS80 HMA**	50	22	**LC1 D32●●**

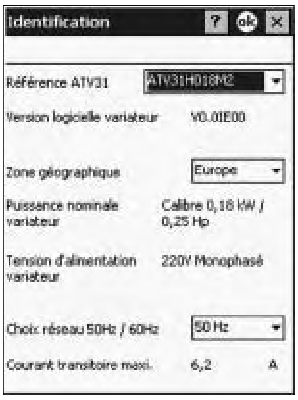
(1) The HP values given are NEC-compliant (National Electrical Code).
(2) Usual control circuit voltages.

a.c. control circuit

	Volts ~	**24**	**48**	**110**	**220**	**230**	**240**
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ~	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.

PowerSuite for PC welcome screen



Référence ATV31 ATV31H018M2

Version logicielle variateur V0.01E00

Zone géographique Europe

Puissance nominale variateur Calibre 0,18 kW / 0,25 Hp

Tension d'alimentation variateur 220V Monophasé

Choix réseau 50Hz / 60Hz 50 Hz

Courant transitoire maxi. 6,2 A

PowerSuite for Pocket PC identification screen

Summary of functions

Variable speed drives for asynchronous motors

Altivar 31

Drive factory setting

The drive is supplied ready for use in most applications, with the following functions and settings:

- Nominal motor frequency: 50 Hz
- Motor voltage: 230 V (ATV 31H●●●M2 and M3X), 400 V (ATV 31H●●●N4) or 600 V (ATV 31H●●●S6X)
- Linear ramp times: 3 seconds
- Low speed (LSP): 0 Hz, high speed (HSP): 50 Hz
- Normal stop mode on deceleration ramp
- Stop mode in the event of a fault: Freewheel
- Motor thermal current = nominal drive current
- Standstill injection braking current = 0.7 x nominal drive current, for 0.5 seconds
- Constant torque operation, with sensorless flux vector control
- Logic inputs:
  - 2 directions of operation (LI1, LI2), 2-wire control
  - 4 preset speeds (LI3, LI4): LSP (low speed), 10 Hz, 15 Hz, 20 Hz
- Analog inputs:
  - AI1 speed reference (0 +10 V)
  - AI2 (0 ± 10 V) summing of AI1
  - AI3 (4-20 mA) not configured
- Relay R1: fault relay
- Relay R2: not assigned
- Analog output AOC: 0-20 mA, image of the motor frequency
- Automatic adaptation of the deceleration ramp in the event of excessive braking
- Switching frequency 4 kHz, random frequency

Functions of the display and keys

1 Information is displayed in the form of codes or values in four "7-segment" displays
2 Buttons for scrolling through the menus or modifying values
3 "ENT": Validation button for entering a menu or confirming the new value selected
4 "ESC": Button for exiting the menus (no confirmation)
5 2 diagnostic LEDs for the CANopen bus

- For ATV 31H●●●●M2A, ATV 31H●●●M3XA and ATV 31H●●●N4A drives only:

6 Speed reference potentiometer
7 "RUN": Local control of motor operation
8 STOP/RESET: Controls motor stopping locally and resets any faults

Remote display terminal

■ Remote display terminal option

The remote display terminal can be mounted on the door of a wall-fixing or floor-standing enclosure.
It comprises an LCD display with programming and control keys and a switch for locking access to the menus.
Drive control keys:

☐ "FWD/RV": reversal of the direction of rotation
☐ "RUN": motor run command
☐ "STOP/RESET": motor stop command or fault reset

The speed reference is given by the remote display terminal. Only the freewheel, fast stop and DC injection stop commands remain active on the terminal block. If the drive/operator terminal link is broken, the drive locks in fault mode.
Its subsequent action depends on the control and reference channel programming.

Note: *protection via customer confidential code has priority over the switch.*

■ Menu access levels

There are 3 access levels:

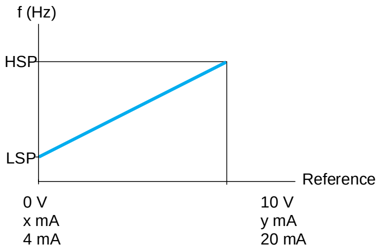
☐ Level 1: access to standard functions. Significantly, this level is interchangeable with the Altivar 28.
☐ Level 2: access to advanced application functions.
☐ Level 3: access to advanced application functions and management of mixed control modes.

■ Menu access code

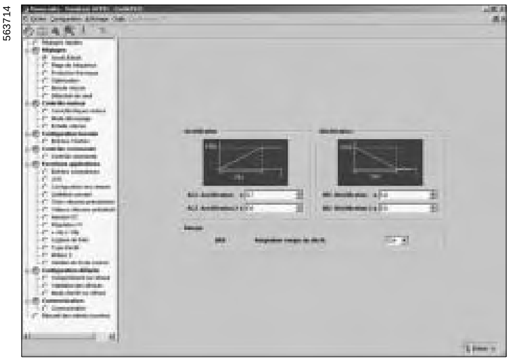
Enables the drive configuration to be protected using an access code.
When access is locked using a code, only the adjustment and monitoring parameters can be accessed.

■ Operating speed range

Used to determine the 2 frequency limits which define the speed range permitted by the machine under actual operating conditions for all applications with or without overspeed.



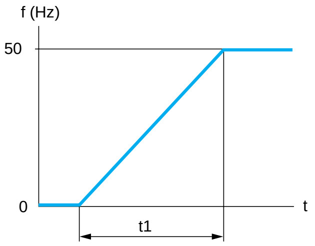
LSP: low speed, from 0 to HSP, factory setting 0
HSP: high speed, from LSP to f max., factory setting 50 Hz
x: configurable between 0 and 20 mA, factory setting 4 mA
y: configurable between 4 and 20 mA, factory setting 20 mA



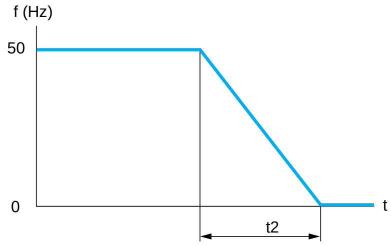
Ramp adjustment with PowerSuite for PC

■ Acceleration and deceleration ramp times

Used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



Linear deceleration ramp

t1: acceleration time
t2: deceleration time
t1 and t2 can be set independently between 0.1 and 999.9 s, factory setting: 3 s

Variable speed drives for asynchronous motors

Altivar 31

■ Acceleration and deceleration ramp profile

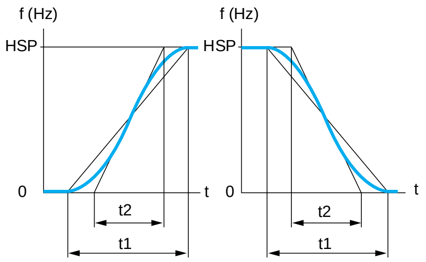
Used to gradually increase the output frequency starting from a speed reference, following a linear ratio or a preset ratio.

☐ For applications such as material handling, packaging, transportation of people: the use of S ramps takes up mechanical play and eliminates jolts, and limits “non-following” of speed during rapid transient operation of high inertia machines.

☐ For pumping applications (installation with centrifugal pump and non-return valve): valve closing can be controlled more accurately if U ramps are used.

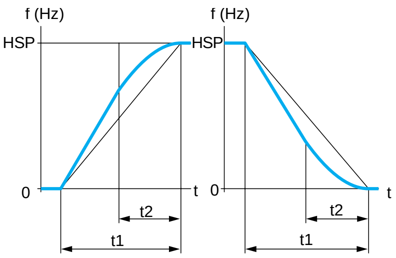
☐ Selecting “linear”, “S”, “U” or customized profiles will affect both the acceleration and deceleration ramps.

S ramps



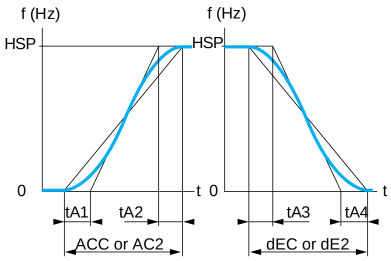
HSP: high speed
t1: ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.

U ramps



HSP: high speed
t1: ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.

Customized ramps



HSP: high speed
tA1: can be set between 0 and 100% (of ACC or AC2)
tA2: can be set between 0 and (100% - tA1) (of ACC or AC2)
tA3: can be set between 0 and 100% (of dEC or dE2)
tA4: can be set between 0 and (100% - tA3) (of dEC or dE2)
ACC: acceleration ramp 1 time
AC2: acceleration ramp 2 time
dEC: deceleration ramp 1 time
dE2: deceleration ramp 2 time

■ Ramp switching

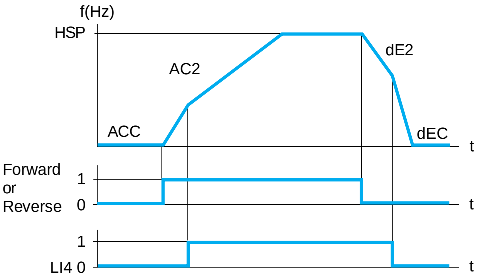
Used to switch 2 acceleration or deceleration ramp times, which can be adjusted separately.

Ramp switching can be enabled by:

☐ a logic input
☐ a frequency threshold
☐ a combination of logic input and frequency threshold

Function suitable for:

☐ material handling with smooth starting and approach
☐ machines with fast steady state speed correction



Acceleration 1 (ACC) and deceleration 1 (dEC):
- adjustment 0.1 to 999.9 s
- factory setting 3 s

Acceleration 2 (AC2) and deceleration 2 (dE2):
- adjustment 0.1 to 999.9 s
- factory setting 5 s

HSP: high speed

Example of switching using logic input LI4

■ Automatic adaptation of deceleration ramp

Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function avoids the drive locking in the event of an **excessive braking** fault.
Function suitable for all applications not requiring precise stopping and not using braking resistors.
Automatic adaptation must be cancelled if the machine has position control with stopping on a ramp and a braking resistor installed. This function is automatically disabled if the brake sequence is configured.

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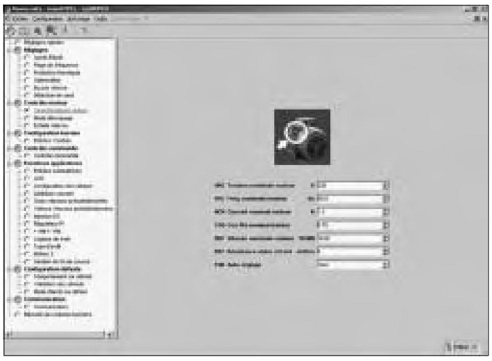


Adjustment of the voltage/frequency ratio with PowerSuite for PC

■ Voltage/frequency ratio

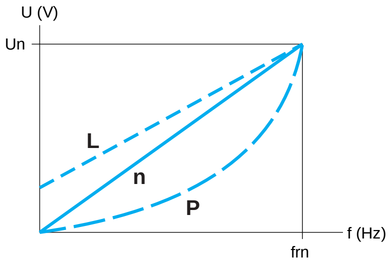
□ Motor and power supply characteristics
Used to determine the limit values for the voltage/frequency ratio according to the line supply, the motor and the application.
The following values should be set for variable or constant torque applications with or without overspeed:

- the base frequency corresponding to the supply,
- the nominal motor frequency (in Hz) given on the motor rating plate,
- the nominal motor voltage (in V) given on the motor rating plate,
- the maximum output frequency of the drive (in Hz).

□ Type of voltage/frequency ratio
Used to adapt the voltage/frequency ratio to the application in order to optimize performance for the following applications:

- constant torque applications (machines with average loads operating at low speed) with motors connected in parallel or special motors (e.g.: resistive cage motor): ratio **L**,
- variable torque applications (pumps, fans): ratio **P**,
- machines with heavy loads operating at low speed, machines with fast cycles, with (sensorless) flux vector control: ratio **n**,
- energy saving, for machines with slow speed and torque variations: ratio **nLd**.

Voltage is automatically reduced to a minimum according to the necessary torque.



Un: Nominal motor voltage
frn: Nominal motor frequency

■ Auto-tuning

Auto-tuning may be performed:
□ voluntarily by the operator using dialogue tools via local control mode or the serial link
□ each time the drive is switched on
□ on each run command
□ by enabling a logic input
Auto-tuning is used to optimize application performance.

■ Switching frequency, noise reduction

The switching frequency can be adjusted to reduce the noise generated by the motor.
The switching frequency is modulated randomly in order to avoid resonance. This function can be disabled if it causes instability.
High frequency switching of the intermediate DC voltage can be used to supply the motor with a current wave that has a lower harmonic distortion. The switching frequency can be adjusted during operation to reduce the noise generated by the motor.
Value: 2 to 16 kHz, with a factory setting of 4 kHz.
For all applications which require low motor noise.

Variable speed drives for asynchronous motors

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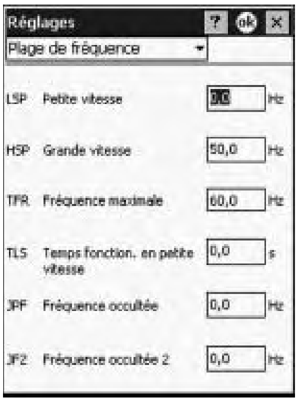

Réglages

Plage de fréquence

LSP Petite vitesse 0,0 Hz

HSP Grande vitesse 50,0 Hz

TFR Fréquence maximale 60,0 Hz

TLS Temps fonction. en petite vitesse 0,0 s

JPF Fréquence occultée 0,0 Hz

JF2 Fréquence occultée 2 0,0 Hz

Adjustment of the skip frequency with PowerSuite for Pocket PC

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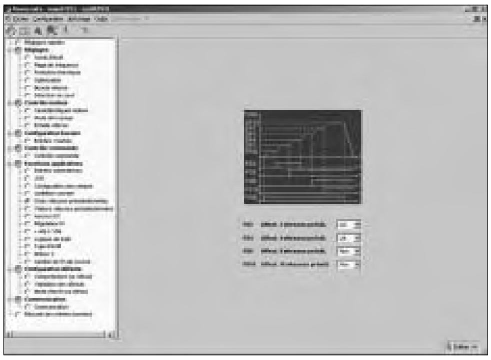
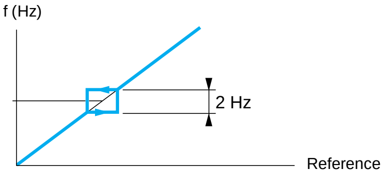


Adjustment of preset speeds with PowerSuite for PC

■ Skip frequencies

Used to suppress one or two critical speeds which may be the cause of mechanical resonance.
It is possible to prohibit the prolonged operation of the motor on 1 or 2 frequency bands (with a bandwidth of ± 1 Hz), which can be set within the operating range.
Function suitable for lightweight machines, bulk product conveyors with unbalanced motor, fans and centrifugal pumps.



Motor speed change depending on the skip frequency reference

■ Speed reference

The speed reference can have different sources depending on the drive configuration:

- ☐ references provided by 3 analog inputs
- ☐ the potentiometer reference (for ATV 31●●●A drives only)
- ☐ the +/- speed function via logic input, using the keypad or remote terminal keys
- ☐ the remote display terminal reference
- ☐ speed references provided by the communication bus or networks

These different sources are managed by programming the reference functions and channels.

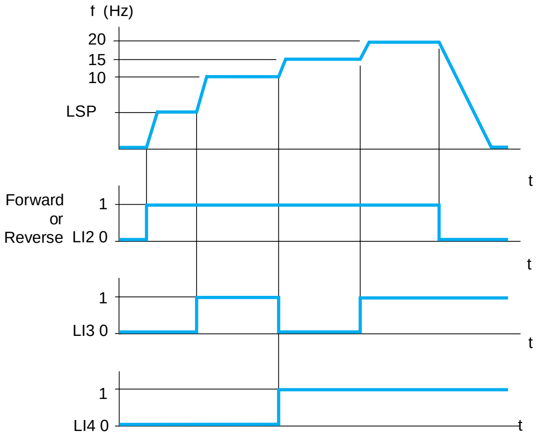
■ Analog inputs

There are 3 analog inputs:

- ☐ 2 voltage inputs:
  - 0-10 V (AI1)
  - ± 10 V (AI2)
- ☐ 1 current input:
  - X-Y mA (AI3) where X is configurable between 0 and 20 mA, and Y is configurable between 4 and 20 mA.

■ Preset speeds

Used to switch preset speed references.
2, 4, 8 or 16 preset speeds can be selected.
Enabled by means of 1, 2, 3 or 4 logic inputs.
The preset speeds can be adjusted in increments of 0.1 Hz from 0 Hz to 500 Hz.
Function suitable for material handling and machines with several operating speeds.



The speed obtained with inputs LI3 and LI4 at state 0 is LSP or the speed reference, depending on the level of analog inputs AI1, AI2 and AI3.

Factory settings:

1st speed: LSP (low speed or speed reference)

2nd speed: 10 Hz

3rd speed: 15 Hz

4th speed: 20 Hz (high speed)

Example of operation with 4 preset speeds and 2 logic inputs

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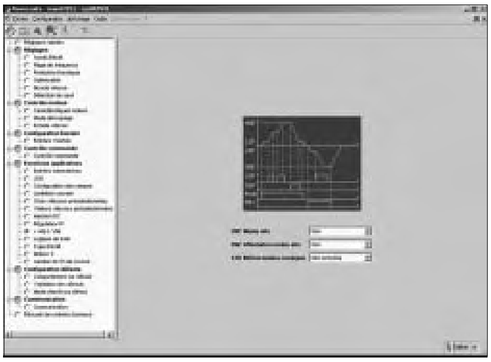


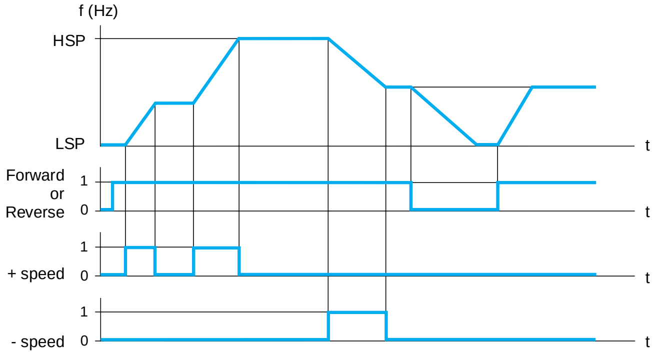
Adjustment of the "+/- speed" function with PowerSuite for PC

■ +/- speed

Used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorised potentiometer function).
This function is suitable for centralised control of a machine with several sections operating in one direction or for control by a pendant control station of a handling crane with two operating directions.

Two types of operation are available:

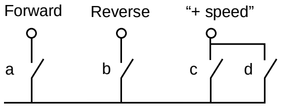
☐ Use of single action buttons: two logic inputs are required in addition to the operating direction(s).
The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.



Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving

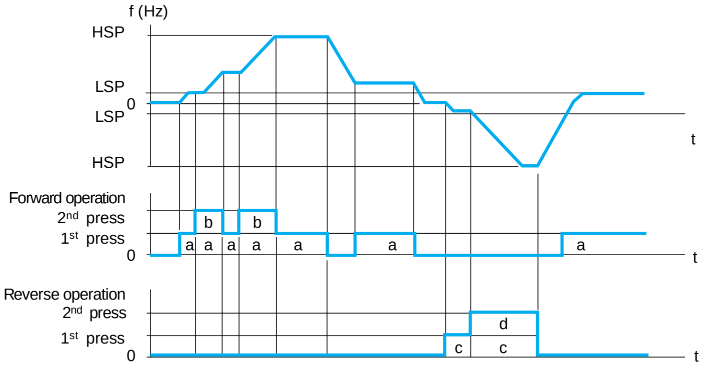
☐ Use of double action buttons (only one logic input assigned to “+ speed” is necessary):

Logic inputs:



a and b: 1st press
c and d: 2nd press

	Released (- speed)	**1st press** (speed maintained)	**2nd press** (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d



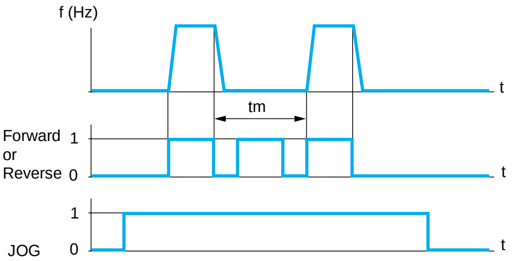
LSP: low speed, HSP: high speed

Example with double action buttons and 1 logic input

Note: *this type of “+/- speed” control is incompatible with 3-wire control*

■ Save reference

This function is associated with “+/- speed” control.
Enables the reading and saving of the last speed reference prior to the loss of the run signal or mains supply. The saved reference is applied at the next run signal.



Speed reference:
can be adjusted from 0 to 10 Hz
factory setting 10 Hz

tm: fixed time of 0.5 s, minimum time between 2 pulses

Example of jog operation

■ Step by step (JOG)

Used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
Enabled by a logic input and pulses given by the operating direction command.

This function is suitable for machines with product insertion in manual mode (example: gradual movement of the mechanism during maintenance operations).

■ Control and reference channels

There are several control and reference channels which can be independent.
Commands (forward, reverse, etc.) and speed references can be sent using the following methods:

- ☐ terminals (logic and analog inputs)
- ☐ keypad for ATV 31●●●A only (RUN/STOP and potentiometer)
- ☐ ATV 31 keypad
- ☐ via the serial link
  - remote display terminal,
  - Modbus control word,
  - CANopen control word.

The control and speed reference channels can be separate.
Example: speed reference issued by CANopen and commands issued by the remote display terminal.

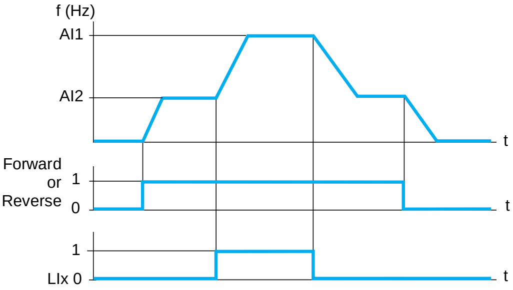
***Note:** the STOP keys on the keypad and the remote display terminal may retain priority.*
The "summing inputs" and "PI regulator" functions only apply to one reference channel.

■ Reference switching

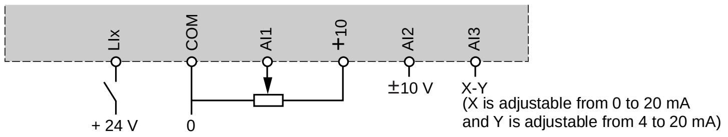
Switching between 2 speed references can be enabled via:

- ☐ a logic input
- ☐ a bit in a Modbus or CANopen control word

Reference 1 is active if the logic input (or control word bit) is at 0, reference 2 is active if the logic input (or control word bit) is at 1.
The reference can be switched with the motor running.



Example of reference switching



Connection diagram for reference switching

■ Summing inputs

Used to add up 2 or 3 speed references from different sources.
The references to be added together are selected from all the possible types of speed reference.
Example:
Reference 1 sent by AI1
Reference 2 sent by AI2
Reference 3 sent by AIP
Drive speed reference: reference 1 + reference 2 + reference 3.

Variable speed drives for asynchronous motors

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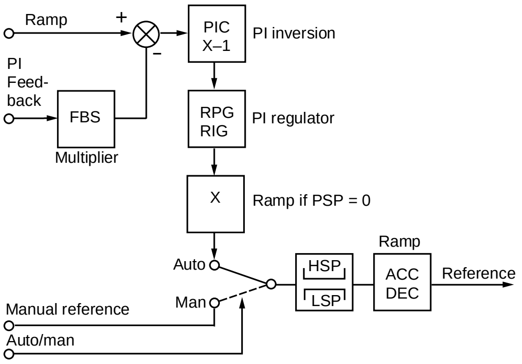


ACC: Acceleration
DEC: Deceleration
FBS: PI feedback multiplication coefficient
HSP: High speed
PIC: Reversal of the direction of correction of the PI regulator
LSP: Low speed
RIG: PI regulator integral gain
RPG: PI regulator proportional gain

PI regulator

■ PI regulator

Used for simple control of a flow rate or a pressure with a sensor which supplies a feedback signal adapted to the drive.
This function is suitable for pumping and ventilation applications.

☐ **PI reference:**
- internal regulator reference, adjustable from 0 to 100,
- regulation reference selected from all the possible types of regulation reference,
- preset PI references.

☐ **2 or 4 preset PI references**, adjustable from 0 to 100, require the use of 1 or 2 logic inputs respectively.

☐ **Manual reference**
- speed reference selected from all the possible types of speed reference.

☐ **PI feedback:**
- analog input AI1, AI2 or AI3.

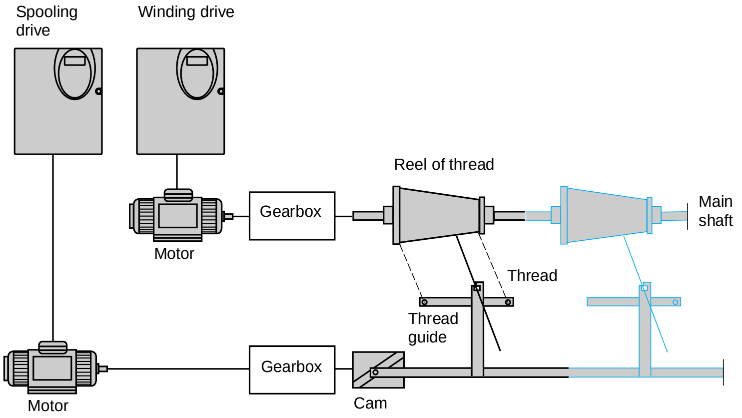
☐ **Auto/Man:**
- logic input LI for switching operation to speed reference (Man) or PI regulation (Auto).

During operation in automatic mode, it is possible to adapt the process feedback, to correct inverse PI, to adjust the proportional and integral gain and to apply a ramp (time = ACC - DEC) for establishing the PI action on starting and stopping.
The motor speed is limited to between LSP and HSP.

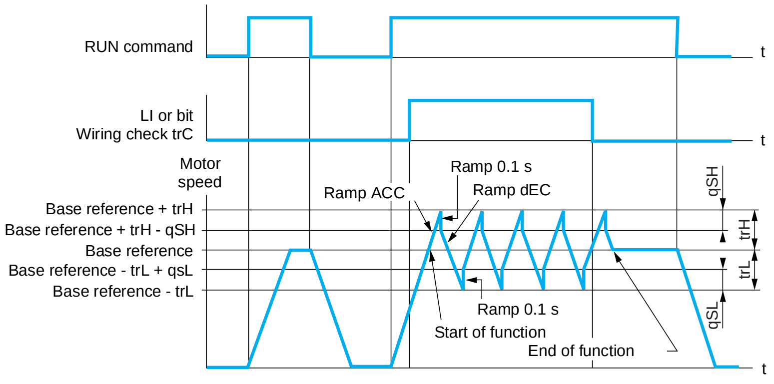
Note: *the PI function is incompatible with the "preset speeds" and "step by step (JOG)" functions. The PI reference can also be transmitted on line via the Modbus RS 485 serial link or via the CANopen bus.*

■ Spooling (function only available with ATV 31●●●●T drives)

Function for winding reels of thread (in textile applications)



The cam speed of rotation must follow a precise profile to ensure steady winding.



When the function is configured, the ramp type is forced to linear ramp.

Variable speed drives for asynchronous motors

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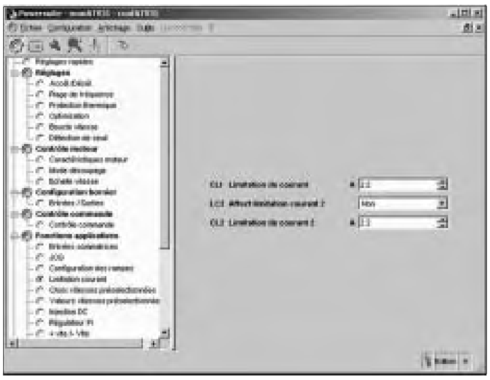


Configuration of current switching with PowerSuite for PC

■ Current limit switching

A 2nd current limit can be configured between 0.25 and 1.5 times the nominal drive current.
Used to limit the torque and the temperature rise of the motor.
Switching between 2 current limits can be enabled via:

- ☐ a logic input
- ☐ a bit in a Modbus or CANopen control word

■ Limiting low speed operating time

The motor is stopped automatically after an operating period at low speed (LSP) with zero reference and run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time).
Factory setting: 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is broken and then re-established.
This function is suitable for automatic stopping/starting on pressure-regulated pumps.

■ Motor switching

Allows two motors with different powers to be supplied successively by the same drive. Switching must take place with the drive stopped and locked, using an appropriate sequence at the drive output.
The function can be used to adapt the motor parameters. The following parameters are switched automatically:

- ☐ nominal motor voltage
- ☐ nominal motor frequency
- ☐ nominal motor current
- ☐ nominal motor speed
- ☐ motor cosine Phi
- ☐ selection of the type of voltage/frequency ratio for motor 2
- ☐ IR compensation, motor 2
- ☐ motor frequency loop gain
- ☐ motor stability
- ☐ motor slip compensation

Motor thermal protection is disabled by this function.
Motor switching can be enabled by:

- ☐ a logic input
- ☐ a bit in a Modbus or CANopen control word

With hoisting applications, this function enables a single drive to be used for vertical and horizontal movements.

■ Control mode switching

Control channel switching provides a choice of 2 operating modes.
Switching can be enabled by:

- ☐ a logic input
- ☐ a bit in a Modbus or CANopen control word.

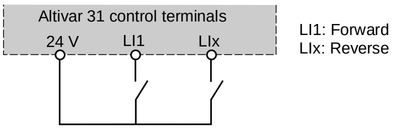
Variable speed drives for asynchronous motors

Altivar 31

■ 2-wire control

Used to control the direction of operation by means of a maintained contact.
Enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:

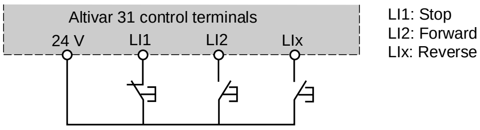
☐ detection of the state of the logic inputs
☐ detection of a change in state of the logic inputs
☐ detection of the state of the logic inputs with forward operation always having priority over reverse.



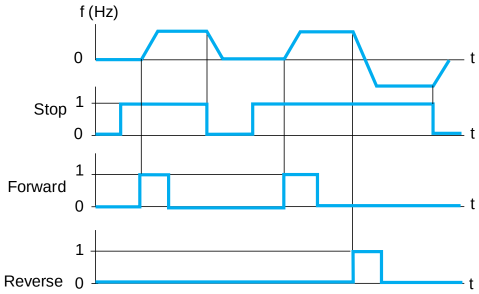
Wiring diagram for 2-wire control

■ 3-wire control

Used to control the operating direction and stopping by means of pulsed contacts.
Enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.



Wiring diagram for 3-wire control



Example of operation with 3-wire control

■ Forced local mode

Forced local mode imposes control via the terminals or operator terminal and prohibits all other control modes.
The following references and commands are available for forced local mode:

☐ references AI1, or AI2, or AI3 and control via logic inputs
☐ reference and control via RUN/STOP keys and potentiometer (ATV 31●●●A drives only)
☐ reference and control via the remote display terminal

The changeover to forced local mode is enabled by a logic input.

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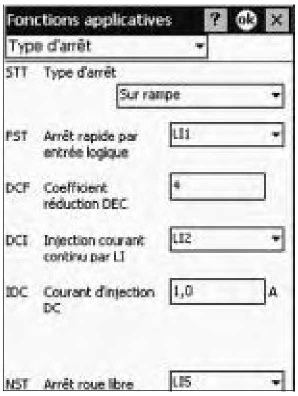


Type d'arrêt
STT Type d'arrêt: Sur rampe
FST Arrêt rapide par entrée logique: LI1
DCF Coefficient réduction DEC: 4
DCI Injection courant continu par LI: LI2
IDC Courant d'injection DC: 1,0 A
NST Arrêt roue libre: LI5

Configuration of stop types with PowerSuite for Pocket PC

■ Freewheel stop

Stops the motor by resistive torque only if the motor power supply is cut.
A freewheel stop is achieved:

☐ by configuring a normal stop command as a freewheel stop (on disappearance of a run command or appearance of a stop command)
☐ by enabling a logic input.

■ Fast stop

Used to achieve a braked stop with an acceptable deceleration ramp time (divided by 2 to 10) for the drive/motor unit to avoid locking on an excessive braking fault.
Used for conveyors with emergency stop electrical braking.
A fast stop is achieved:

☐ by configuring a normal stop as a fast stop (on disappearance of a run command or appearance of a stop command)
☐ by enabling a logic input.

■ DC injection stop

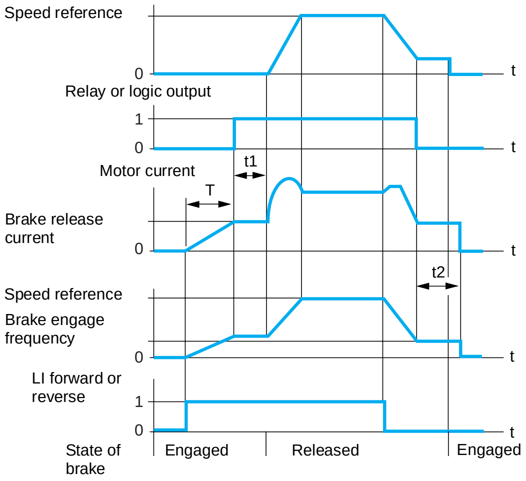
Used to brake (at low speed) high inertia fans, or to maintain torque on stopping in the case of fans located in an airflow.
A DC injection stop is achieved:

☐ by configuring a normal stop as a DC injection stop (on disappearance of a run command or appearance of a stop command)
☐ by enabling a logic input

The DC value and the standstill braking time are adjustable.

Variable speed drives for asynchronous motors

Altivar 31



Accessible settings:
t1: Brake release time delay
t2: Brake engage time delay

Brake control

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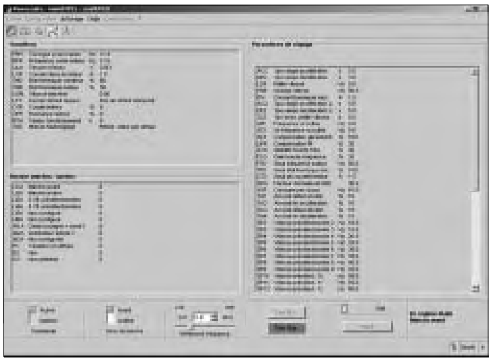

Monitoring the different parameters with PowerSuite for PC

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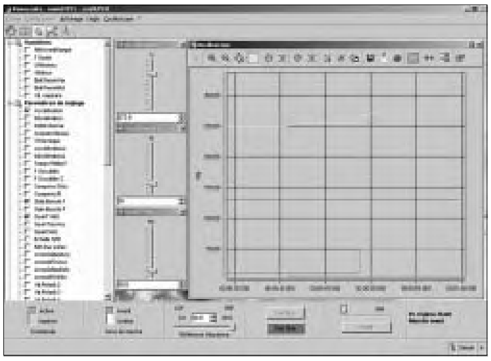

Monitoring the different parameters with the oscilloscope function in PowerSuite for PC

■ Brake control

Used to manage control of an electromagnetic brake in synchronization with the starting and stopping of the motor to avoid jolts and load veering.
The brake control sequence is managed by the drive.
Values that can be adjusted for releasing the brake: current threshold and time delay.
Values that can be adjusted for engaging the brake: frequency threshold and time delay.
Enabled: by relay logic output R2 or logic output AOC assigned to brake control.
Function suitable for material handling applications with movements equipped with electromagnetic brakes (hoisting) and machines requiring a parking brake (unbalanced machines).

☐ **Principle:**

- Vertical lifting movement:

Maintain motor torque in an upward direction when the brake is being released and engaged, in order to hold the load, and start smoothly as soon as the brake is released.

- Horizontal lifting movement:

Synchronizes brake release with the build-up torque on starting and brake engage at zero speed on stopping, in order to prevent jerking.
Recommended settings for brake control for a vertical lifting application (for a horizontal lifting application set the current threshold to zero):

- Brake release current:

Adjust the brake release current to the nominal current indicated on the motor. If, during testing, the torque is insufficient, increase the brake release current (the maximum value is imposed by the drive).

- Acceleration time:

For lifting applications it is advisable to set the acceleration ramps to more than 0.5 seconds. Ensure that the drive does not change to current limiting.
The same recommendation applies for deceleration.
Note: For a lifting movement, a braking resistor should be used. Ensure that the settings and configurations selected cannot cause a drop or a loss of control of the lifted load.

- Brake release time delay t1:

Adjust according to the type of brake. It is the time required for the mechanical brake to release.

- Brake engage frequency:

Set to twice the nominal slip then adjust according to the result.

- Brake engage time delay t2:

Adjust according to the type of brake. It is the time required for the mechanical brake to engage.

■ Management of limit switch

Used to manage the operation of one or two limit switches (with 1 or 2 operating directions).
Each limit (forward, reverse) is associated with a logic input. The type of stop that occurs on detection of a limit can be configured as normal, freewheel or fast.
Following a stop, the motor is permitted to restart in the opposite direction only.

■ Monitoring

The following data can be displayed:
☐ frequency reference
☐ internal PI reference
☐ frequency reference (absolute value)
☐ output frequency applied to the motor (value signed in two’s complement)
☐ output value in customer units
☐ current in the motor
☐ motor power: 100% = nominal power
☐ line voltage
☐ motor thermal state:
100%: nominal thermal state, 118%: motor overload threshold
☐ drive thermal state:
100%: nominal thermal state, 118%: drive overload threshold
☐ motor torque: 100% = nominal torque
☐ last fault
☐ operating time
☐ auto-tuning status
☐ configuration and state of logic inputs
☐ configuration of analog inputs.

Presentation:
pages 2/26 to 2/33
Characteristics:
pages 2/34 to 2/37
References:
pages 2/38 to 2/41
Dimensions:
pages 2/52 to 2/57
Schemes:
pages 2/58 to 2/61

Variable speed drives for asynchronous motors

Altivar 31

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Fault management with PowerSuite for PC

■ Fault management

There are different modes of operation on a resettable fault:

- freewheel stop
- the drive switches to the fallback speed
- the drive maintains the speed at which it was operating when the fault occurred until the fault disappears
- stop on ramp
- fast stop

The detected resettable faults are as follows:

- drive overheating
- motor overheating
- CANopen bus fault
- Modbus serial link failure
- external faults
- loss of 4-20 mA signal.

■ Fault reset

Used to clear the last fault by means of a logic input.
The restart conditions after a reset to zero are the same as those of a normal power-up.
Resets the following faults: overvoltage, overspeed, external fault, drive overheating, motor phase loss, DC bus overvoltage, loss of 4-20 mA reference, load veering, motor overload if the thermal state is less than 100%, serial link fault.
"Line supply undervoltage" and "line supply phase loss" faults are reset automatically when the line supply is restored.
Function suitable for applications where the drives are difficult to access, for example on moving parts in material handling systems.

■ General reset (resets all faults)

This function can be used to inhibit all faults, including thermal protection (forced operation) and may cause irreparable damage to the drive.
Function suitable for applications where a restart can be vital (conveyor in a furnace, smoke extraction station, machine with hardening products which need to be removed).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ↑ of the logic input.

■ Controlled stop on loss of line supply

Used to control motor stopping on a loss of line supply.
Function suitable for material handling, machines with high inertia, continuous product processing machines.
Type of stop possible:

- locking of the drive and freewheel stop
- stop which uses the mechanical inertia to maintain the drive power supply as long as possible
- stop on ramp
- fast stop (depends on the inertia and the braking ability of the drive).

■ Stop mode in the event of a fault

The type of stop that occurs on detection of a fault can be configured as normal, freewheel or fast for the following faults:

- external fault (detection enabled by a logic input or a bit in a Modbus or CANopen control word)
- motor phase loss fault

If a downstream contactor is being used between the drive and the motor, the motor phase loss fault should be inhibited.

■ **Automatic catching a spinning load with speed detection** (“catch on the fly”)
Used to restart the motor smoothly after one of the following events, provided the run command is still present:
- ☐ loss of line supply or simple switch off
- ☐ fault reset or automatic restart
- ☐ freewheel stop

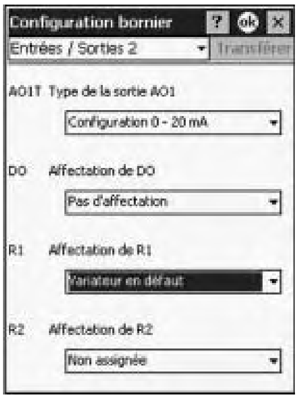
On disappearance of the event, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines where the speed loss is negligible during the time over which the mains supply is lost (machines with high inertia), fans and pumps driven by residual flow, etc.

■ **Automatic restart**
Enables the drive to be restarted automatically after locking following a fault if this fault has disappeared and if the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer wait periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The whole restart procedure can last anywhere from 5 minutes to an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been switched off and on again.

The faults permitting this restart are:
- ☐ line supply overvoltage
- ☐ motor thermal overload
- ☐ drive thermal overload
- ☐ DC bus overvoltage
- ☐ failure of a line supply phase
- ☐ external fault
- ☐ loss of 4-20 mA reference
- ☐ CANopen bus fault
- ☐ Modbus serial link fault
- ☐ line supply voltage too low. For this fault, the function is always active, even if it is not configured.

For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and the direction of operation must be maintained for this function.
This function is suitable for machines or installations in continuous operation or without monitoring, and where a restart will not endanger equipment or personnel in any way.

■ **Derated operation in the event of an overvoltage**
The line voltage monitoring threshold is lowered to 50% of the motor voltage.
In this case, a line choke must be used and the performance of the drive cannot be guaranteed.



Entrées / Sorties 2

AO1T Type de la sortie AO1
Configuration 0 - 20 mA

DO Affectation de DO
Pas d'affectation

R1 Affectation de R1
Variateur en défaut

R2 Affectation de R2
Non assignée

Configuration of the fault relay with PowerSuite for Pocket PC

■ **Fault relay, unlocking**
The fault relay is energised when the drive is powered up and is not faulty.
It contains a “C/O” common point contact.
The drive can be unlocked after a fault in one of the following ways:
- ☐ by powering down until the “ON” LED extinguishes, then switching the power back on
- ☐ by assigning a logic input to the “reset faults” function
- ☐ by the “automatic restart” function, if it has been configured

■ **Operating time reset to zero**
The drive operating time can be reset to zero.

Variable speed drives for asynchronous motors

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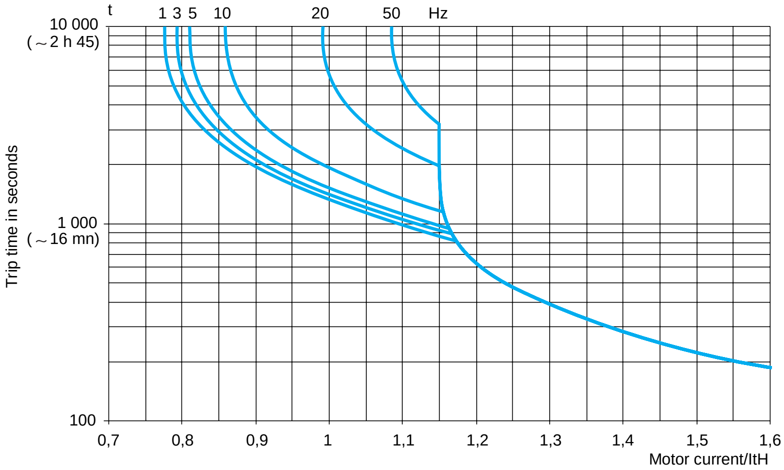
■ Motor thermal protection

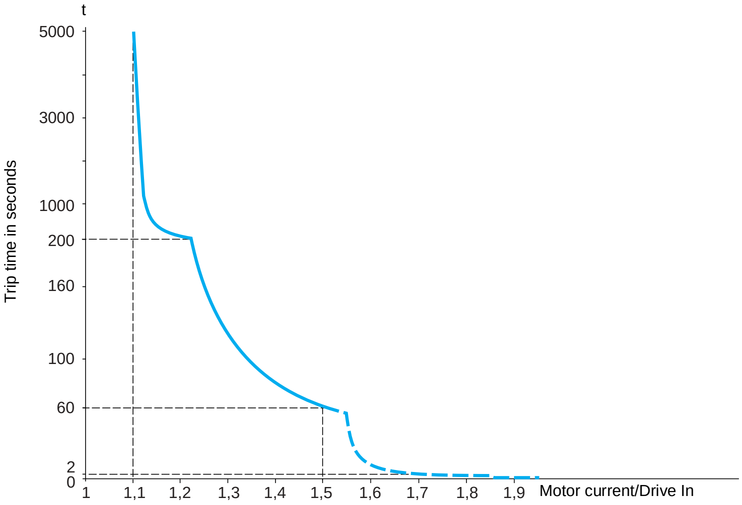
Indirect motor thermal protection is implemented via continuous calculation of its theoretical temperature rise.
Thermal protection can be adjusted from 0.2 to 1.5 times the nominal drive current.
This function is suitable for applications with self-cooled motors.



Motor thermal protection curves

■ Drive thermal protection

Thermal protection, by a PTC probe fitted on the heatsink or integrated in the power module, ensures that the drive is protected in the event of poor ventilation or excessive ambient temperatures.
Locks the drive in the event of a fault.



■ R1/R2 relay configuration

The following states are signalled when the relay is powered on:
- ☐ drive fault
- ☐ drive running
- ☐ frequency threshold reached
- ☐ high speed reached
- ☐ current threshold reached
- ☐ frequency reference reached
- ☐ motor thermal threshold reached
- ☐ brake sequence (R2 only)

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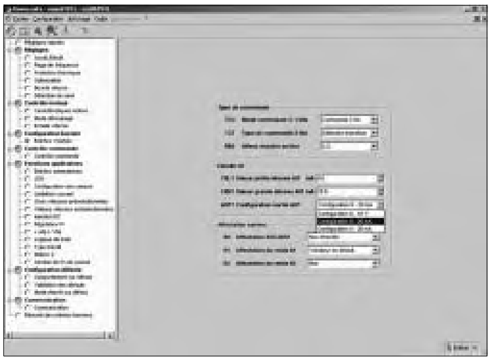


Configuration of AOC/AOV outputs with PowerSuite for PC

■ AOC/AOV analog outputs

The same data is available on analog outputs AOC and AOV.
The following assignments are possible:

- ☐ motor current
- ☐ motor frequency
- ☐ motor torque
- ☐ power supplied by the drive
- ☐ drive fault
- ☐ frequency threshold reached
- ☐ high speed reached
- ☐ current threshold reached
- ☐ frequency reference reached
- ☐ motor thermal threshold reached
- ☐ brake sequence.

The adjustment of analog outputs AOC/AOV is used to modify the characteristics of the current analog output AOC or the voltage analog output AOV.
AOC: can be set as 0-20 mA or 4-20 mA
AOV: can be set at 0-10 V.

■ Saving and retrieving the configuration

A configuration can be saved to the EEPROM. This function is used to store a configuration in addition to the current configuration.
Retrieving this configuration clears the current configuration.

Function compatibility table

■ Configurable I/O

Functions which are not listed in this table are fully compatible.
Stop functions have priority over run commands.
The selection of functions is limited:

- by the number of drive I/O
- by the incompatibility of certain functions with one another.

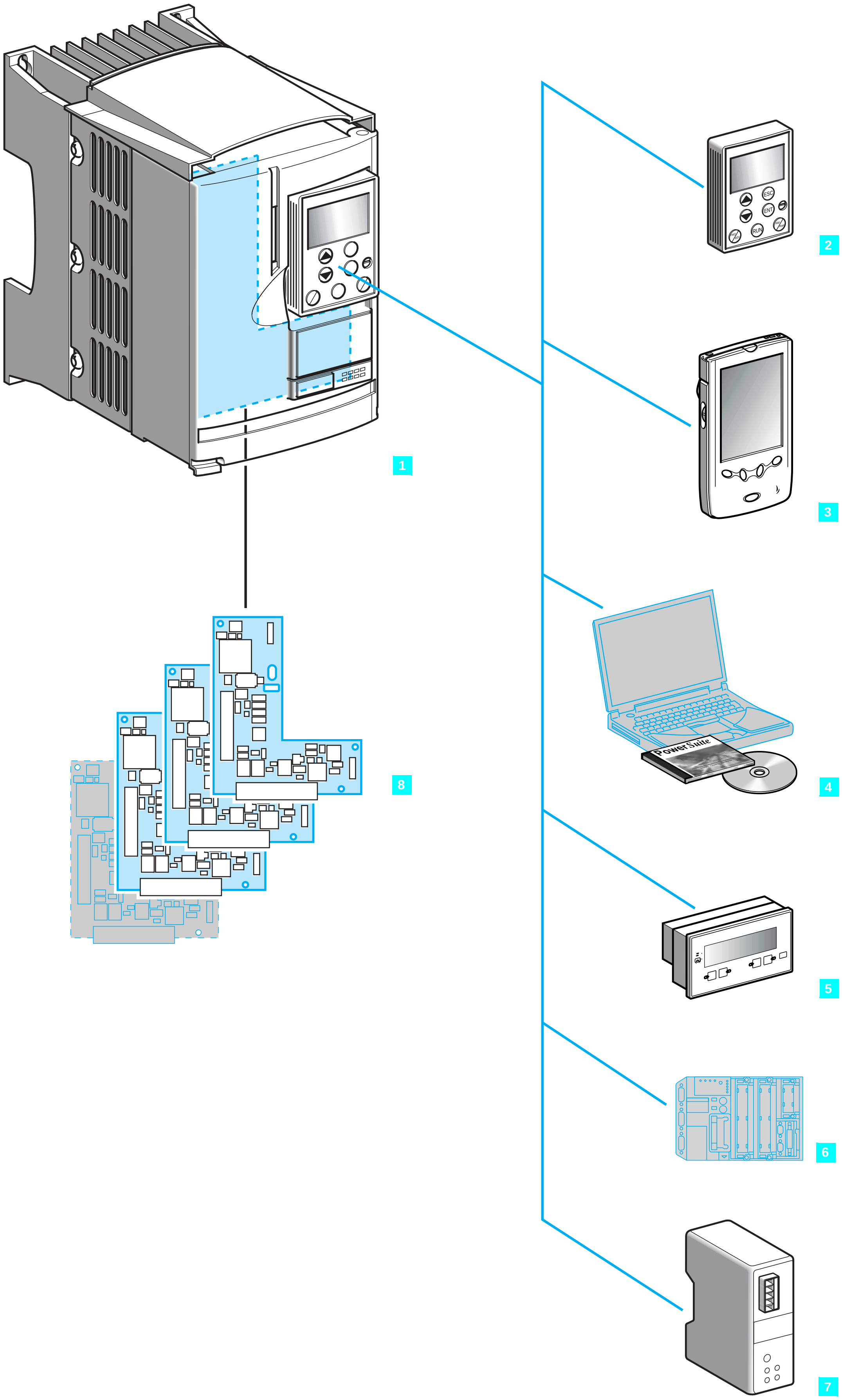
Functions	**Summing inputs**	**+/- speed**	**Manage-ment of limit switch**	**Preset speeds**	**PI regulator**	**Jog operation**	**Brake sequence**	**DC injection stop**	**Fast stop**	**Freewheel stop**
Summing inputs	⬜	⊖	🟦	↑	⊖	↑	🟦	🟦	🟦	🟦
+/- speed	⊖	⬜	🟦	⊖	⊖	⊖	🟦	🟦	🟦	🟦
Management of limit switch	🟦	🟦	⬜	🟦	⊖	🟦	🟦	🟦	🟦	🟦
Preset speeds	←	⊖	🟦	⬜	⊖	↑	🟦	🟦	🟦	🟦
PI regulator	⊖	⊖	⊖	⊖	⬜	⊖	⊖	🟦	🟦	🟦
Jog operation	←	⊖	🟦	←	⊖	⬜	⊖	🟦	🟦	🟦
Brake sequence	🟦	🟦	🟦	🟦	⊖	⊖	⬜	⊖	🟦	🟦
DC injection stop	🟦	🟦	🟦	🟦	🟦	🟦	⊖	⬜	🟦	↑
Fast stop	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	⬜	↑
Freewheel stop	🟦	🟦	🟦	🟦	🟦	🟦	🟦	←	←	⬜

⊖ Incompatible functions
🟦 Compatible functions
⬜ Not applicable

Priority functions (functions which cannot be active at the same time)
← The arrow indicates which function has priority
↑ Example: the "Freewheel stop" function has priority over the "Fast stop" function

Variable speed drives for asynchronous motors

Altivar 38



Variable speed drives for asynchronous motors

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Applications

The Altivar 38 is a frequency inverter for three-phase asynchronous motors powered by a three-phase supply 380 V – 10% to 460 V + 10% or 480 V + 5% in the power range 0.75 kW to 315 kW.

The Altivar 38 has been designed for state-of-the-art applications in heating, ventilation and air conditioning (HVAC) in industrial and commercial buildings:

- ventilation
- air conditioning
- pumping

The Altivar 38 can reduce operating costs in buildings by optimizing energy consumption whilst improving user comfort.

Its numerous integrated options enable it to be adapted to and incorporated into electrical installations and sophisticated control systems.

The need for **electromagnetic compatibility** was taken into account at the outset of designing the drive. Depending on the drive rating, filters and chokes are either built-in or available as optional accessories.

Functions

The Altivar 38 (1) is supplied ready for use in pumping and ventilation applications.

It comprises a terminal (2) which can be used to modify programming, adjustment, control or monitoring functions in order to adapt and customize the application to meet individual customer requirements.

- **Specific functions for pumping/ventilation**:
  - Energy saving
  - Automatic catching a spinning load with speed detection (catch on the fly)
  - Adaptation of current limiting according to speed
  - Faster/slower, preset speeds
  - Integrated PI control, with preset PI references
  - Electricity and service hours meter
  - Motor noise reduction
- **Protection functions**:
  - Motor and fan thermal protection via PTC thermal probe
  - Protection against overloads and overcurrents in continuous operation
  - Machine mechanical protection via jump frequency function
  - Protection via multiple fault management and configurable alarms
- **Easy to integrate into control systems**:
  - 4 logic inputs, 2 relay outputs, 2 analogue inputs and 1 analogue output
  - Plug in I/O connectors
  - Display of electrical variables and operating indicators
  - An RS 485 multidrop serial link with Modbus protocol as standard in the drive. This serial link can be used to connect PLCs (6), a PC, communication gateways or one of the available programming tools.

Options

- **PowerSuite advanced dialogue solutions**:

  3 solutions are available, with plain text display in 5 languages (English, French, German, Spanish, Italian) and configuration memory:
  - Pocket PC for PowerSuite (3)
  - PowerSuite software workshop for PC (4)
  - Magelis display unit (5).
- **Customizing the application**:
  - I/O extension cards (8)
  - Application cards (8):

    pump switching, multi-motor function, multiple parameter settings and cycles
  - Communication cards for bus or network (8):

    METASYS N2, Ethernet, Fipio, Uni-Telway/Modbus, Modbus Plus, AS-Interface, Profibus DP, InterBus, CANopen, DeviceNet
  - Communication module for LonWorks bus (7).

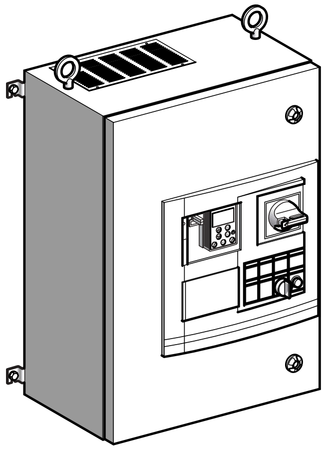
Standard versions

The Altivar 38 is available in two versions for integration into machines.

- Drive with heatsink
- Altivar 38 ENERGY ready-assembled drive with a power rating between 3 and 75 kW.

The IP 55 enclosure is equipped with a drive with a cooling system and a Vario switch disconnector. A slot is provided for an additional contactor. The drives are supplied with a built-in line choke.

This enclosure can be installed next to the motor.



Altivar 38 ENERGY

Characteristics:
pages 2/84 to 2/87
References:
pages 2/88 to 2/89
Dimensions:
pages 2/96 to 2/99
Schemes:
pages 2/100 to 2/103

Environment characteristics

Conforming to standards		Altivar 38 drives have been developed to conform to the strictest national and international standards and the recommendations relating to electrical industrial control devices (IEC, EN, NFC, VDE), in particular: ● Low voltage EN 50178 ● EMC immunity: - IEC 1000-4-2/EN 61000-4-2 level 3 - IEC 1000-4-3/EN 61000-4-3 level 3 - IEC 1000-4-4/EN 61000-4-4 level 4 - IEC 1000-4-5/EN 61000-4-5 level 3 - IEC 1800-3/EN 61800-3, environments 1 and 2 ● EMC, radiated and conducted emissions: - IEC 1800-3/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply), restricted distribution - EN 55011 class A (drives with built-in radio interference filters) - EN 55022 class B, with additional filters		
CE marking		The drives have been designed to meet the requirements of the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives. Altivar 38 drives are therefore permitted to carry the CE European Union mark.		
Product certifications				DNV (up to 75 kW), UL and CSA
Degree of protection	Conforming to EN 50178	ATV 38HU18N4 to HD23N4 and ATV 38HD25N4● to HD79N4● drives		IP 21 and IP 41 on upper part
		ATV 38HC10N4X to HC33N4X drives		IP 00 on lower part *(1)*, IP 20 on other sides
Vibration resistance	Conforming to IEC 60068-2-6	ATV 38HU18N4 to HD23N4 and ATV 38HD25N4● to HD79N4● drives		1.5 mm peak from 2 to 13 Hz 1 gn from 13 to 200 Hz
		ATV 38HC10N4X to HC33N4X drives		0.6 gn from 10 to 55 Hz 1 gn from 55 to 150 Hz
Shock resistance	Conforming to IEC 60068-2-27	All ratings		15 gn for 11 ms
Maximum ambient pollution	Conforming to UL 508C	ATV 38HD25N4 to HD79N4 and HD25N4X to HD79N4X drives		Level 3
	Conforming to IEC 664-1 and EN 50178	ATV 38HU18N4 to HD23N4 and ATV 38HC10N4X to HC33N4X drives		Level 2
Maximum relative humidity	Conforming to IEC 60068-2-3			93 % without condensation or dripping water
Ambient air temperature around the device	Storage	All ratings	**°C**	- 25...+ 65
	Operation	ATV 38HU18N4 to HU90N4 drives	**°C**	- 10...+ 50 without derating Up to + 60 with current derating of 2.2 % per °C above 50 °C
		ATV 38HD12N4 to HD23N4 and ATV 38HC10N4X to HC33N4X drives	**°C**	- 10...+ 40 without derating Up to + 50 with current derating of 2.2 % per °C above 40 °C
		ATV 38HD25N4 to HD79N4 and HD25N4X to HD79N4X drives	**°C**	- 10...+ 40 without derating Up to + 60 with ventilation kit, current derating of 2.2 % per °C above 40 °C
Maximum operating altitude			**m**	1000 without derating (above this, derate the current by 1 % per additional 100 m)
Operating position				Vertical

Drive characteristics

Output frequency range			**Hz**	0.1...500
Configurable switching frequency	Without derating, in continuous operation	ATV 38HU18N4 to HD46N4 and HD25N4X to HD46N4X drives	**kHz**	0.5-1-2-4
		ATV 38D54N4 to HD79N4 and HD54N4X to HC33N4X drives	**kHz**	0.5-1-2
	Without derating with intermittent operating cycle or with derating by one power rating in continuous operation	ATV 38HU18N4 to HD23N4 drives	**kHz**	8-12-16
		ATV 38HD25N4 to HD46N4 and HD25N4X to HD46N4X drives	**kHz**	8-12
		ATV 38HD54N4 to HD79N4 and HD54N4X to HD79N4X drives	**kHz**	4-8
		ATV 38HC10N4X to HC33N4X drives	**kHz**	4
Speed range				1...10
Transient overtorque		110 % of the nominal motor torque (typical value at ± 10 %) for 60 s		
Braking torque		30 % of the nominal motor torque without braking resistor (typical value) for low power ratings		
Principle of motor control		Pulse width modulation (PWM)		

(1) A protection device to prevent direct contact by personnel must be added.

Variable speed drives for asynchronous motors

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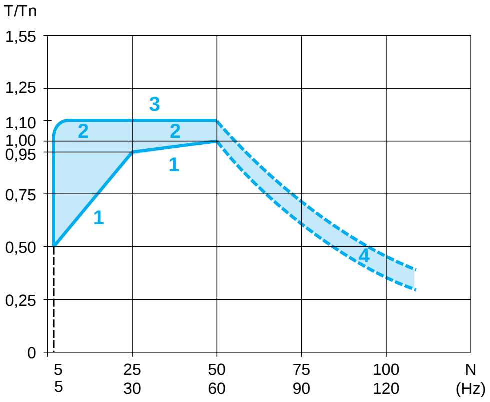
Electrical characteristics

Power supply	a.c. voltage	**V**	**ATV 38●●●●N4** and **●●●●N4X** drives: 380 - 10 % to 460 + 10 % or 480 + 5 %, three-phase
	Frequency	**Hz**	50 ± 5 % or 60 ± 5 %
Output voltage			Maximum voltage equal to line supply voltage
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Available internal supplies			Protected against short-circuits and overloads: - 1 x + 10 V (0, + 10 %) supply for the reference potentiometer (1…10 kΩ), maximum current 10 mA - 1 x + 24 V supply (min. 20 V, max. 30 V) for control inputs, maximum current 200 mA
Analogue inputs AI			1 analogue voltage input AI1: 0-10 V, impedance 30 kΩ 1 analogue current input AI2: 0-20 mA, impedance 100 Ω (reassignable to X-Y mA by programming X and Y with a precision of 0.1 mA) Frequency resolution at analogue reference: 0.1 Hz for 100 Hz (10 bits), precision ± 1 %, linearity ± 0.5 % of the maximum output frequency Sampling time: 4 ms max. Other analogue inputs: see option cards
Analogue output AO1			Assignable analogue output 0-20 mA, max. load impedance 500 Ω (reassignable to X-Y mA by programming X and Y from 0 to 20 with a precision of 0.1 mA) Resolution 0.04 mA (9 bits), linearity ± 0.1 mA, precision ± 0.2 mA Max. sampling time 2 ms Other analogue inputs: see option cards
Logic inputs LI			4 assignable logic inputs, impedance 3.5 kΩ, compatible with PLC level 1, standard IEC 65A-68. Maximum length of shielded cable: 100 m + 24 V power supply (min. 11 V, max. 30 V). State 0 if < 5 V, state 1 if ≥ 11 V Sampling time: 2 ms max. Other logic inputs: see option cards
Logic outputs			2 relay logic outputs R1 (fault relay) and R2 (assignable) 1 C/O contact protected against overvoltages (relay R1) 1 N/O contact protected against overvoltages (relay R2) Minimum switching capacity: 10 mA for ⎓ 24 V Maximum switching capacity: - on resistive load (cos φ = 1): 5 A for ∿ 250 V or ⎓ 30 V - on inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for ∿ 250 V or ⎓ 30 V. Other outputs: see option cards
Maximum connection capacity of I/O			1.5 mm^2 (AWG 14)
Communication			RS 485 multidrop serial link with Modbus protocol integrated into the drive Transmission speed: 9600 or 19200 bps, no parity Use: - connecting a terminal (option) or - connecting a microprocessor card or - connecting a PC or a pocket PC (options) or - connecting one or more PLCs
Acceleration and deceleration ramps			Ramp profiles can be selected: linear, S or U. Possibility of 2 ramp ranges which can be switched via frequency threshold or logic input. Can be adjusted separately between 0.05 and 999.9 s (precision 0.1 s) Automatic adaptation of deceleration ramp times if the braking capacity is exceeded (configurable option)
Braking to a standstill			By d.c. injection: - by a signal on an assignable logic input - automatically on stopping as soon as the frequency drops below 0.1 Hz, for a time which can be set between 0 and 30 s or alternately set - continuous
Main protection and safety features of the drive			Short-circuit protection: - between output phases - between output phases and earth - on internal supply outputs Thermal protection against excessive overheating and overcurrents Mains undervoltage and overvoltage safety circuits Loss of supply phase safety circuit (prevents single phase operation of 3-phase drives)
Motor protection			Thermal protection integrated into the drive via continuous calculation of $I^2 t$ taking the speed into account: - the motor thermal state is saved when the drive is powered down. - the function can be modified via the terminal or by using the PowerSuite advanced dialogue solutions, depending on the type of motor (force-cooled or self-cooled). Protection against motor phase breaks Protection via PTC probes with option card
Insulation resistance to earth		**MΩ**	> 500 (electrical isolation) at ⎓ 500 V
Dielectric strength		**V**	⎓ 2830 earth/power ∿ 2000 control/power

Torque characteristics (typical curves)

The curves below define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors.
The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.



1 Self-cooled motor: continuous useful torque
2 Force-cooled motor: continuous useful torque
3 Transient overtorque
4 Torque in overspeed at constant power

***Caution**: check the mechanical overspeed characteristics of the selected motor with the manufacturer.*

Motor thermal protection

The Altivar 38 drive features motor thermal protection designed specifically for self-cooled or forced-cooled variable speed motors.

This motor thermal protection is designed for a maximum ambient temperature of 40 °C around the motor.

If the temperature around the motor exceeds 40 °C, thermal protection should be provided directly by thermistor probes integrated into the motor using one of the available option cards.

Variable speed drives for asynchronous motors

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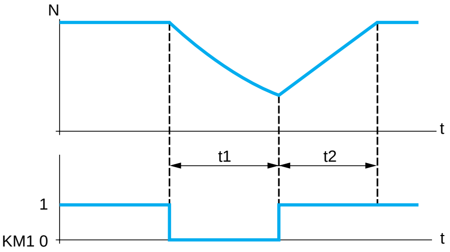
Special uses

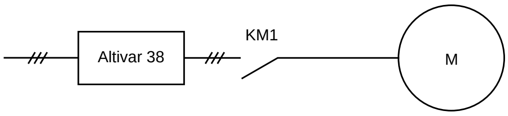
Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive locked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp.
The "flying restart" must be configured for this type of use and the "loss of motor phase" protection function must be disabled.

Example: breaking of downstream contactor

Typical applications: breaking safety circuit at drive outputs, "bypass" function, switching of motors connected in parallel



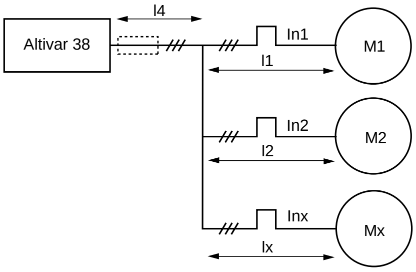


t1: deceleration without ramp
t2: acceleration with ramp

Operation with intermittent cycle and high switching frequency

If the operating conditions are intermittent and the maximum cumulative running time is 36 s per 60 s cycle (load factor 60 %), it is possible to operate at a high switching frequency without derating the power.
Switching frequencies (in kHz):
- 8-12-16 for ATV 38HU18N4 to HD23N4 drives.
- 8-12 for ATV 38HD25N4● to HD46N4● drives.
- 4 for ATV 38HD54N4● to HC33N4X drives.

Connecting motors in parallel



Calculating the drive rating:
In drive > In1 + In2 = ...Inx

The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled. In this case, provide external thermal protection for each motor using thermal probes or relays. If the number of motors connected in parallel is ⩾ 3, it is advisable to install an output filter between the drive and the motors or to reduce the switching frequency.

If several motors are used in parallel, there are 2 possible scenarios:
- the motors have equal power ratings, in which case the torque characteristics will remain optimised after the drive has been configured,
- the motors have different power ratings, in which case the drive configuration will be incompatible for the motors with the lowest power ratings and the overtorque at low speed will be considerably reduced.

Ensure that the cables are the correct length.
As the leakage currents are proportional to the total length of the cable between the drive and the motors, ensure L ⩽ 100 m by L = l1 + l2 + lx + l4.
For longer lengths, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

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Variable torque applications (110 % Tn)

ATV 38HU18N4

ATV 38HD28N4

ATV 38HC19N4X

3-phase supply voltage: 380...460 V 50/60 Hz

Motor	**Line supply** *(2)*	**Altivar 38**					
Power *(1)*	**Line current at 400 V**	**Nominal drive current**	**Max. transient current** *(3)*	**Power dissipated at nominal load** *(4)*	**Reference**		**Weight**
					With integral EMC filters	**No EMC filters**	
kW	**A**	**A**	**A**	**W**			**kg**
0.75	3.1	2.1	2.3	55	**ATV 38HU18N4**	–	3.800
1.5	5.4	3.7	4.1	65	**ATV 38HU29N4**	–	3.800
2.2	7.3	5.4	6	105	**ATV 38HU41N4**	–	3.800
3	10	7.1	7.8	145	**ATV 38HU54N4**	–	6.900
4	12.3	9.5	10.5	180	**ATV 38HU72N4**	–	6.900
5.5	16.3	11.8	13	220	**ATV 38HU90N4**	–	6.900
7.5	24.3	16	17.6	230	**ATV 38HD12N4**	–	13.000
11	33.5	22	24.2	340	**ATV 38HD16N4**	–	13.000
15	43.2	30	33	410	**ATV 38HD23N4**	–	15.000
18,5	42	37	41	670	**ATV 38HD25N4**	–	34.000
					–	**ATV 38HD25N4X**	34.000
22	49	44	49	750	**ATV 38HD28N4**	–	34.000
					–	**ATV 38HD28N4X**	34.000
30	65	60	66	925	**ATV 38HD33N4**	–	34.000
					–	**ATV 38HD33N4X**	34.000
37	79	72	80	1040	**ATV 38HD46N4**	–	34.000
					–	**ATV 38HD46N4X**	34.000
45	95	85	94	1045	**ATV 38HD54N4**	–	57.000
					–	**ATV 38HD54N4X**	57.000
55	118	105	116	1265	**ATV 38HD64N4**	–	57.000
					–	**ATV 38HD64N4X**	57.000
75	158	138	152	1730	**ATV 38HD79N4**	–	57.000
					–	**ATV 38HD79N4X**	57.000
90	156 *(5)*	173	190	2250	–	**ATV 38HC10N4X**	49.000
110	191 *(5)*	211	232	2750	–	**ATV 38HC13N4X**	75.000
132	229 *(5)*	253	278	3300	–	**ATV 38HC15N4X**	77.000
160	279 *(5)*	300	330	4000	–	**ATV 38HC19N4X**	77.000
200	347 *(5)*	370	407	5000	–	**ATV 38HC23N4X**	159.000
220	384 *(5)*	407	448	5500	–	**ATV 38HC25N4X**	166.000
250	433 *(5)*	450	495	6250	–	**ATV 38HC28N4X**	168.000
280	485 *(5)*	503	553	7000	–	**ATV 38HC31N4X**	168.000
315	536 *(5)*	564	620	7875	–	**ATV 38HC33N4X**	168.000

(1) Value indicated on the motor rating plate. These power levels are for the maximum switching frequency permitted by the drive (2 or 4 kHz depending on the rating) in continuous operation without derating. For switching frequencies above this level, the drive must be in intermittent operation or it must be set one rating lower (see special uses on the previous pages).

(2) The prospective short-circuit current at 400 V is 5 kA for ATV 38HU18N4 to HU90N4 drive ratings and 22 kA for ATV 38HD25N4● to HC33N4X drive ratings.

(3) For 60 seconds.

(4) These power levels are given for the maximum switching frequency permitted by the drive in continuous operation (2 or 4 Hz, depending on the rating).

(5) Line chokes must be used if the prospective short-circuit line current is greater than 22 kA. The current values given include the addition of a line choke.

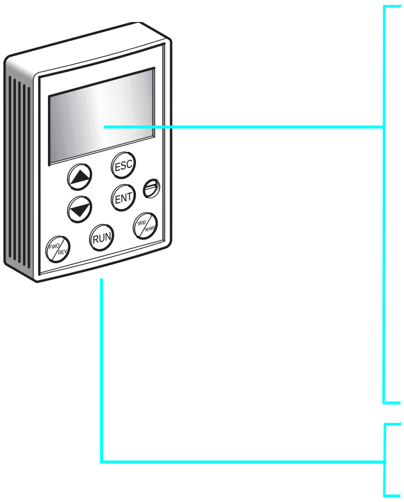
Variable speed drives for asynchronous motors
Altivar 38
Options: dialogue

Operator terminal

The removable operator terminal fits into a designated slot on the front panel of the drive. The operator terminal is supplied with the drive or can be ordered separately.

The operator terminal can be used:
- in 5 languages (English, French, German, Spanish, Italian),
- to control, adjust and configure the drive,
- for visible remote signalling,
- to save and download configurations (4 files can be saved).

Its maximum operating temperature is 60 °C.



Display (backlit)

↺	Flashing: indicates the selected direction of rotation
↻	Steady: indicates the direction of motor rotation
LOC	Indicates control via the display module
PROG	Appears in setup and programming mode Flashing: indicates that a value has been modified but not saved

4 digits visible at 5 m: displays numeric values and codes
One line of 16 characters: displays messages in plain text

The keys are used:
To adjust and configure the drive
To control the drive

Description	Reference (if ordered separately)	Weight kg
Operator terminal	**VW3 A58101**	0.200

Kit for remote operator terminal

The removable operator terminal can be used remotely, mounted on an enclosure door, using this kit.

Description	Reference	Weight kg
Kit comprising: - 1 cable fitted with connectors, length 3 m - seals and screws for IP 65 mounting on an enclosure door - installation guide	**VW3 A58103**	0.200

PowerSuite software workshop

See pages 3/2 and 3/3.

Connection kit for RS 485

This kit can be used to connect the drive to PLCs, operator terminals, etc., via the RS 485 multidrop serial link. The kit is connected instead of the operator terminal (the two cannot be used simultaneously).

Description	Reference	Weight kg
Connection kit for RS 485 comprising: - 1 x 3 m cable with 1 male 9-way SUB-D connector and 1 male 15-way SUB-D connector - installation guide	**VW3 A58306**	0.200

I/O extension cards

See pages 2/140 and 2/141.

Communication options

See pages 2/142 and 2/143.

Variable speed drives for asynchronous motors

Altivar 38

Options: accessories

VW3 A58823

Control card fan kit

The fan kit enables the drive to operate at an ambient temperature of 60 °C, for example if it is mounted in an IP 54 enclosure. The circulation of air around the electronic cards prevents the formation of hot spots.

This kit is mounted on the upper part of the drive. It is powered by the drive.

The kit consists of:
- a fan subassembly,
- mounting accessories.

For drives	Reference	Weight kg
ATV 38HU18N4, HU29N4, HU41N4	**VW3 A58822**	0.450
ATV 38HU54N4, HU72N4, HU90N4	**VW3 A58823**	0.450
ATV 38HD12N4, HD16N4, HD23N4	**VW3 A58824**	0.500
ATV 38HD25N4, HD28N4, HD33N4, HD46N4 ATV 38HD25N4X, HD28N4X, HD33N4X, HD46N4X	**VW3 A58825**	1.200
ATV 38HD54N4, HD64N4, HD79N4 ATV 38HD54N4X, HD64N4X, HD79N4X	**VW3 A58826**	1.200

NEMA type 1 kit (IP 21 protection for mounting outside a wall-fixing or floor-standing enclosure)

The kit permits the connection of cables conforming to the NEMA type 1 standard.

The kit will provide IP 21 protection if the drive is mounted directly on a wall and not inside a wall-fixing or floor-standing enclosure.

This kit is mounted on the lower part of the drive.

The kit consists of:
- a cover made up of two metal parts,
- mounting accessories.

For drives	Reference	Weight kg
ATV 38HU18N4, HU29N4, HU41N4	**VW3 A58852**	0.950
ATV 38HU54N4, HU72N4, HU90N4	**VW3 A58853**	1.000
ATV 38HD12N4, HD16N4	**VW3 A58854**	1.100
ATV 38HD23N4	**VW3 A58855**	1.100
ATV 38HD25N4, HD28N4, HD33N4, HD46N4	**VW3 A58856**	1.120
ATV 38HD54N4, HD64N4, HD79N4	**VW3 A58857**	3.200

Dimensions:
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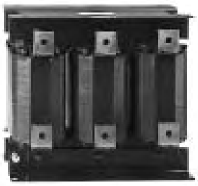
Variable speed drives for asynchronous motors

Altivar 38

Options: line chokes

Presentation

VW3 A6650●



VW3 A6850●

Line chokes can be used to provide improved protection against overvoltages on the line supply and to reduce harmonic distortion of the current produced by the drive.
The recommended chokes are used to limit the line current.
The use of line chokes is recommended in particular under the following circumstances:

- Line supply with significant interference from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases > 1.8% of the nominal voltage
- Line with very low impedance (in the vicinity of power transformers 10 times more powerful than the drive rating)
- Large number of frequency converters on the same line in order to reduce the line current
- Use of cos φ correction capacitors or a power factor correction unit.

ATV 38HD25N4 (18.5 kW) to HD79N4 (75 kW) and ATV 38HD25N4X (18.5 kW) to HD79N4X (75 kW) drives have a built-in line choke which limits the line current to the value of the nominal current of the motor.

Characteristics

Chokes		**VW3 A66501 to VW3 A66503**	**VW3 A66504**	**VW3 A6850●**
Conforming to standards		EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply)		IEC 60076 (with HD 398)
Voltage drop		Between 3 and 5 % of the supply voltage. Values higher than this will cause loss of torque.		
Degree of protection	Choke	IP 00	IP 00	IP 00
	Terminals	IP 20	IP 10	–

References

Drive				**Choke**				
	Prospective line Isc	**Line current without choke at 400 V**	**Line current with choke**	**Value of the choke**	**Nominal current**	**Loss**	**Reference**	**Weight**
	kA	**A**	**A**	**mH**	**A**	**W**		**kg**
3-phase supply voltage: 380 V - 10 %...460 V + 10 %								
ATV 38HU18N4	5	3.1	1.8	10	4	45	**VW3 A66501**	1.500
ATV 38HU29N4	5	5.4	3.3	10	4	45	**VW3 A66501**	1.500
ATV 38HU41N4	5	7.3	4.8	4	10	65	**VW3 A66502**	3.000
ATV 38HU54N4	5	10	6.4	4	10	65	**VW3 A66502**	3.000
ATV 38HU72N4	5	12.3	8.3	4	10	65	**VW3 A66502**	3.000
ATV 38HU90N4	5	16.3	11.6	2	16	75	**VW3 A66503**	3.500
ATV 38HD12N4	22	24.3	15.4	2	16	75	**VW3 A66503**	3.500
ATV 38HD16N4	22	33.5	22.7	1	30	90	**VW3 A66504**	6.000
ATV 38HD23N4	22	43.2	29.4	1	30	90	**VW3 A66504**	6.000
ATV 38HD25N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HD28N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HD33N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HD46N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HD54N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HD64N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HD79N4● *(1)*	22	–	–	–	–	–	–	–
ATV 38HC10N4X	22	–	156 *(2)*	0.220	160	220	**VW3 A68501**	35.000
ATV 38HC13N4X	22	–	191 *(2)*	0.155	195	220	**VW3 A68502**	35.000
ATV 38HC15N4X	22	–	229 *(2)*	0.120	235	220	**VW3 A68503**	40.000
ATV 38HC19N4X	22	–	279 *(2)*	0.098	280	245	**VW3 A68504**	50.000
ATV 38HC23N4X	22	–	347 *(2)*	0.066	365	270	**VW3 A68505**	50.000
ATV 38HC25N4X, ATV 38HC28N4X	22	–	384 *(2)*	0.049	455	270	**VW3 A68506**	55.000
ATV 38HC31N4X, ATV 38HC33N4X	22	–	433 *(2)*	0.038	540	280	**VW3 A68507**	60.000

(1) The line choke is integrated into these drives.
(2) The addition of a line choke is recommended in particular for these drive ratings. The current values given include the addition of a line choke.

Dimensions:
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Variable speed drives for asynchronous motors

Altivar 38

Options: radio interference input filters

Presentation

VW3 A68403

VW3 A68465

Function

■ **Note about built-in filters**:
ATV 38HU18N4 to HD79N4 drives have a built-in radio interference filter to meet EMC "product" standards for speed drives IEC 1800-3 and EN 61800-3. Compliance with these standards is sufficient to meet the requirements of the European EMC (electromagnetic compatibility) directive.

■ **Additional input filters**:
The additional radio interference input filters enable the drives to meet more stringent requirements.
These filters are designed to reduce emissions conducted on the line supply below the limits of standards EN 55011 class A or EN 55022 class B. They can be added to the following drives:

- ☐ ATV 38HU18N4 to ATV 38 D23N4 which already have a built-in filter, if the motor cable is more than 5 m long,
- ☐ ATV 38HD25N4● to ATV 38 D79N4● *(1)*, available with or without built-in filters, if the motor cable is more than 25 m long,
- ☐ ATV 38HC10N4X to ATV 38HC33N4X without built-in filters.

Additional input filters should be installed on the line supply, upstream of the drive, if the surrounding environment is subject to electromagnetic interference and radio-electric frequencies above 150 kHz.
VW3 A58402 to VW3 A58408 filters can be installed on ATV 38H●●●● drives. They act as supports for the drives and are fixed to them via tapped holes.
VW3 A68401 to VW3 A68403 and VW3 A68415, A68435 and A68465 filters should be installed next to the drives.
The motor cables should be shielded and not exceed the maximum length given in the reference table.
For the filter to operate efficiently, the installation conditions must be carefully respected.

Use according to the type of mains supply

The **built-in filters** are compatible with IT connection (impeding or isolated neutral) up to 460 V. They help to attenuate interference even in conditions not defined by the EMC standard.
These **additional input filters** may only be used on TN (connected to neutral) and TT (neutral to earth) type supplies. They are not permitted on IT (impedance or isolated neutral) supplies.

(1) If EMC conformance is not required, replace ● with an X in the drive reference.

Characteristics

Filters			**VW3 A5840●**	**VW3 A684●●**
Conforming to standards			EN 133200	
Degree of protection			IP 21 and IP 41 on upper part	IP 00
Maximum relative humidity			93 % without condensation or dripping water conforming to IEC 60068-2-3	
Maximum operating temperature	Operation	**°C**	- 10...+ 60	0...+ 45, up to + 55 with current derating of 2 % per °C above 45 °C
	Storage	**°C**	- 25...+ 70	
Maximum operating altitude	Without derating	**m**	1000 (above this, derate the current by 1 % per additional 100 m)	

Dimensions:
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Variable speed drives for asynchronous motors

Altivar 38

Options: radio interference input filters

References

For drives	Filters				
	Maximum length of motor cable *(1)*		**Nominal filter current**	**Reference**	**Weight**
	EN 55011 class A	**EN 55022 class B**			
	m	**m**	**A**		**kg**
3-phase supply voltage: 380 V - 10 %...460 V + 10 % 50-60Hz					
ATV 38HU18N4, HU29N4, HU41N4	50	20	25	**VW3 A58402**	3.600
ATV 38HU54N4, HU72N4, HU90N4	50	20	25	**VW3 A58403**	5.000
ATV 38HD12N4, HD16N4	50	20	45	**VW3 A58404**	10.000
ATV 38HD23N4	50	20	45	**VW3 A58405**	13.000
ATV 38HD25N4	200	100	50	**VW3 A58406**	13.000
ATV 38HD25N4X	50	20	50	**VW3 A58406**	13.000
ATV 38HD28N4	200	100	50	**VW3 A58406**	13.000
ATV 38HD28N4X	50	20	50	**VW3 A58406**	13.000
ATV 38HD33N4, HD46N4	200	100	80	**VW3 A58407**	13.000
ATV 38HD33N4X, HD46N4X	50	20	80	**VW3 A58407**	13.000
ATV 38HD54N4, HD64N4, HD79N4,	200	100	160	**VW3 A58408**	20.000
ATV 38HD54N4X, HD64N4X, HD79N4X	50	20	160	**VW3 A58408**	20.000

For drives	Filters					
	Maximum length of motor cable *(1)*		**Nominal filter current**	**Loss**	**Reference**	**Weight**
	With motor choke	**Without motor choke**				
	m	**m**	**A**	**W**		**kg**
Supply voltage: 400 V (± 15 %)						
ATV 38HC10N4X	120	40	170	20	**VW3 A68401** *(2)*	5.000
ATV 38HC13N4X and HC15N4X	150	40	300	40	**VW3 A68402** *(2)*	5.500
ATV 38HC19N4X	100	40	300	40	**VW3 A68402** *(2)*	5.500
ATV 38HC23N4X, HC25N4X, HC28N4X, HC31N4X and HC33N4X	120	40	570	60	**VW3 A68403** *(2)*	6.000
Supply voltage: 440 V...460 V (± 15 %)						
ATV 38HC10N4X	100	25	180	38	**VW3 A68415**	6.500
ATV 38HC13N4X, HC15N4X and HC19N4X	120	25	320	40	**VW3 A68435**	10.500
ATV 38HC23N4X, HC25N4X, HC28N4X, HC31N4X and HC33N4X	100	25	600	65	**VW3 A68465**	11.000

(1) The length of the shielded cables connecting the motor to the drive is limited. If motors are connected in parallel, it is the total length that should be taken into account. The limits are given as examples only as they vary depending on the interference capacity of the motors and the cables used.
ATV 38HU18N4 to ATV 38HD79N4● drives: cable length limits given for a switching frequency between 0.5 and 12 kHz.
ATV 38HC10N4X to ATV 38HC33N4X drives: cable length limits given for a modulation frequency of 2.5 kHz. They should be multiplied by 0.6 for a frequency of 5 kHz and by 0.3 for 10 kHz. If the motor cable is longer, the addition of a motor choke enables the length to be multiplied by 2.5, and the use of a single cable with a larger cross-section instead of several cables in parallel enables it to be multiplied by 1.5 or 2 if it is not shielded. In this case the radiated emissions are not limited.

(2) Filters VW3 A68401 to 403 have 2 parts: the line choke should be mounted between them.

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Variable speed drives for asynchronous motors

Altivar 38

Options: output filters and motor chokes

Presentation

By inserting an output filter between the drive and the motor, it is possible to:

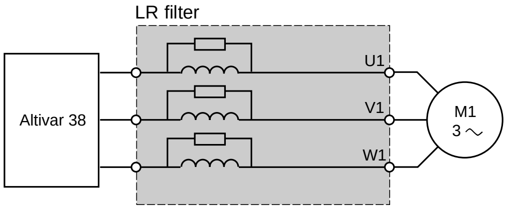
- Limit $\frac{dv}{dt}$ to 500 V/µs at 400 V.
- Limit overvoltages to on the motor terminals to 1000 V at 400 V.
- Filter interference caused by opening a contactor placed between the filter and the motor.
- Reduce the motor earth leakage current.

The offer comprises three types of filters and motor chokes.

Principle

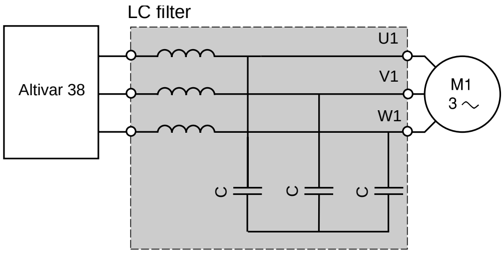
LR filter cell

This cell comprises 3 high frequency chokes and 3 resistors.



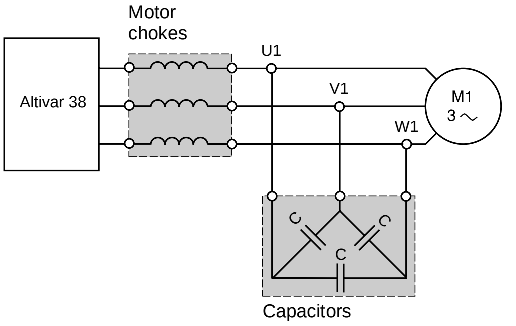
LC filter cell

This cell comprises 3 high frequency chokes and 3 capacitors.



Choke + capacitor combination

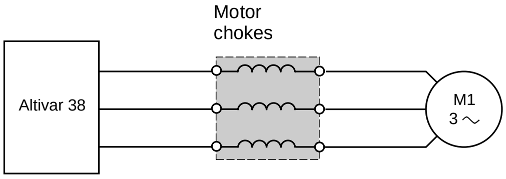
This combination comprises 3 capacitors installed in a delta connection in a junction box to be connected to a VW3 A6650● 3-phase line choke.



Motor choke

Overvoltages on the motor terminals can be limited by inserting an output choke between the drive and the motor. This is recommended for motor cable lengths over:

- 50 m (shielded cables) or 100 m (unshielded cables) for ATV 38HU18N4 to ATV 38HD79N4● drives,
- 50 m (shielded cables) or 80 m (unshielded cables) for ATV 38HC10N4X to ATV 38HC33N4X drives.



Characteristics *(1)*

			LR filter cells *(2)*	**LC filter cells**		**Chokes + capacitors combinations**		**Motor chokes**	
				VW3 A6641●		**VW3 A6650● + VW3 A66421**		**VW3 A6650●**	**VW3 A6855●**
Drive switching frequency		**kHz**	0.5 ... 4 max.	2 or 4	12	2 or 4	12	4	–
Length of motor cable	Shielded cables	**m**	⩽ 80	⩽ 100	⩽ 50	⩽ 40	⩽ 20	⩽ 100	(3)
	Unshielded cables	**m**	⩽ 80	⩽ 40	⩽ 100	⩽ 200	⩽ 100	–	(3)
Degree of protection			IP 20	IP 00	IP 00	IP 00	IP 00	IP 20	IP 00

(1) Filter performance is ensured if the cable lengths between the motor and the drive given in the above table are not exceeded. If motors are connected in parallel, it is the total length that should be taken into account. If a cable longer than that recommended is used, the filters may overheat.

(2) For frequencies greater than 4 kHz or cable lengths longer than 100 m, please consult your Regional Sales Office.

(3) See page 2/95.

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Variable speed drives for asynchronous motors

Altivar 38

Options: output filters and motor chokes

LR filter cells

For drives	Nominal current A	Loss W	Reference	Weight kg
ATV 38HU18N4 to HU72N4	10	150	**VW3 A58451**	7.400
ATV 38HU90N4	16	180	**VW3 A58452**	7.400
ATV 38HD12N4 to HD23N4	33	220	**VW3 A58453**	12.500

LC filter cells

For drives	Reference	Weight kg
ATV 38HD25N4 to HD33N4, **ATV 38HD25N4X to HD33N4X**	**VW3 A66412**	35.000
ATV 38HD46N4 to HD64N4 **ATV 38HD46N4X to HD64N4X**	**VW3 A66413**	40.000

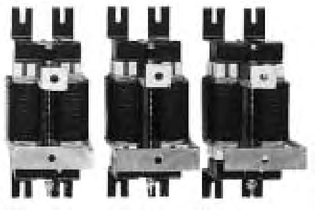
Chokes *(1)* + capacitors combination

For drives	Description	Reference	Weight kg
ATV 38HD25N4 to HD46N4 **ATV 38HD25N4X to HD46N4X**	Motor chokes	**VW3 A66506**	16.000
	Capacitors *(2)*	**VW3 A66421**	0.250
ATV 38HD54N4 to HD79N4 **ATV 38HD54N4X to HD79N4X**	Motor chokes	**VW3 A66507**	45.000
	Capacitors *(2)*	**VW3 A66421**	0.250

Motor chokes

For drives	Reference	Weight kg
ATV 38HD23N4 to HD46N4 **ATV 38HD25N4X to HD46N4X**	**VW3 A66506**	16.000
ATV 38HD54N4 to HD79N4 **ATV 38HD54N4X to HD79N4X**	**VW3 A66507**	45.000

For drives	Maximum length of motor cable *(3)*		Nominal current	Max. loss	Reference	Weight
	Unshielded	Shielded				
	m	m	A	W		kg
Power supply voltage 400 V ± 15 %						
ATV 38HC10N4X	250	150	170	500	**VW3 A68551**	11.500
ATV 38HC13N4X	300	200	300	650	**VW3 A68552**	18.000
ATV 38HC15N4X	300	200	300	650	**VW3 A68552**	18.000
ATV 38HC19N4X	250	150	300	650	**VW3 A68552**	18.000
ATV 38HC23N4X	300	250	580	800	**VW3 A68553**	40.000
ATV 38HC25N4X **ATV 38HC28N4X**	300	250	580	800	**VW3 A68553**	40.000
ATV 38HC31N4X **ATV 38HC33N4X**	250	200	580	800	**VW3 A68553**	40.000
Power supply voltage 440 V - 10 %…460 V +10 %						
ATV 38HC10N4X	200	150	170	500	**VW3 A68551**	11.500
ATV 38HC13N4X	250	200	300	650	**VW3 A68552**	18.000
ATV 38HC15N4X	250	200	300	650	**VW3 A68552**	18.000
ATV 38HC19N4X	200	150	300	650	**VW3 A68552**	18.000
ATV 38HC23N4X	280	200	580	800	**VW3 A68553**	40.000
ATV 38HC25N4X **ATV 38HC28N4X**	250	200	580	800	**VW3 A68553**	40.000
ATV 38HC31N4X **ATV 38HC33N4X**	220	180	580	800	**VW3 A68553**	40.000



VW3 A68553

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(1) It is not recommended to connect option VW3 A66421 to drive terminals without chokes as this could cause a drive fault to be displayed.

(2) Connected to terminals S1, S2, S3 of the selected choke using wires with a cross-section of 1.5 mm^2.

(3) For longer cables, please consult your Regional Sales Office.
Choke performance is ensured if the cable lengths above are not exceeded. If motors are connected in parallel, it is the total length that should be taken into account. If a cable longer than that recommended is used, the motor chokes may overheat.

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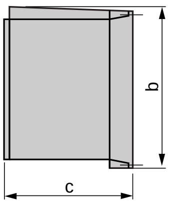
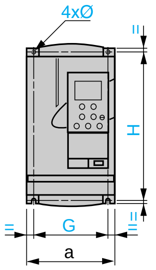
ATV 38HU18N4 to ATV 38HD23N4

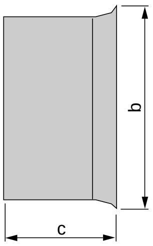


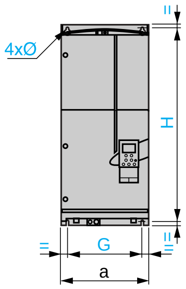


ATV 38H	a	b	c	G	H	Ø
U18N4, U29N4, U41N4	150	230	184	133	210	5
U54N4, U72N4, U90N4	175	286	184	155	270	5.5
D12N4, D16N4	230	325	210	200	310	5.5
D23N4	230	415	210	200	400	5.5

Maximum connection capacity: all terminals ATV 38H
U18N4 to U90N4: 6 mm² (AWG 8)
D12N4 to D23N4: 10 mm² (AWG 6)

ATV 38HD25N4● to ATV 38HD79N4●

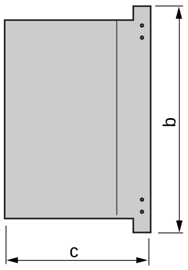


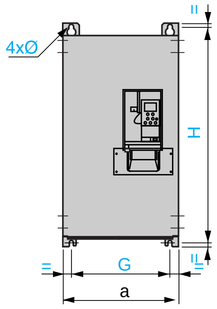


ATV 38H	a	b	c	G	H	Ø
D25N4●, D28N4●, D33N4●, D46N4●	240	550	283	205	530	7
D54N4●, D64N4●, D79N4●	350	650	304	300	619	9

Maximum connection capacity: all terminals ATV 38H
D25N4●, D28N4●: 16 mm² (AWG 4)
D33N4●, D46N4●: 35 mm² (AWG 2)
D54N4● to D79N4●: 70 mm² (AWG 2/0)

ATV 38HC10N4X to ATV 38HC33N4X



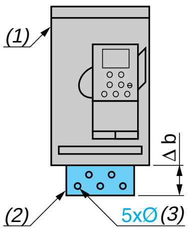


ATV 38H	a	b	c	G	H	Ø
C10N4X	370	630	360	317.5	609	12
C13N4X, C15N4X, C19N4X	480	680	400	426	652	12
C23N4X, C25N4X, C28N4X, C31N4X, C33N4X	660	950	440	598	920	15

Maximum connection capacity

ATV 38H	Earth connection	Power terminal
C10N4X to C15N4X	**60 mm²**	**100 mm²**
C19N4X	**100 mm²**	**150 mm²**
C23N4X to C25N4X	**100 mm²**	**200 mm²**
C28N4X to C33N4X	**150 mm²**	**150 x 2 mm²**

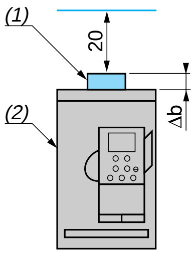
EMC mounting plate (supplied with drive)



Mounting on ATV 38H	Δb	Ø *(3)*
U18N4 to U90N4	64.5	M4
D12N4 to D23N4	62	M4
D25N4● to D46N4●	80	M5
D54N4● to D79N4●	110	M5

(1) Drive
(2) Mounting plate
(3) Tapped holes for fixing the EMC clamps

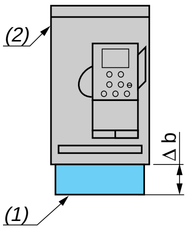
Control card fan kit



VW3	Δb
A58822	25
A58823	25
A58824	25
A58825	60
A58826	60

(1) VW3 A58822 to VW3 A58826
(2) Drive

NEMA type 1 kit



VW3	Δb
A58852	71
A58853	75
A58854	75
A58855	75
A58856	89
A58857	171

(1) VW3 A58852 to VW3 A58857
(2) Drive

Presentation:
pages 2/82 and 2/83

Characteristics:
pages 2/84 to 2/87

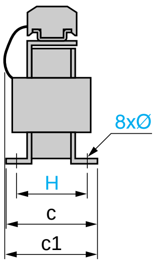
References:
pages 2/88 and 2/89

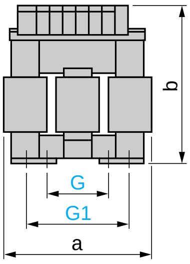
Schemes:
pages 2/100 to 2/103

Variable speed drives for asynchronous motors

Altivar 38

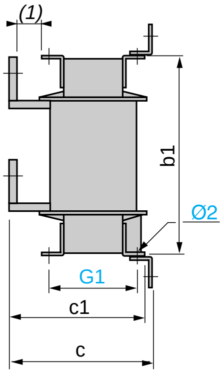
3-phase chokes (line and motor) VW3 A66501 to VW3 A66507

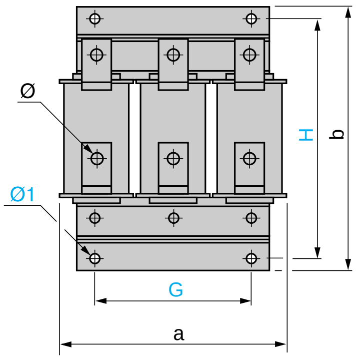




VW3	a	b	c	c1	G	G1	H	Ø
Line chokes								
A66501	100	135	55	60	40	60	42	6 x 9
A66502	130	155	85	90	60	80.5	62	6 x 12
A66503	130	155	85	90	60	80.5	62	6 x 12
A66504	155	170	115	135	75	107	90	6 x 12
Motor chokes								
A66506	275	210	130	160	105	181	100	11 x 22
A66507	320	290	172	215	190	230	142	–

3-phase line chokes VW3 A68501 to VW3 A68507

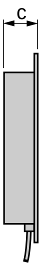


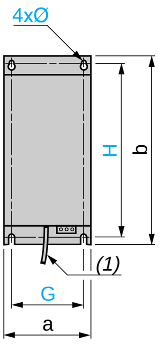


VW3	a	b	b1	c	c1	G	G1	H	Ø	Ø1	Ø2
A68501	280	305	240	210	200	200	125	275	9	9	9
A68502	280	330	260	210	200	200	125	300	11	9	9
A68503	320	380	300	210	200	225	150	350	11	9	9
A68504	320	380	300	210	200	225	150	350	11	9	9
A68505	320	380	300	250	230	225	150	350	13	11	11
A68506	320	380	300	250	230	225	150	350	13	11	11
A68507	320	380	300	250	230	225	150	350	13	11	11

(1) min. 25 mm

Radio interference suppression filters (EMC) VW3 A58402 to VW3 A58408

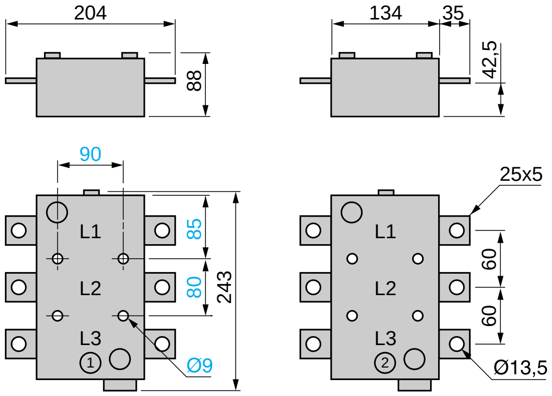




VW3	a	b	c	G	H	Ø
A58402	150	276	50	133	260	5
A58403	175	340	60	153	320	6
A58404	230	390	60	200	370	6
A58405	230	480	60	200	460	6
A58406	240	690	85	205	650	7
A58407	240	690	85	205	650	7
A58408	350	770	90	300	770	9

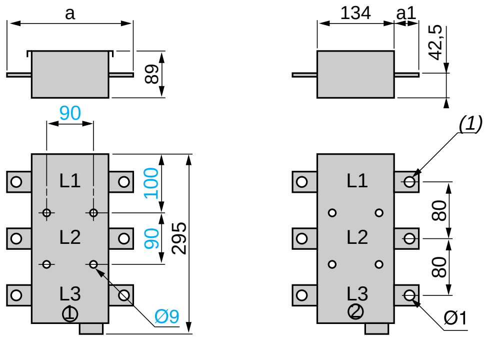
(1) Cable

VW3 A68401 (2 elements)



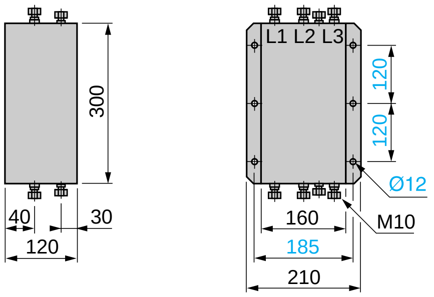
Radio interference suppression filters (EMC) (continued)

VW3 A68402, A68403 (2 elements)

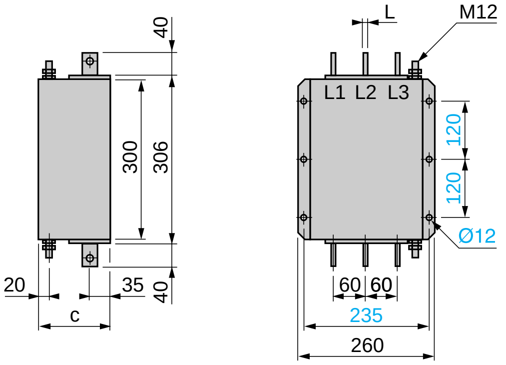


VW3	a	a1	Ø	(1)
A68402	204	35	11	bar 30 x 5
A68403	224	40	13.5	bar 40 x 5

VW3 A68415

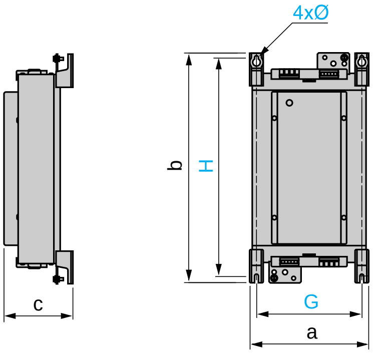


VW3 A68435 and A68465



VW3	c	L
A68435	115	6
A68465	135	8

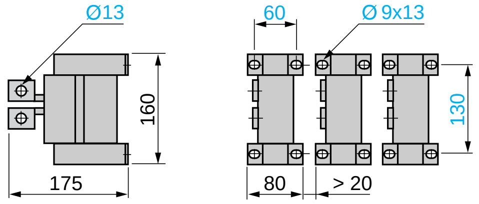
Output filters
VW3 A58451 to A58453



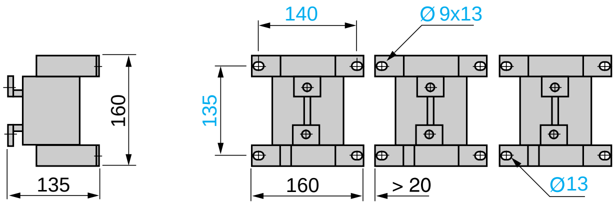
VW3	a	b	c	G	H	Ø
A58451	169.5	340	123	150	315	7
A58452	169.5	340	123	150	315	7
A58453	239	467.5	139.5	212	444	7

Additional motor chokes

VW3 A68551

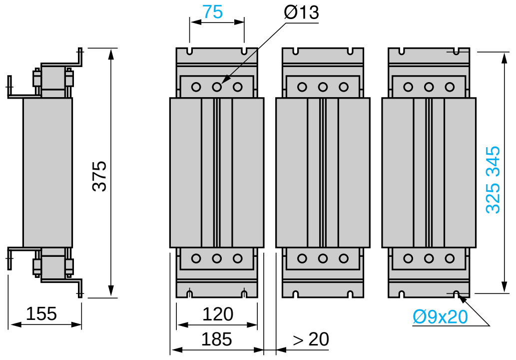


VW3 A68552



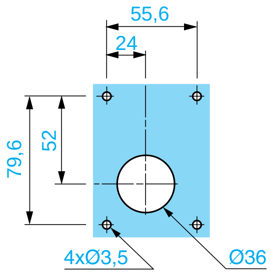
Additional motor chokes

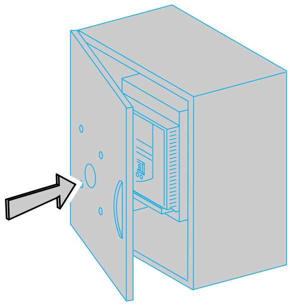
VW3 A68553



Mounting the remote operator terminal

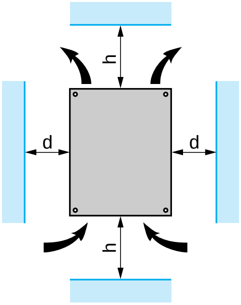
VW3 A58103

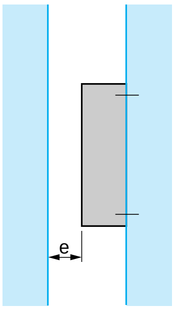




Mounting recommendations

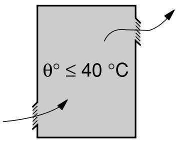
Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories. Install the unit vertically, at ± 10º.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

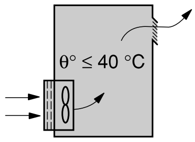




Drive	Mounting recommendations
ATV 38HU18N4 to **ATV 38HU90N4**	e ⩾ 10 mm, h ⩾ 50 mm **-10…+40 °C** d ⩾ 50 mm, no special precautions d = 0 mm, remove the drive's protective blanking cover (the degree of protection will then be IP 20) **+40…+50 °C** d ⩾ 50 mm, remove the drive's protective blanking cover (the degree of protection will then be IP 20) **+50…+60 °C** d ⩾ 50 mm, add the VW3 A5882● control card fan kit. Derate the current by 2.2 % per °C above 50 °C.
ATV 38HD12N4 to **ATV 38HD23N4**	e ⩾ 10 mm, h ⩾ 50 mm **-10…+40 °C** d ⩾ 50 mm, no special precautions d = 0 mm, remove the drive's protective blanking cover (the degree of protection will then be IP 20) **+40…+50 °C** d ⩾ 50 mm, remove the drive's protective blanking cover (the degree of protection will then be IP 20). Derate the current by 2.2 % per °C above 40 °C. d = 0 mm, add the VW3 A5882● control card fan kit. Derate the current by 2.2 % per °C above 40 °C.
ATV 38HD25N4● to **ATV 38HD79N4●**	e ⩾ 50 mm, h ⩾ 100 mm, d ⩾ 50 mm **- 10…+ 40 °C**, no special precautions **+ 40…+ 50 °C**, add the VW3 A588●●● control card fan kit. Derate the current by 2.2 % per °C above 40 °C.
ATV 38HC10N4X to **ATV 38HC33N4X**	e ⩾ 50 mm, h ⩾ 100 mm, d ⩾ 50 mm **- 10…+ 40 °C**, no special precautions **+ 40…+ 50 °C**, derate the current by 2.2 % per °C over 40 °C.

Mounting in a metal wall-mounted or floor-standing enclosure with degree of protection IP 23 or IP 54





- Observe the mounting recommendations above.
- To ensure proper air circulation in the drive: fit ventilation grilles, ensure that the ventilation is adequate - if not, install forced ventilation with a filter.
- Use special filters with IP 54 protection.

Fan flow rate depending on the drive rating

ATV 38 drive	Flow rate m^3/hour
ATV 38HU18N4	not cooled
ATV 38HU29N4, HU41N4, U54N4	36
ATV 38HU72N4, HU90N4, HD12N4, HD16N4, HD23N4	72
ATV 38HD25N4●, HD28N4●, HD33N4●, HD46N4●	292
ATV 38HD54N4●, HD64N4●, HD79N4●	492
ATV 38HC10N4X	600
ATV 38HC13N4X, HC15N4X, HC19N4X	900
ATV 38HC23N4X, HC25N4X, HC28N4X, HC31N4X, HC33N4X	900

Metal wall-mounted or floor-standing enclosure with IP 54 degree of protection

The drive must be mounted in a dust and damp proof casing in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
To avoid hot spots in the drive, add a fan to circulate the air inside the enclosure, reference VW3 A5882● (see page 2/90). This enables the drive to be used in an enclosure where the maximum internal temperature can reach 60 ºC.

Calculating the size of the wall-mounted or floor-standing enclosure

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

θ = maximum temperature inside the enclosure in °C, θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by drive: see page 2/88. Add the power dissipated by the other equipment components.

Effective exchange surface area of enclosure S (m^2)

(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

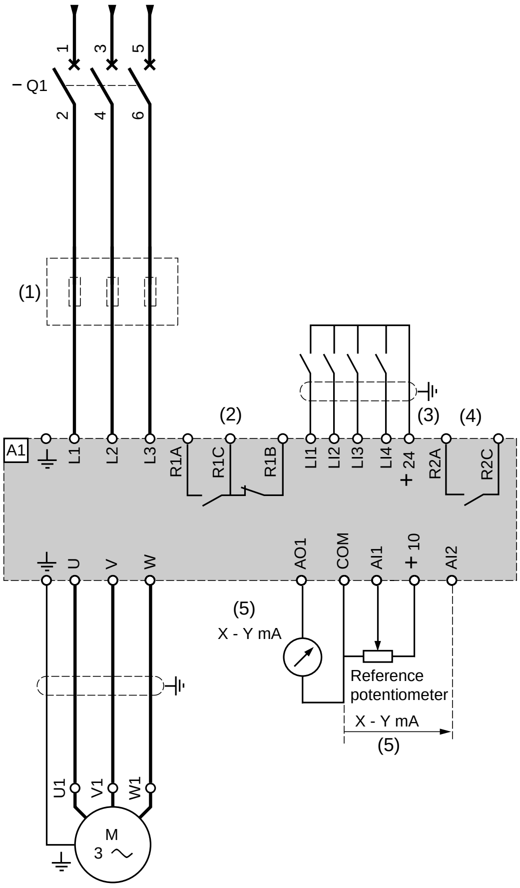
K is the thermal resistance per m^2 of casing

For ACM type metal enclosures: K = 0.12 with internal fan, K = 0.15 without fan.
Caution: do not use insulated enclosures as they have a poor level of conductivity.

Scheme without line contactor, recommended for machines which are not dangerous

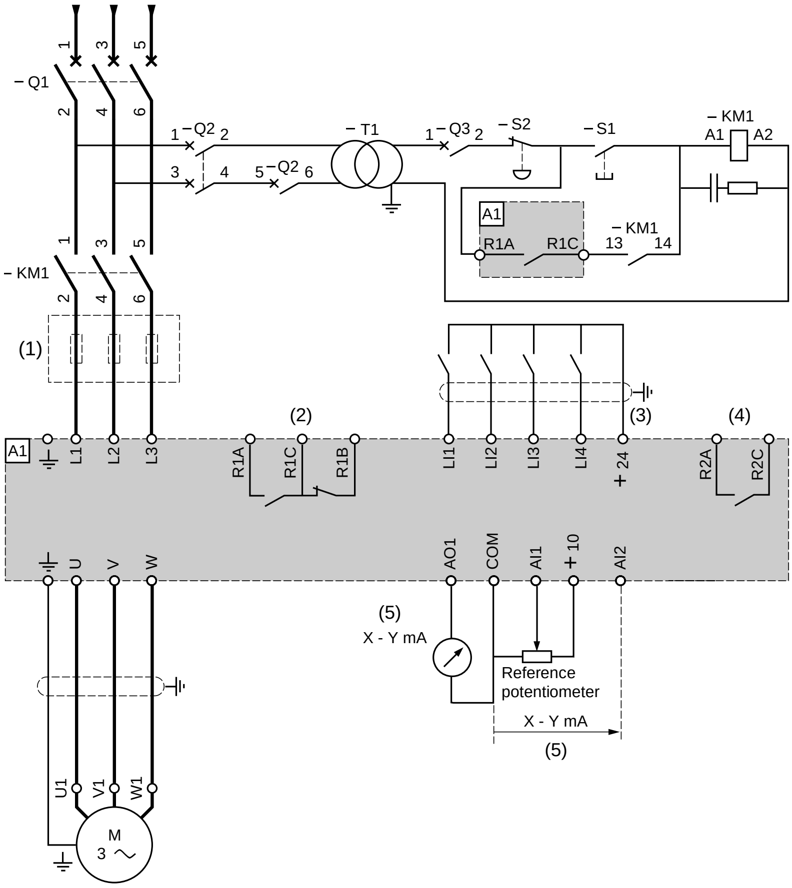
ATV 38H●●●●

3-phase power supply



Scheme with line contactor, recommended for dangerous machines which are switched off and on infrequently

3-phase power supply



(1) Line choke recommended.

(2) Fault relay contacts for remote signalling of drive status.

(3) Internal + 24 V. If an external + 24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 24 terminal on the drive, and connect the common of the LI inputs to the + 24 V of the external supply.

(4) Relay R2 can be reassigned .

(5) X and Y can be configured between 0 and 20 mA independently for AI2 and AO1.

Nota :

1. *All terminals are located at the bottom of the drive.*
2. *Fit interference suppressors to all specific circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

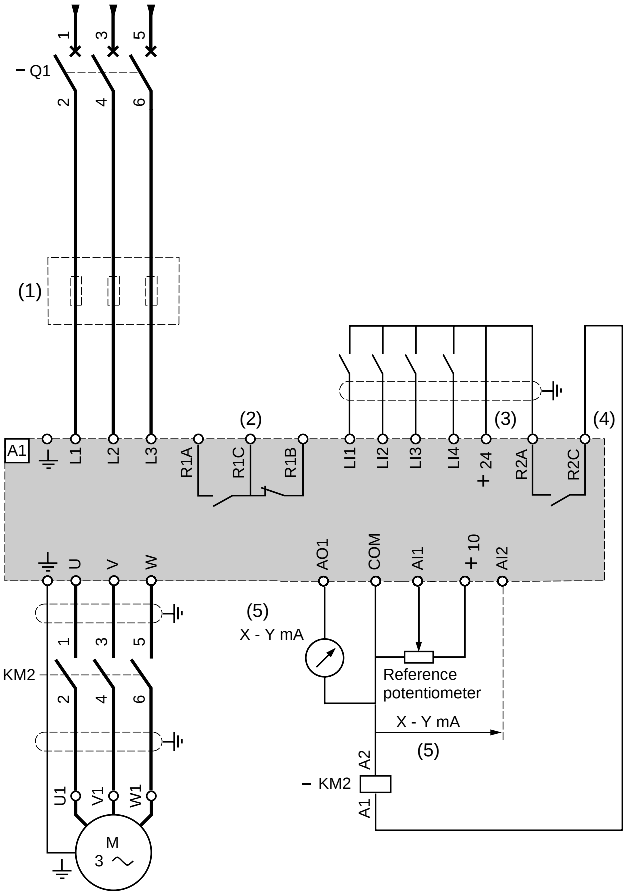
Compatible components

Code	Description
A1	Drive
Q1	GV2-L or Compact NS circuit-breaker (see pages 2/104 and 2/105)
KM1	LC1-D●● contactor with interference suppressor (see pages 2/104 and 2/105)
S1, S2	XB2-B or XA2-B pushbuttons
T1	100 VA transformer 220 V secondary
Q2	GV2-L circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2-CB05

Scheme with downstream contactor, recommended for dangerous machines which are switched off and on frequently

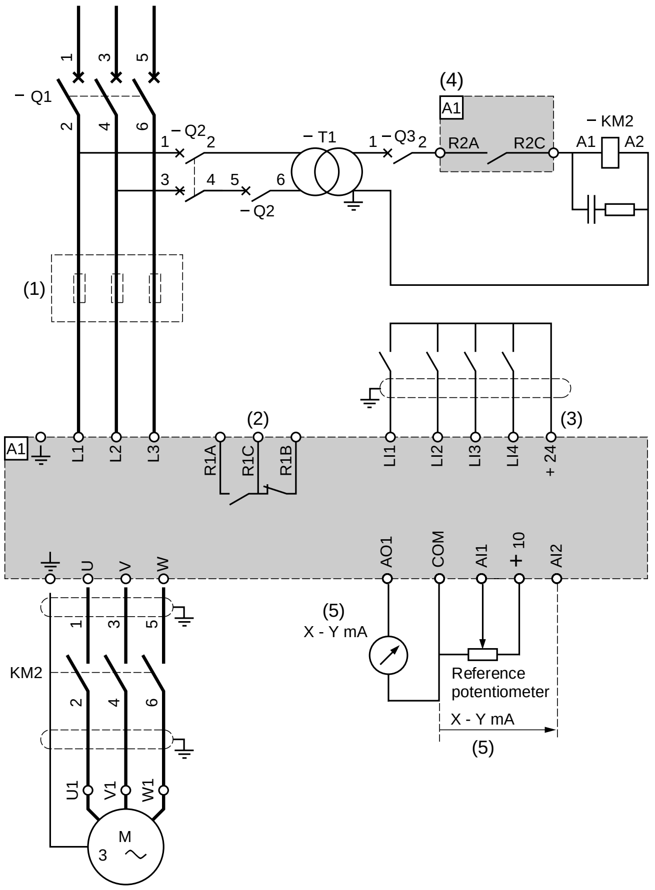
ATV 38HU18N4 to ATV 38HD23N4

3-phase power supply



ATV 38HD25N4● to ATV 38HC33N4X

3-phase power supply



(1) Line choke recommended.

(2) Fault relay contacts for remote signalling of drive status.

(3) Internal + 24 V. If an external + 24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 24 terminal on the drive, and connect the common of the LI inputs to the + 24 V of the external supply.

(4) Use the "downstream contactor control" function with relay R2 (or with the logic output LO of one of the "I/O extension" cards, when connecting).

(5) X and Y can be configured between 0 and 20 mA independently for AI2 and AO1.

Nota :

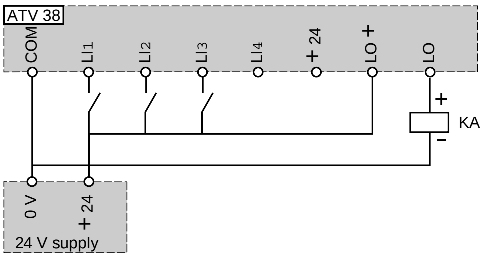
1 *All terminals are located at the bottom of the drive.*

2 *Fit interference suppressors to all specific circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

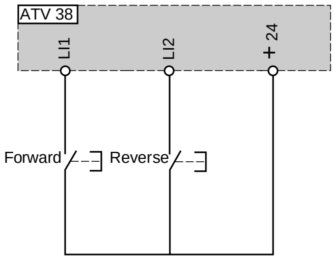
Compatible components

Code	Description
A1	Drive
Q1	GV2-L or Compact NS circuit-breaker (see pages 2/104 and 2/105)
KM2	LC1-D●● contactor with interference suppressor (see pages 2/104 and 2/105)
T1	100 VA transformer 220 V secondary
Q2	GV2-L circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2-CB05

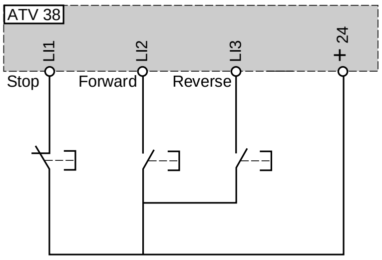
External 24 V supply for the logic inputs and/or the logic output



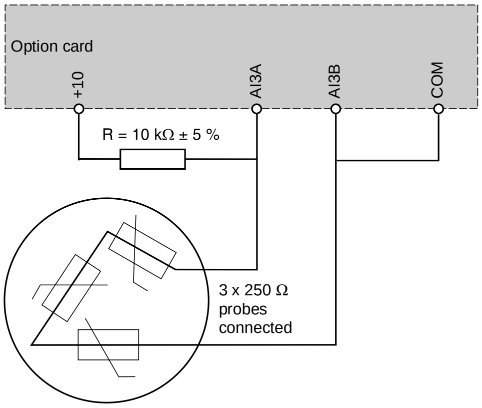
2-wire control



3-wire control

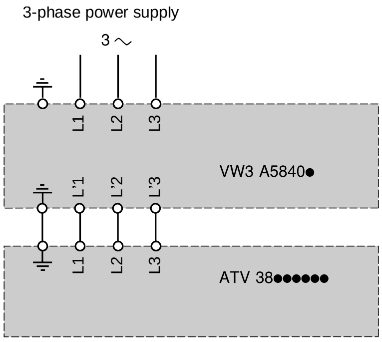


Motor protection via PTC probes, with optional analogue input extension card



Additional radio interference suppression input filters

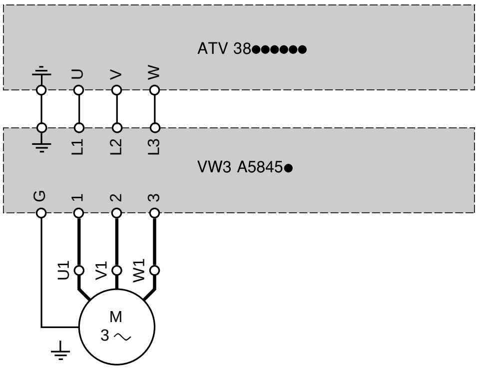
VW3 A5840●



Output filters

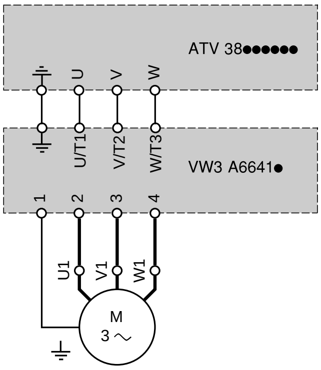
VW3 A5845●

LR cell



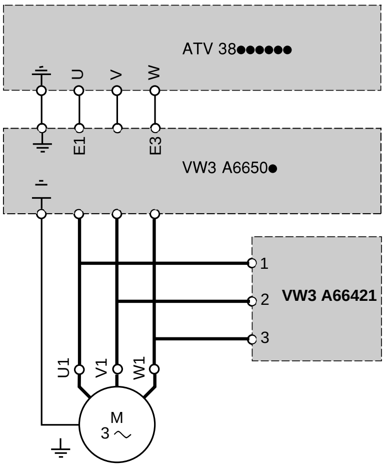
VW3 A6641●

LC cell



VW3 A6650● + VW3 A66421

Motor chokes + capacitors



Variable speed drives for asynchronous motors

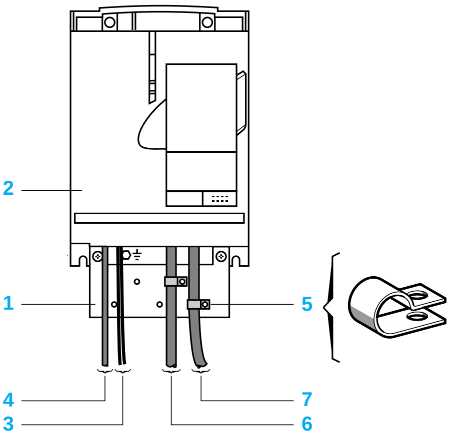
Altivar 38

Electromagnetic compatibility

Principle

- ■ Grounds between drive, motor and cable shielding must have "high frequency" equipotentiality.
- ■ Use shielded cables with shielding connected to earth over 360° at both ends for the motor cable and the control-command cables. Conduit or metal ducting can be used for part of the shielding length provided that there is no break in continuity.
- ■ Ensure maximum separation between the power supply cable (mains supply) and the motor cable.

Mounting: installation diagram for ATV 38HU18N4 to HD79N4● drives



1 Steel plate supplied with the drive, to be fitted on it (machine ground)
2 Altivar 38
3 Non-shielded power supply wires or cable
4 Non-shielded wires for the output of the safety relay contacts
5 Fix and earth the shielding of cables 6 and 7 as close as possible to the drive:
  - strip the shielding
  - use the correct size clamps on the stripped part of the shielding to fix to metal sheet 1. The shielding must be clamped tightly enough on the metal sheet to ensure good contact
  - types of clamp: stainless steel
6 Shielded cable *(1)* for connecting the motor
7 Shielded cable *(1)* for connecting the control/command system. For applications requiring several conductors, use small cross-sections (0.5 mm^2).

---

(1) The shielding of cables 6 and 7 must be connected to earth at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

Nota :

1 *Although there is an HF equipotential earth connection between the drive, the motor and the cable shielding, it is still necessary to connect the PE protective conductors (green-yellow) to the appropriate terminals on each of the devices.*

2 *If using an additional input filter, it should be mounted beneath the drive and connected directly to the mains supply via an unshielded cable. The connection 3 is then made via the filter cable.*

Wiring recommendations for ATV 38HC10N4X to HC33N4X drives

Line chokes must be used if the prospective short-circuit line current is greater than 22 kA. These chokes provide improved protection against overvoltages on the mains supply and reduce harmonic distortion of the current produced by the drive. The chokes are used to limit the line current.

Power wiring

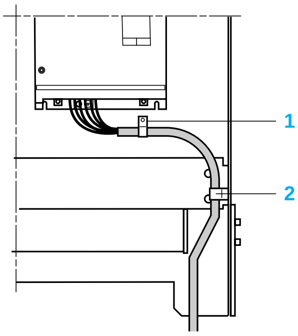
The power wiring should consist of cables with 4 conductors or individual cables maintained as close as possible to the PE cable. Take care to route the motor cables well away from the power supply cables.

The power supply cables are not shielded. If a radio interference filter is used, the grounds for the filter and the drive should be at the same potential with low-impedance links at high frequency (fixed to unpainted steel plate with anti-corrosion treatment/machine ground wiring). The filter should be fitted as close as possible to the drive.

If the environment is sensitive to radiated radio interference, the motor cables should be shielded. On the drive side, fix and connect the shielding to the machine ground with rustproof clamps. The main function of the motor cable shielding is to limit their radio frequency radiation. Therefore, use 4-pole cables for the motor, connecting each end of the shielding in accordance with established practice for High Frequency wiring. The type of protective material (copper or steel) is less important than the quality of the connection at both ends. An alternative is to use a metal cable duct with good conductivity and no break in continuity.

Nota : *when using a cable with a protective sleeve (NYCY type) which fulfils the dual function of PE + screen, it must be connected correctly to both the drive and the motor (its radiation efficiency is reduced).*

Control wiring

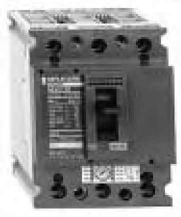


1 Shielding clamp
2 Cable grip. Check that the cable follows the path indicated by the clips.

Variable speed drives for asynchronous motors

Altivar 38

Motor starters



NS80HMA
+
LC1 D
+
ATV 38

Applications

Circuit-breaker/contactor/drive combinations can be used to ensure continuous service of the installation with optimum safety.
The selected circuit-breaker/contactor combination can reduce maintenance costs in the event of a short-circuit by minimising the time required to make the necessary repairs and the cost of replacement equipment. The combinations suggested correspond to type 2 coordination.
Type 2 coordination: a short-circuit will not damage the device or affect its settings. The motor starter should be able to operate once the electrical fault has been removed. The electrical isolation provided by the circuit-breaker will not be affected by the short-circuit. Welding of the contactor contacts is permissible if they can be separated easily.

The downstream contactor is not affected by type 2 coordination.

The drive controls the motor, provides protection against short-circuits between the drive and the motor and protects the motor cable against overloads. The overload protection is provided by the drive's motor thermal protection.
If this protection is removed, external thermal protection should be provided.
Before restarting the installation, the cause of the trip must be removed.

3-phase supply voltage: 380 to 415 V

(for 0.75 to 315 kW motors)

Motor circuit-breaker:
NS●●●●MA product sold under the Merlin Gerin brand
Composition of contactors:
LC1 D09 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
LC1 F●●: 3 poles

Motor *(1)*	Circuit-breaker		Line contactor	Downstream contactor	Variable speed drive
Power kW	Reference *(2)*	Rating A	Reference *(3)*	Reference *(3)*	Reference *(5)*
0.75	**GV2 L08**	4	**LC1 D18●●**	**LC1 D09BL** *(4)*	**ATV 38HU18N4**
1.5	**GV2 L10**	6.3	**LC1 D18●●**	**LC1 D09BL** *(4)*	**ATV 38HU29N4**
2.2	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL** *(4)*	**ATV 38HU41N4**
3	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL** *(4)*	**ATV 38HU54N4**
4	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL** *(4)*	**ATV 38HU72N4**
5.5	**GV2 L22**	25	**LC1 D25●●**	**LC1 D09BL** *(4)*	**ATV 38HU90N4**
7.5	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D09BL** *(4)*	**ATV 38HD12N4**
11	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25BL** *(4)*	**ATV 38HD16N4**
15	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25BL** *(4)*	**ATV 38HD23N4**
18.5	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25●●**	**ATV 38HD25N4●**
22	**NS80●MA50**	50	**LC1 D50●●**	**LC1 D32●●**	**ATV 38HD28N4●**
30	**NS80●MA80**	80	**LC1 D65●●**	**LC1 D40●●**	**ATV 38HD33N4●**
37	**NS80●MA80**	80	**LC1 D80●●**	**LC1 D50●●**	**ATV 38HD46N4●**
45	**NS100●MA100**	100	**LC1 D80●●**	**LC1 D80●●**	**ATV 38HD54N4●**
55	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 38HD64N4●**
75	**NS160●MA150**	150	**LC1 D150●●**	**LC1 D115●●**	**ATV 38HD79N4●**
90	**NS250●MA**	220	**LC1 F185●●**	**LC1 D115●●**	**ATV 38HC10N4X**
110	**NS250●MA**	220	**LC1 F225●●**	**LC1 D115●●**	**ATV 38HC13N4X**
132	**NS250●MA**	220	**LC1 F265●●**	**LC1 D150●●**	**ATV 38HC15N4X**
160	**NS400●MA**	320	**LC1 F330●●**	**LC1 F225●●**	**ATV 38HC19N4X**
200	**NS630●MA**	320	**LC1 F400●●**	**LC1 F265●●**	**ATV 38HC23N4X**
220	**NS630●MA**	500	**LC1 F400●●**	**LC1 F330●●**	**ATV 38HC25N4X**
250	**NS630●MA**	500	**LC1 F500●●**	**LC1 F400●●**	**ATV 38HC28N4X**
280	**NS630●MA**	500	**LC1 F630●●**	**LC1 F400●●**	**ATV 38HC31N4X**
315	**NS630●MA**	500	**LC1 F630●●**	**LC1 F500●●**	**ATV 38HC33N4X**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
(2) Replace ● with N, H or L, according to the breaking capacity, in the table below.

Breaking capacity of circuit-breakers according to standard IEC60947-2

380/415 V	Icu (kA)		
GV2 L	50		
NS80●MA	70		
380/415 V	**N**	**H**	**L**
NS100●MA	25	70	130
NS160●MA, NS250●MA	35	70	130
NS400●MA, NS630●MA	–	70	130

(3) Replace ●● with the control circuit voltage reference indicated in the table on the opposite page.
(4) LC1 D●●BL contactors have 24 V d.c. low consumption coils (100 mA). Up to 15 kW, they are powered by the internal drive power supply. For power ratings above this level, use an external supply and complete the contactor coil voltage according to footnote (3).
(5) For drives without integrated EMC filter, replace the ● with an X.

Note: *the maximum line current is determined with a maximum upstream short-circuit power rating of 5 kA at between 0.75 and 5.5 kW (22 kA between 7.5 and 315 kW).*

Variable speed drives for asynchronous motors

Altivar 38

Motor starters

NS80HMA
+
LC1 D
+
ATV 38

3-phase supply voltage: 440 to 460 V

(for 0.75 to 315 kW motors)

Motor circuit-breaker:
NS●●●●MA: product sold under the Merlin Gerin brand
Composition of contactors:
LC1 D09 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
LC1 F●●: 3 poles

Motor *(1)*	**Circuit-breaker**		**Line contactor**	**Downstream contactor**	**Variable speed drive**
Power	**Reference**	**Rating**	**Reference**	**Reference**	**Reference**
kW	*(2)*	**A**	*(3)*	*(3)*	*5)*
0.75	**GV2 L08**	4	**LC1 D18●●**	**LC1 D09BL** *(4)*	**ATV 38HU18N4**
1.5	**GV2 L10**	6.3	**LC1 D25●●**	**LC1 D09BL** *(4)*	**ATV 38HU29N4**
2.2	**GV2 L10**	6.3	**LC1 D25●●**	**LC1 D09BL** *(4)*	**ATV 38HU41N4**
3	**GV2 L14**	10	**LC1 D25●●**	**LC1 D09BL** *(4)*	**ATV 38HU54N4**
4	**GV2 L14**	10	**LC1 D25●●**	**LC1 D09BL** *(4)*	**ATV 38HU72N4**
5.5	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D09BL** *(4)*	**ATV 38HU90N4**
7.5	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D09BL** *(4)*	**ATV 38HD12N4**
11	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25BL** *(4)*	**ATV 38HD16N4**
15	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25BL** *(4)*	**ATV 38HD23N4**
18.5	**NS100●MA50**	50	**LC1 D80●●**	**LC1 D25●●**	**ATV 38HD25N4●**
22	**NS100●MA50**	50	**LC1 D80●●**	**LC1 D32●●**	**ATV 38HD28N4●**
30	**NS100●MA50**	50	**LC1 D80●●**	**LC1 D40●●**	**ATV 38HD33N4●**
37	**NS100●MA80**	100	**LC1 D80●●**	**LC1 D50●●**	**ATV 38HD46N4●**
45	**NS100●MA100**	100	**LC1 D80●●**	**LC1 D80●●**	**ATV 38HD54N4●**
55	**NS100●MA100**	100	**LC1 D115●●**	**LC1 D80●●**	**ATV 38HD64N4●**
75	**NS160●MA150**	150	**LC1 D150●●**	**LC1 D115●●**	**ATV 38HD79N4●**
90	**NS160●MA**	150	**LC1 D150●●**	**LC1 D115●●**	**ATV 38HC10N4X**
110	**NS250●MA**	220	**LC1 F185●●**	**LC1 D115●●**	**ATV 38HC13N4X**
132	**NS250●MA**	220	**LC1 F265●●**	**LC1 F150●●**	**ATV 38HC15N4X**
160	**NS400●MA**	320	**LC1 F265●●**	**LC1 F225●●**	**ATV 38HC19N4X**
200	**NS400●MA**	320	**LC1 F330●●**	**LC1 F265●●**	**ATV 38HC23N4X**
220	**NS400●MA**	320	**LC1 F400●●**	**LC1 F330●●**	**ATV 38HC25N4X**
250	**NS630●MA**	500	**LC1 F400●●**	**LC1 F400●●**	**ATV 38HC28N4X**
280	**NS630●MA**	500	**LC1 F500●●**	**LC1 F400●●**	**ATV 38HC31N4X**
315	**NS630●MA**	500	**LC1 F500●●**	**LC1 F500●●**	**ATV 38HC33N4X**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
(2) Replace ● with N, H or L, according to the breaking capacity, in the table below.

Breaking capacity of circuit-breakers according to standard IEC60947-2

400/460 V	**Icu (kA)**		
GV2 L08, L10	> 100		
GV2 L14, L16, L22	20		
NS80●MA	65		
440/460 V	**N**	**H**	**L**
NS100●MA	25	65	130
NS160●MA, NS250●MA	35	65	130
NS400●MA, NS630●MA	–	65	130

(3) Replace ●● with the control circuit voltage reference indicated in the table below.

a.c. control circuit

Volts ∿	24	48	110	115	220	230	240	400
50/60 Hz	**B7**	**E7**	**F7**	**FE7**	**M7**	**P7**	**U7**	**V7**

(4) LC1 D●●BL contactors have 24 V d.c. low consumption coils (100 mA). Up to 15 kW, they are powered by the internal drive power supply. For power ratings above this level, use an external supply and complete the contactor coil voltage according to footnote (3).
(5) For drives without integrated EMC filter, replace the ● with an X.

Note: *the maximum line current is determined with a maximum upstream short-circuit power rating of 5.5 kA at between 0.75 and 5.5 kW (22 kA between 7.5 and 315 kW).*

Variable speed drives for asynchronous motors
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Summary of functions

Drive factory setting

To facilitate installation of the drive, the functions, parameters and I/O have been assigned to meet the requirements of pumping and ventilation applications.

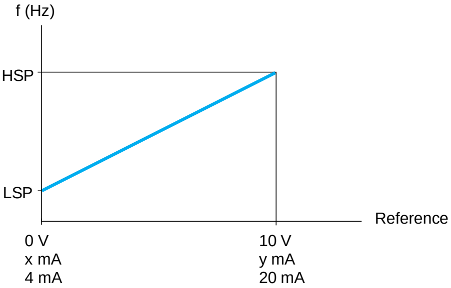
Drive I/O:
- logic input LI1: forward,
- logic input LI2: reverse,
- logic input LI3: fault reset,
- logic input LI4: not assigned,
- analog input AI1: speed reference,
- analog input AI2: summing speed reference,
- relay R1: drive fault,
- relay R2: drive running,
- analog output AO1: motor frequency.

Extension card I/O:
- logic input LI5: ramp switching,
- logic input LI6: not assigned,
- analog input AI3 or encoder inputs: summing speed reference,
- logic output LO: high speed reached,
- analog output AO: motor current.

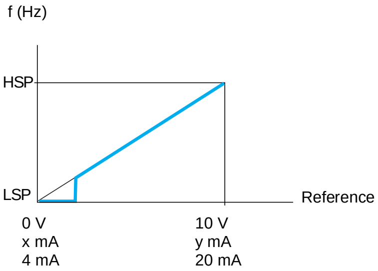
■ Operating speed range

Used to determine 2 frequency limits which define the speed range permitted by the machine under actual operating conditions. Three operating modes are possible:

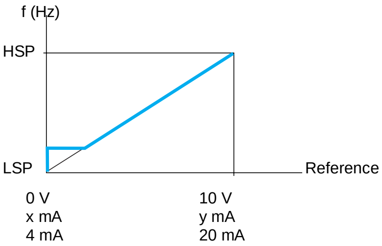
☐ Normal mode



☐ Pedestal mode



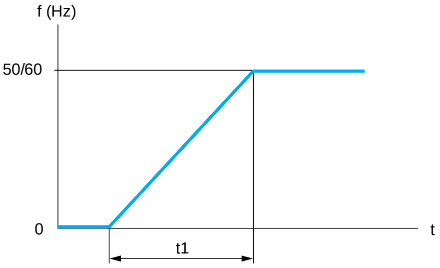
☐ Deadband mode



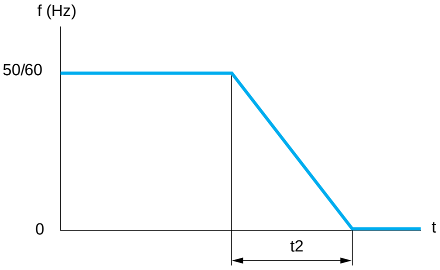
LSP: low speed, from 0 to HSP, factory setting 0
HSP: high speed, from LSP to f max., factory setting 50/60 Hz
x: configurable between 0 and 20 mA, factory setting 4 mA
y: configurable between 0 and 20 mA, factory setting 20 mA

■ Acceleration and deceleration ramp times

Used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



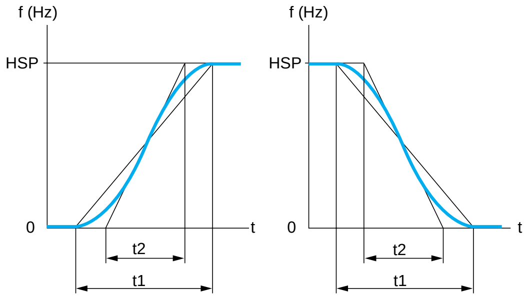
Linear deceleration ramp

Adjustment for t1 and t2 between 0.05 and 999.9 s, factory setting 3 s.

■ Acceleration and deceleration ramp profiles

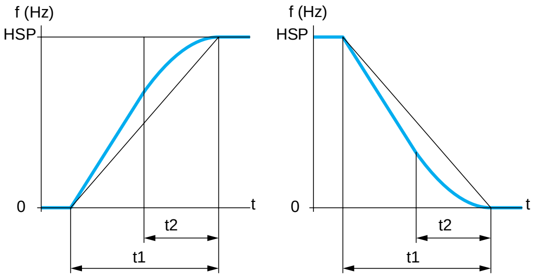
Used to gradually increase the output frequency starting from a speed reference, following a linear ratio or a preset ratio which enables the ramp to be given an S or a U profile. For a pumping application (installation with centrifugal pump and non-return valve): the closing of the valve can be controlled more accurately if U-shape ramps are used. Selecting "linear", "S", or "U" profiles will affect both the deceleration and acceleration ramps.

☐ S-shape ramps



HSP: high speed
The curve coefficient is fixed, with t2 = 0.6 x t1.
where t1 = set ramp time

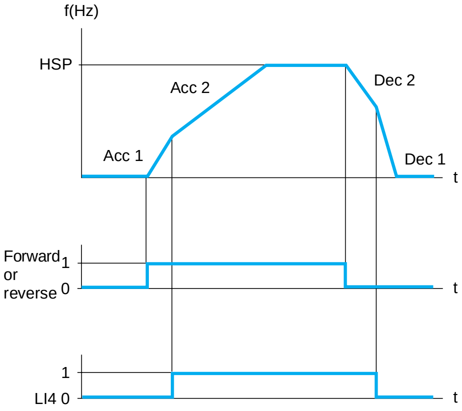
☐ U-shape ramps



HSP: high speed
The curve coefficient is fixed, with t2 = 0.5 x t1.
where t1 = set ramp time

Variable speed drives for asynchronous motors

Altivar 38

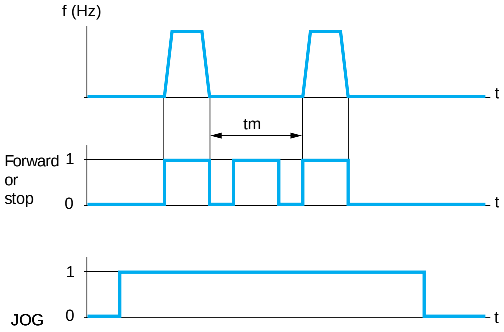


Acceleration 1 (Acc 1) and deceleration 1 (Dec 1):
- adjustment 0.05 to 999.9 s
- factory setting 3 s

Acceleration 2 (Acc 2) and deceleration 2 (Dec 2):
- adjustment 0.05 to 999.9 s,
- factory setting 5 s.

HSP: high speed

Acceleration and deceleration
Example of switching using logic input LI4



Speed reference:
- adjustment 0 to 10 Hz
- factory setting 10 Hz

Minimum time tm between 2 pulses:
- adjustment 0 to 2 s
- factory setting 0.5 s

Jog function

■ Alternate ramp switching

Used to switch 2 acceleration or deceleration ramp times, which can be adjusted separately.
The function is enabled by reassigning 1 logic input or by defining 1 frequency threshold.
It is suitable for machines with fast continuous speed correction and high speed lathes with acceleration and deceleration limiting above certain speeds.

■ Automatic adaptation of deceleration ramp

Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function avoids the drive locking in the event of an **excessive braking** fault.

■ Reverse operation

Used to reverse the direction of operation by means of a logic input.
LI2 is assigned to this function in the factory setting.
This function can be suppressed in non-reversing motor applications by reassigning input LI2 to a different function.

■ Disabling reverse direction

Used to:
☐ inhibit operation in the opposite direction to that controlled by the logic inputs, even if this reversal is required by a summing or feedback control function,
☐ inhibit reverse operation if it is requested using the REV key on the terminal.
To be used if the direction of operation should not be reversed (example: fan).

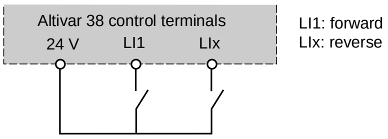
■ Jog operation

Used for pulse operation at minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
Enabled by means of an adjustable logic input LI, assigned to this function, and pulses given by the operating direction command.
This function is suitable for machines with product insertion in manual mode
(example: gradual movement of the mechanism during maintenance operations).

■ 2-wire control

Used to control the direction of operation by means of a maintained contact.
Enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all one or two direction applications.
3 operating modes are possible:

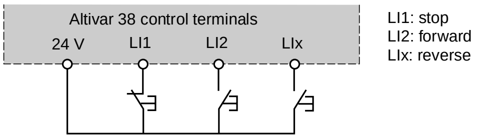
- ☐ detection of the state of the logic inputs,
- ☐ detection of a change in state of the logic inputs,
- ☐ detection of the state of the logic inputs with forward operation always having priority over reverse.



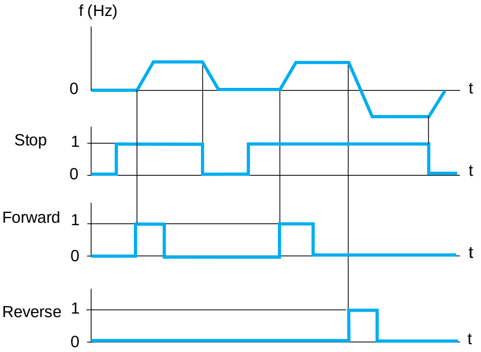
Wiring diagram for 2-wire control

■ 3-wire control

Used to control the operating and stopping direction by means of pulsed contacts.
Enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.



Wiring diagram for 3-wire control

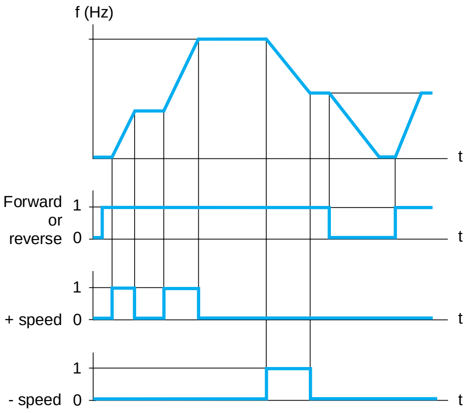


3-wire control

■ +/- speed

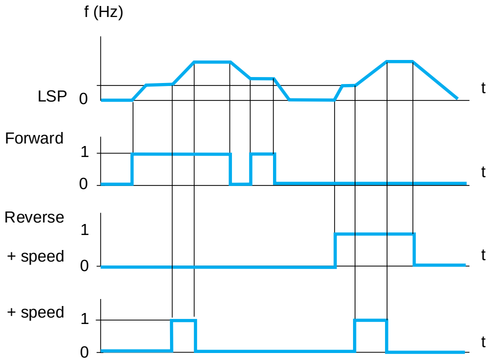
Used to increase or decrease a speed reference by means of 1 or 2 logic commands, with or without the last reference being saved (motorised potentiometer function). The maximum speed is given by the reference applied to the analog inputs. For example, connect AI1 to the + 10V.
Enabled by assigning 1 or 2 logic inputs.
This function is suitable for centralised control of a machine with several sections operating in one direction or for controlling pendant control station, using a handling crane in two operating directions.

☐ With saving of the last reference and 2 logic inputs



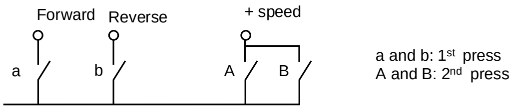
Example of "+/- speed" with 2 logic inputs

☐ Without saving of the last reference and a single logic input ("+ speed")



LSP: low speed

Example with double action buttons



***Note:** this type of "+/- speed" control is incompatible with 3-wire control.*

■ Save reference

This function is associated with "+/- speed" control. Select yes or no.
Enables the new speed reference to be applied if the run command or line supply is lost. The save is applied the next time a run command is received.

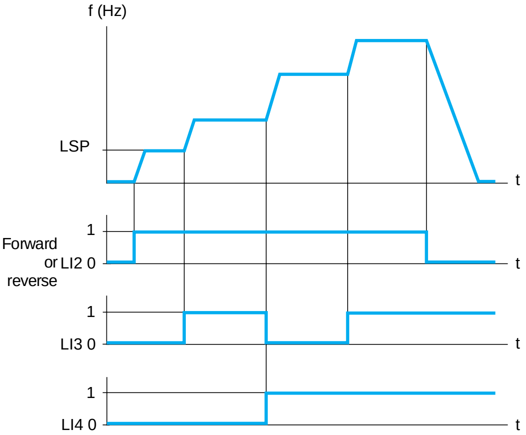
■ **Motor switching**
Allows two motors with different powers to be supplied successively by the same drive. Switching must take place with the drive stopped and locked, using an appropriate sequence at the drive output.
The function can be used to adapt the motor parameters. The following parameters are switched automatically:
☐ nominal motor current,
☐ injection current.
Motor thermal protection is disabled by this function.
Enabled by assigning logic input LI to this function.
The associated parameter is the coefficient which provides the ratio between the power of the smallest motor and the power of the drive: 0.2 to 1.

■ **Downstream contactor control**
Allows the drive to control a contactor located between the drive and the motor.
The request to close the contactor is made when a run command appears.
The request to open the contactor is made when there is neither a run command nor a current present in the motor (freewheel stop, drive locked or braking terminated).
Enabled by means of logic output LO or relay R2.

☐ This function avoids the need for frequency switching on the power circuit upstream of the drive (otherwise premature aging of the filtering capacitors will occur) and requires a specific connection diagram (see page 2/101).
☐ **This function must be used for cycles < 60 s with motor isolation on stopping.**

■ **Preset speeds**
Used to switch preset speed references.
2, 4, or 8 preset speeds can be selected.
Enabled by means of 1, 2 or 3 logic inputs.

The preset speeds can be adjusted in increments of 0.1 Hz to 0 Hz up to the maximum speed.



The speed obtained with inputs LI3 and LI4 at state 0 is LSP or the speed reference, depending on the level of analog inputs AI1 and AI2.

Presets:

1st speed: LSP (low speed or reference)

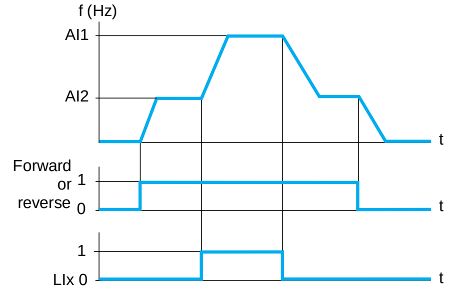
2nd speed: 5 Hz

3rd speed: 10 Hz

4th speed: HSP (high speed)

Example of operation with 4 preset speeds

■ **Adjusting analog input AI2**
It is possible to modify the characteristics of analog current input AI2.
Factory setting: 4-20 mA.
Other values: 0-20 mA, 20-4 mA or X-Y mA by programming X and Y with a precision of 0.1 mA.



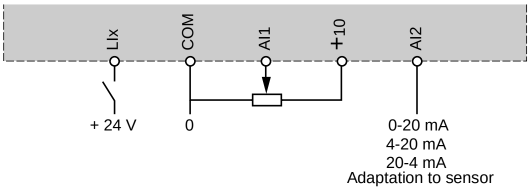
Example of reference switching

■ Summing inputs

Analog input AI2 (and/or analog input AI3 with extension card) can be assigned as a summing input with AI1.
The sum is limited to the value corresponding to the high speed (HSP).
This function is suitable for machines on which the speed is controlled by a process controller signal on input AI2.

■ Reference switching

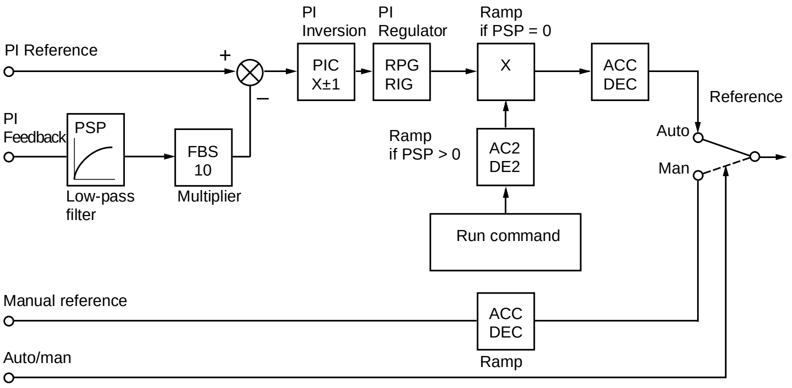
Allows 2 analog references to be switched by means of a logic command. This function avoids having to switch low level signals and makes the 2 reference inputs AI1 and AI2 independent.
Enabled by means of 1 reassignable logic input LI.
This function is suitable for all machines with automatic/manual operation.
Automatic control via a sensor on input AI2, enabled by setting the logic input to 0.
Manual control by means of potentiometer on input AI1 (local control).



Connection diagram for reference switching

■ PI regulator

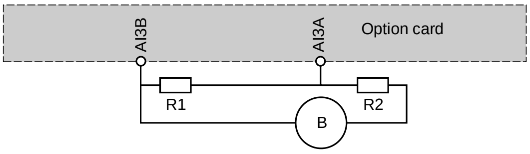
Used for simple control of a flow rate or a pressure with a sensor which supplies a feedback signal adapted to the drive.
This function is suitable for pumping and ventilation applications.



ACC: acceleration
AC2: acceleration 2
DEC: deceleration
DE2: deceleration 2
FBS: PI feedback multiplication coefficient
PIC: reversal of the direction of correction of the PI regulator
PSP: filter time constant setting on the PI feedback
RIG: PI regulator integral gain
RPG: PI regulator proportional gain

Preset PI references:
2 or 4 preset references require the use of 1 or 2 logic inputs respectively.

2 preset references **Assign: LIx to Pr2**		**4 preset references** **Assign: LIx to Pr2, LIy to Pr4**		
LIx	**Reference**	**LIy**	**LIx**	**Reference**
0	Analog reference	0	0	Analog reference
1	Process max (= 10 V)	0	1	PI2 (adjustable)
		1	0	PI3 (adjustable)
		1	1	Process max (= 10 V)



Connection diagram for speed feedback via tachogenerator

- **Speed feedback with tachogenerator**

Used for precise speed control, irrespective of the state of the motor load.

Assigned to logic input AI3, with extension card/analog input

The maximum tachogenerator voltage must be between 5 and 9 V. If necessary, use an external divider bridge to adapt this value *(1)*.

The value can be set precisely in the "Adjust" menu. Consistency between the motor frequency and the speed feedback is monitored in the drive fault management system.

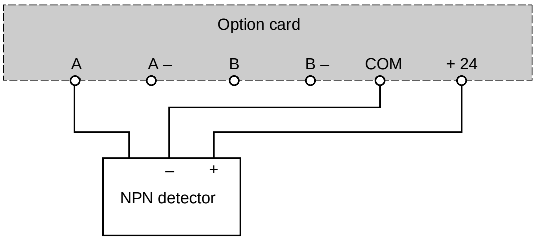
This function is suitable for all applications requiring exact speed irrespective of the load.

(1) Example: motor 1500 rpm at 50 Hz, tachogenerator 0.06 V/rpm, max. speed set to 75 Hz (speed 2250 rpm),
maximum voltage 0.06 x 2250 = 135 V,
recommended tachogenerator current 10 mA, therefore R1 + R2 = 135/10 = 13.5 kΩ,
average voltage on the input = 7 V, therefore R1 = 7/10 = 0.7 kΩ or 680 Ω, nearest standard value. R2 = 13.5 - R1, or 12 kΩ, nearest standard value,
exact voltage on AI3 = 135 x R1/(R1 + R2) = 135 x 0.68/12.68 = 7.24 V.
Use appropriate power resistors (min. 2 W).
The speed feedback should be scaled exactly by programming (when the device is set up).

- **Incremental speed feedback**

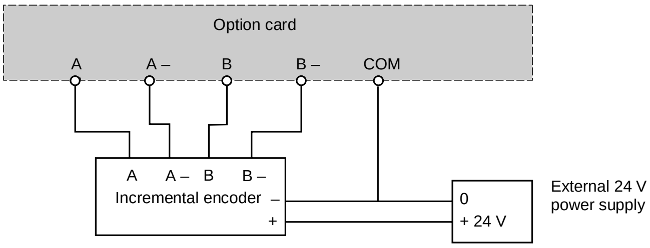
Used for precise speed control, irrespective of the state of the motor load.
Assigned to logic inputs A, A-, B, B- on the extension card/encoder inputs.
NPN type open collector output, nominal voltage 24 V ⎓
Max. read frequency 33 kHz at max. speed HSP

☐ Use in 1 operating direction



Connection diagram with inductive sensor or simple control photoelectric sensor (not very precise at low speeds)

☐ Use in 1 or 2 operating directions



Connection diagram with incremental encoder for precise control at low speeds

Consistency between the motor frequency and the speed feedback is monitored in the drive fault management system.

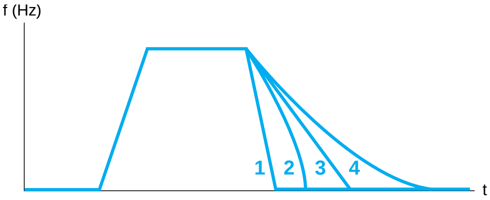
This function is suitable for applications requiring precise speed control irrespective of the load and a high level of immunity to interference.

- **Incremental speed reference**

Enabled by assigning the logic inputs on the above extension card/encoder inputs to the "summing inputs" function.
Synchronization of the speed of a number of drives.
Nominal voltage 24 V ⎓
Max. reading frequency 33 kHz at max. speed HSP

- **Controlled stop**

Used to define stop modes in addition to the standard drive stops. These stop requests always have priority.



1 Fast stop
2 d.c. injection stop
3 Normal stop on deceleration ramp
4 Freewheel stop

Example of controlled stops

Three stop modes are available for selection:
☐ freewheel stop: the drive is locked and the motor stops in accordance with the inertia and the resistive torque,
☐ fast stop: the motor brakes to a stop with the deceleration ramp time divided by a coefficient which can be set between 1 and 10,
☐ d.c. injection braking: adjustment of the time (0 to 30 s, factory setting 0.5 s) and current (10 % to 110 % of the nominal drive current in high torque applications, factory setting 70 %).
Continuous braking is possible but is limited automatically to another adjustable value (10 % to 100 % of the nominal motor current, factory setting 50 %) after 30 s.

Enable modes:
☐ by means of 1 reassignable logic input LI: active at 0 for freewheel stop and fast stop, active at 1 for injection stop,
☐ automatically when stopping (frequency less than 0.1 Hz) for injection braking, as this function can be combined with the others. In this case, only the current after 30 s of injection can be adjusted.

■ **Automatic catching a spinning load with speed detection** ("catch on the fly")
Used to restart the motor smoothly after one of the following events:
☐ loss of line supply or power off,
☐ fault reset or automatic restart,
☐ freewheel stop or injection stop with logic input,
☐ uncontrolled loss of power downstream of the drive.

On restarting, the effective speed of the motor is detected in order to restart on the ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
Factory setting: active.
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines for which the loss of motor speed is negligible during the supply loss time (machines with high inertia), fans and pumps driven by a residual flux, etc.

■ **Automatic restart**
Enables the drive to be restarted automatically after locking following a fault if this fault has disappeared and if the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts at 30 s intervals.
If a restart has not been possible after 6 attempts, the procedure is abandoned and it remains locked until it has been switched off and on again.
Factory setting: inactive.

The faults permitting this restart are:
☐ supply overvoltage,
☐ motor thermal overload,
☐ drive thermal overload,
☐ loss of 4-20 mA reference,
☐ d.c. bus overvoltage,
☐ external fault,
☐ motor phase loss,
☐ serial link fault,
☐ mains voltage too low. For this fault, the function is always active, even if it is not configured.
For this type of fault, the drive fault relay remains activated if the function is configured. The speed reference and the direction of operation must be maintained for this function.
This function is suitable for machines or installations in continuous operation or without monitoring, and where a restart will not endanger equipment or personnel in any way.

■ **Maintaining the speed following loss of the 4-20 mA reference**
Enables the motor speed to be maintained following loss of the 4-20 mA reference.
This function is suitable for applications which must not be interrupted.

■ **Limiting low speed operating time** (LSP)
The motor is stopped automatically after an operating period at low speed (LSP) with zero reference and run command present.
This time can be set between 0.1 and 999.9 s or no limit. Factory setting 5 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is broken and then re-established.
This function is suitable for automatic stopping/starting on pressure-regulated pumps.

■ **Fault reset**
Enables faults to be reset by means of a logic input LI which can be reassigned to this function.
The restart conditions after a reset to zero are the same as those of a normal power-up.
Fault reset: overvoltage, overspeed, external fault, drive overheating, loss of motor phase, d.c. bus overvoltage, loss of 4-20 mA reference, load veering, motor overload if the thermal state is less than 100 %, serial link fault.
"Mains undervoltage" and "mains phase loss" faults are reset automatically when the mains supply is restored.
This function is suitable for applications with drives which are difficult to access.

■ **General reset (inhibits all faults)**
This function can be used to inhibit all faults, including thermal protection (forced operation) except short-circuit faults, to ensure operation unless irreparable damage has been caused in extreme operating conditions.
This function is suitable for applications where a restart could be vital (tunnel smoke extraction system).

■ **Forced local mode**
Forced local mode switches the drive from serial link control to terminal control. A logic input LI can be reassigned to this function.

■ **External fault**
When the input assigned to this function changes to 1, the motor stops in accordance with the parameter configuration and the drive locks in an "EPF external fault" fault.

■ Fault relay, unlocking

The fault relay is energised when the drive is powered up and is not faulty.
It has one “C/O” contact at the common point.
The drive can be unlocked after a fault in one of the following ways:

- ☐ by switching the drive off until the “power on” LED goes out and then switching it on again,
- ☐ by assigning a logic input to the “fault reset” function,
- ☐ using the “automatic restart” function (if it has been configured).

■ Motor thermal protection

Indirect motor thermal protection is implemented via continuous calculation of its theoretical temperature rise.
The drive is locked by default if this temperature rise exceeds 118 % of the nominal temperature rise.

☐ This function is suitable for applications with self-cooled or force-cooled motors:
the microprocessor calculates the theoretical temperature rise of the motor based on various elements:

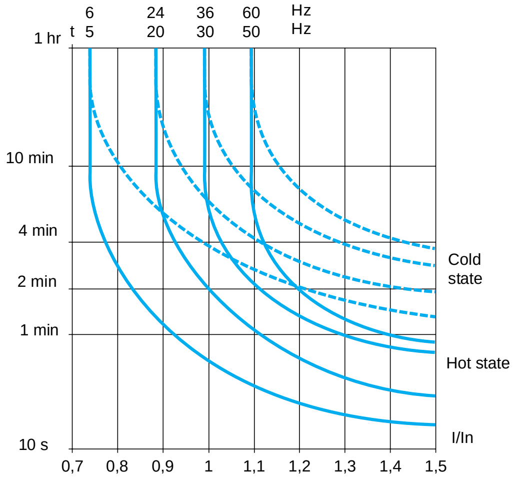
- the operating frequency,
- the current taken by the motor,
- the operating time,
- the maximum ambient temperature around the motor (40 °C).

Adjustment:
0.25 to 1.36 times the nominal current of the drive in high torque applications, factory setting 0.9 times the nominal current indicated on the motor rating plate.

☐ Special applications
Adaptation of thermal protection in the fault configuration menu:

- applications with force-cooled motor: in this case, the tripping curves are those shown opposite for the nominal frequency 50/60 Hz,
- suppression of thermal protection in harsh environments: temperature greater than 40 °C around the motor, which may cause the cooling fins to become clogged (provide direct thermal protection via thermistor probes integrated into the motor),
- motor thermal protection using PTC probes: see "thermal protection with PTC probes" function with option card,
- if several motors are connected in parallel on the same drive, fit each motor starter with a thermal relay to reduce the risk of the load being distributed unevenly.

***Note:** when the drive is switched off, calculation I2t is saved and the amount by which it has decreased is calculated.*



Thermal protection characteristics (warm and cold)

■ PTC probe protection

Used for motor thermal protection (if the motor is fitted with PTC probes).
Assigned to logic input AI3, with extension card/analog input.
Maximum resistance of probe circuit at 20 °C: 750 Ω (3 x 250 Ω probes connected in series).
Probe break and short-circuit faults are monitored.
This function is suitable for use in all applications.

■ Thermal protection of drive

Enables the drive to be protected directly via a thermistor fitted on the heatsink, ensuring that components are protected in the event of poor ventilation or excessive ambient temperatures.
Locks the drive in the event of a fault.

■ Switching frequency, noise reduction

High frequency switching of the intermediate d.c. voltage can be used to supply the motor with a current wave with low harmonic distortion.
The switching frequency can be adjusted to reduce the noise generated by the motor.
In addition, the switching frequency is random in order to avoid resonance. This function can be disabled if it causes instability.
This function is suitable for all applications which require low motor noise.

☐ Without derating, for continuous or intermittent operation (frequencies of 0.5 and 1 kHz should be used for long cable lengths).

Drive	Configurable switching frequency - kHz
ATV 38HU18N4 to HD46N4 ATV 38HD25N4X to HD46N4X	0.5-1-2-4
ATV 38HU54N4 to HC33N4 ATV 38HD54N4X to HC33N4X	0.5-1-2

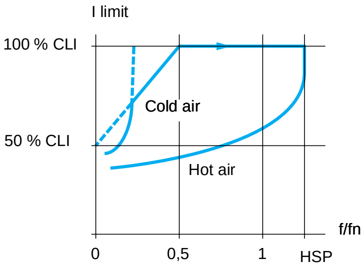
☐ Without derating, with intermittent operating cycle or with derating by one power rating in continuous operation *(1)*.

Drives	Configurable switching frequency - kHz
ATV 38HU18N4 to HD23N4	8-12-16
ATV 38HU25N4 to HD46N4 ATV 38HU25N4X to HD46N4X	8-12
ATV 38HU54N4 to HD79N4 ATV 38HU54N4X to HD79N4X	4-8
ATV 38HC10N4X to HC33N4X	4

(1) In intermittent operation, the frequency automatically decreases in the case of overheating.

■ Energy saving

Enables the power consumption to be adapted according to the load, improving efficiency.



CLI: internal current limit
HSP: high speed

Adaptation of the current limit

■ Adaptation of the current limit

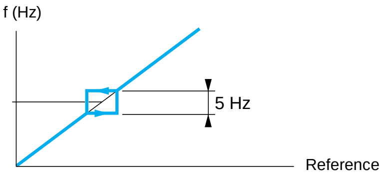
The current limit can be adapted automatically according to the speed in order to avoid a motor overload fault.
This function is suitable for ventilation applications in which the load curve changes according to the air density.

■ Auto-tuning

Auto-tuning is only possible by means of user intervention using the dialogue tools and an assignable logic input. It is used to optimize performance.
This function is suitable for use in all applications.

■ Skip frequencies

Skip frequencies can be used to suppress up to three critical speeds which may be the cause of mechanical resonance.
Prolonged operation of the motor can be prohibited on one to three adjustable frequency bands (with a band width of 5 Hz), which can be set within the operating range.
This function is suitable for use in fans and centrifugal pumps.



Motor speed change depending on the reference with a skip frequency

■ Reassignable logic outputs

Relay R2 (or LO solid state output with I/O extension card):

□ remote signalling of the following information as required:
- drive operating (running or braking),
- frequency threshold reached (greater than or equal to an adjustable threshold),
- 2nd frequency threshold reached,
- frequency reference reached (motor frequency equal to the reference),
- current threshold reached (greater than or equal to an adjustable threshold),
- motor thermal threshold reached (greater than or equal to an adjustable threshold),
- drive thermal threshold reached (greater than or equal to an adjustable threshold),
- high speed reached,
- loss of 4-20 mA reference.

□ remote downstream contactor control.

■ Analog outputs AO1 (or AO with I/O extension card)

Analog outputs AO and AO1 (x-y mA) can be assigned to the following parameters:

- motor current (y mA = twice the nominal current of the drive),
- motor frequency (y mA = maximum frequency),
- ramp output (y mA = maximum frequency),
- signed ramp (x mA = maximum reversing frequency, y mA = maximum forward frequency),
- PI reference (x mA = minimum reference, y mA = maximum reference),
- PI feedback (x mA = minimum feedback, y mA = maximum feedback),
- PI error (x mA = maximum error < 0, y mA = minimum error > 0),
- PI integral (y mA = integral saturated),
- motor power (x mA = 0 % of the nominal motor power , y mA = 200 % of the nominal motor power),
- motor thermal state calculated: (x mA = 0 %, y mA = 200 %),
- drive thermal state: (x mA = 0 %, y mA = 200 %).

Note: *x and y can be set between 0 and 20 mA*

■ Adjusting the analog outputs AO1 (or AO with I/O extension card)

The characteristics of analog current outputs AO and AO1 can be modified.
Factory setting: 0-20 mA
Other values: 4-20 mA, 20-4 mA or x-y mA by programming x and y with a definition of 0.1 mA.
This function is suitable for use in applications with a signal other than 0-20 mA.

Variable speed drives for asynchronous motors

Altivar 38

Compatibility table for configurable I/O functions

■ Configurable I/O

Functions which are not listed in this table are fully compatible.

- ☐ stop functions have priority over run commands,
- ☐ speed references via logic command have priority over analog references.

The selection of functions is limited:

- by the number of drive I/O which can be reassigned: if necessary, add an I/O extension card,
- by the incompatibility of certain functions with one another.

Functions	d.c. injection braking	Summing inputs	PI regulator	+/- speed	Reference switching	Freewheel stop	Fast stop	Jog operation	Preset speeds	Speed regulation with tacho-generator or encoder
d.c. injection braking	▨	🟦	🟦	🟦	🟦	↑	↑	🟦	🟦	🟦
Summing inputs	🟦	▨	🟦	🟦	⊖	🟦	🟦	🟦	🟦	🟦
PI regulator	🟦	🟦	▨	⊖	🟦	🟦	🟦	⊖	⊖	⊖
+/- speed	🟦	🟦	⊖	▨	⊖	🟦	🟦	↑	⊖	🟦
Reference switching	🟦	⊖	🟦	⊖	▨	🟦	🟦	🟦	⊖	🟦
Freewheel stop	←	🟦	🟦	🟦	🟦	▨	←	🟦	🟦	🟦
Fast stop	🟦	🟦	🟦	🟦	🟦	↑	▨	🟦	🟦	🟦
Jog operation	🟦	🟦	⊖	←	🟦	🟦	🟦	▨	←	🟦
Preset speeds	🟦	🟦	⊖	⊖	⊖	🟦	🟦	↑	▨	🟦
Speed regulation with tachogenerator or encoder	🟦	🟦	⊖	🟦	🟦	🟦	🟦	🟦	🟦	▨

⊖ Incompatible functions
🟦 Compatible functions
▨ Not applicable

Priority functions (functions which cannot be active at the same time)

← ↑ The arrow indicates which function has priority.

Example: the "fast stop" function has priority over the "d.c. injection braking" function

Summary table of the configurable I/O assignments

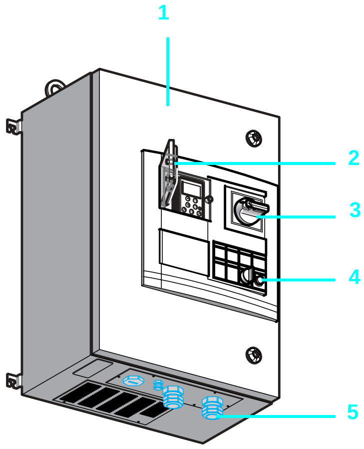
	Drive I/O								
	Without option card				With I/O extension cards				
	Relay R2	Analog input AI2	Analog output AO1	3 logic inputs LI2-LI3-LI4	2 logic inputs LI5-LI6	Analog input AI3	Logic output LO	Analog output AO	Encoder inputs A-, A+, B-, B+
Functions									
Auto-tuning				▨	▨				
Reverse operation				▨	▨				
Alternate ramp switching				▨	▨				
Jog operation				▨	▨				
+/- speed				▨	▨				
Preset speeds				▨	▨				
Reference switching				▨	▨				
External fault				▨	▨				
Freewheel stop				▨	▨				
Injection stop				▨	▨				
Fast stop				▨	▨				
Motor switching				▨	▨				
Forced local mode				▨	▨				
PI auto/man				▨	▨	▨			
Fault reset				▨	▨				
General reset (inhibits all faults)				▨	▨				
Summing reference		▨				▨			▨
PI regulator		▨		▨	▨	▨			
2nd speed reference		▨							
Speed feedback						▨			▨
PTC probes						▨			
Downstream contactor control	▨						▨		
Frequency threshold reached	▨						▨		
High speed reached	▨						▨		
Frequency reference reached	▨						▨		
Current threshold reached	▨						▨		
Motor thermal threshold reached	▨						▨		
Drive thermal threshold reached	▨						▨		
Drive running	▨						▨		
Loss of 4-20 mA reference	▨						▨		
Motor current			▨					▨	
Motor frequency			▨					▨	
Ramp output (signed)			▨					▨	
PI function outputs			▨					▨	
Motor power			▨					▨	
Motor thermal state			▨					▨	
Drive thermal state			▨					▨	

▨ Possible assignments

Variable speed drives for asynchronous motors

Ready-assembled Altivar 38

Presentation



Altivar 38 ENERGY ready-assembled drives are motor starters specifically designed for pump and fan applications powered by a three-phase supply 380 to 460 V in the power range 3 to 75 kW or 5 to 100 HP.

They are housed inside a dust and damp proof enclosure 1 which contains:

- An ATV 38 drive
- A line choke
- A Vario switch disconnector with padlockable front external control 3
- A "frequency" reference potentiometer
- A 3-position switch for selecting the direction of operation
- An operator terminal 4

A slot is provided for installing an additional contactor.

The front panel has a hinged cover 2. For safety reasons, it can only be opened when the switch disconnector is in the "OFF" position. The underside of the enclosure should be fitted with cable glands 5 via which the cables can be routed.

Options

■ Common functions of the Altivar 38 and the Altivar 38 ENERGY:

☐ Extension cards (see pages 2/140 and 2/141)

☐ Communication cards (see pages 2/142 and 2/143)

☐ Powersuite software workshop (see pages 3/2 and 3/3)

☐ Braking module and resistors to be mounted externally (see pages 2/144 to 2/147)

■ Specific options for Altivar 38 ENERGY:

☐ An IP 65 enclosure for the remote operator terminal

☐ A line or downstream contactor

☐ A SUB-D cable gland.

Characteristics

The ready-assembled Altivar 38 has the same environmental, drive and electrical characteristics as the Altivar 38 with heatsink, with the exception of those detailed in the table below.

Degree of protection			IP 55
Ambient air temperature around the device	Storage	**°C**	- 25…+ 65
	Operation	**°C**	- 10...+ 40
Shock resistance	Conforming to IEC 60068-2-27		10 gn for 11 ms

References

Altivar 38 ENERGY, standard torque applications (110% Tn)

Motor		**Line supply**				**Ready-assembled Altivar 38**					
Power indicated on rating plate *(1)*		**Line current** *(2)*		**Prospective line Isc**		**Continuous output current**		**Max. transient current** *(3)*		**References**	**Weight**
		at U min.	**at U max.**	**at U min.**	**at U max.**	**a**	**b**	**a**	**b**		
kW	***HP***	**A**	**A**	**kA**	**kA**	**A**	**A**	**A**	**A**		**kg**
3-phase supply voltage: 380…460 V *(4)*											
3	–	7.9	6,8	5	5	7.1	6.2	7.8	6.8	**ATV 38ED05N4**	37.000
4	*5*	10	8,7	5	5	9.5	7.6	10.5	8.4	**ATV 38ED07N4**	37.000
5.5	*7.5*	13,1	11,5	5	5	11.8	11	13	12.1	**ATV 38ED09N4**	37.000
7.5	*10*	18,5	16	22	22	16	14	17.6	15.4	**ATV 38ED12N4**	43.000
11	*15*	26	22	22	22	22	21	24.2	23.1	**ATV 38ED16N4**	43.000
15	*20*	32	26,7	22	22	30	27	33	29.7	**ATV 38ED23N4**	46.000
18.5	*25*	43	36	22	65	37	34	41	37.4	**ATV 38ED25N4**	70.000
22	*30*	51	42	22	65	44	40	49	44	**ATV 38ED28N4**	70.000
30	*40*	67	56	22	65	60	52	66	58	**ATV 38ED33N4**	70.000
37	*50*	82	69	22	65	72	65	80	72	**ATV 38ED46N4**	70.000
45	*60*	99	83	22	65	85	77	94	85	**ATV 38ED54N4**	110.000
55	*75*	121	102	22	65	105	96	116	106	**ATV 38ED64N4**	110.000
75	*100*	160	137	22	65	138	124	152	137	**ATV 38ED79N4**	110.000

a : values obtained for jumper positioned on 50 Hz at U = 400 V
b : values obtained for jumper positioned on 60 Hz at U = 460 V

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ATV 38ED12N4

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(1) These power ratings are given for a maximum permissible switching frequency of 4 kHz in continuous operation without derating. For higher switching frequencies, the drive must be in intermittent operation or it must be set one rating lower (see special uses on page 2/131).

(2) Typical value without additional choke.

(3) For 60 seconds.

(4) Nominal supply voltages, U min…U max.

Please refer to the table summarising the possible combinations for drives, options and accessories on pages 2/120 and 2/121

References (continued), dimensions, mounting, schemes

Variable speed drives for asynchronous motors
Ready-assembled Altivar 38

References *(continued)*

IP 65 enclosure for the remote operator terminal

The plug-in operator terminal can be used remotely, hand-held or fixed to the machine, using this IP 65 dust and damp proof kit.

Description	For drives	Reference	Weight kg
Kit comprising: - 1 cable fitted with connectors, length 3 m - IP 65 enclosure with flexible, transparent membrane - instructions	ATV 38ED all ratings	**VW3 A58864**	0.300

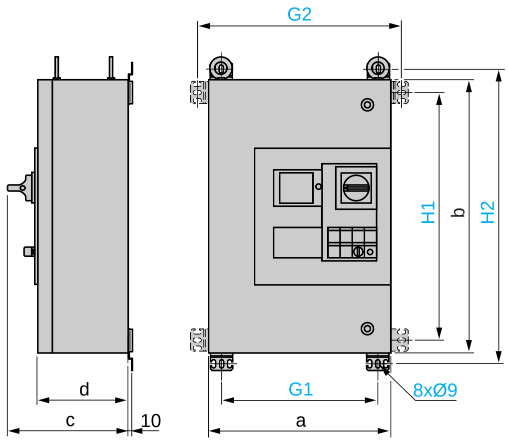
"Line" or "downstream" contactor

A slot is provided for mounting a contactor on ATV 38ED drives. The contactor is wired as a line or downstream contactor by the user, depending on requirements. To select a contactor, see pages 2/172 to 2/175.

Accessories

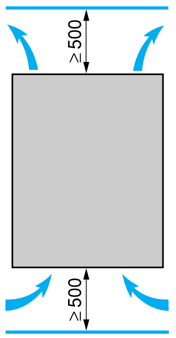
Description	For drives	Reference	Weight kg
IP65 potentiometer 2.2 kΩ	ATV 38ED all ratings	**VW3 A58866**	0.100
SUB-D cable gland, plug-in, 10-terminals	ATV 38ED all ratings	**VW3 A58865**	0.300

Dimensions



ATV 38ED	a	b	c	d	G1	G2	H1	H2
05N4, 07N4, 09N4, 12N4, 16N4, 23N4	500	700	300.5	250	437.5	550	637.5	750
25N4, 28N4, 33N4, 46N4	460	850	365.5	315	397.5	510	787.5	900
54N4, 64N4, 79N4	570	1050	405.5	340	507.5	620	987.5	1100

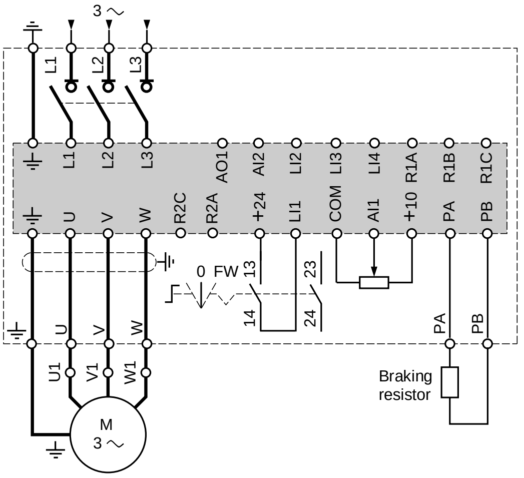
Mounting



Do not place equipment close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 38ED

05N4, 07N4, 09N4, 12N4, 16N4, 23N4, 25N4, 28N4, 33N4, 46N4, 54N4, 64N4, 79N4



Variable speed drives for asynchronous motors

Altivar 38 with heatsink, ready-assembled Altivar 38

Possible combinations for drives with or without integrated EMC filters (see page 2/88)

Altivar 38 with heatsink

Line supply	**Motor**	**ATV 38 drive**		**Options**					
Supply voltage 50/60 Hz	Power indicated on rating plate kW	With integrated EMC filters	No EMC filters	**Line choke**	**1 extension or communication card**	**IP 65 enclosure for the remote operator terminal**	**PowerSuite advanced dialogue solutions** Software workshop	Magelis XBT display unit	**RS 485 interconnection**
380…460 V 3-phase	0.75	**ATV 38HU18N4**	–	VW3 A66501	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	1.5	**ATV 38HU29N4**	–	VW3 A66501	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	2.2	**ATV 38HU41N4**	–	VW3 A66502	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	3	**ATV 38HU54N4**	–	VW3 A66502	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	4	**ATV 38HU72N4**	–	VW3 A66502	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	5.5	**ATV 38HU90N4**	–	VW3 A66503	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	7.5	**ATV 38HD12N4**	–	VW3 A66503	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	11	**ATV 38HD16N4**	–	VW3 A66504	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	15	**ATV 38HD23N4**	–	VW3 A66504	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	18.5	**ATV 38HD25N4**	–	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD25N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	22	**ATV 38HD28N4**	–	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD28N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	30	**ATV 38HD33N4**	–	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD33N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	37	**ATV 38HD46N4**	–	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD46N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	45	**ATV 38HD54N4**	–	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD54N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	55	**ATV 38HD64N4**	–	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD64N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	75	**ATV 38HD79N4**		Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
		–	**ATV 38HD79N4X**	Integrated	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	90	–	**ATV 38HC10N4X**	VW3 A68501	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	110	–	**ATV 38HC13N4X**	VW3 A68502	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	132	–	**ATV 38HC15N4X**	VW3 A68503	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	160	–	**ATV 38HC19N4X**	VW3 A68504	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	200	–	**ATV 38HC23N4X**	VW3 A68505	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	220	–	**ATV 38HC25N4X**	VW3 A68506	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	250	–	**ATV 38HC28N4X**	VW3 A68506	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	280	–	**ATV 38HC31N4X**	VW3 A68507	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306
	315	–	**ATV 38HC33N4X**	VW3 A68507	VW3 A58●●●	VW3 A58103	VW3 A81●●	HM017010A8	VW3 A58306

Possible combinations for ready-assembled drives (see pages 2/118 and 2/119)

Altivar 38 ENERGY

Line supply	**Motor**		**ATV 38 drive**	**Options**					
Supply voltage 50/60 Hz	Power indicated on rating plate kW	*HP*		**Line choke**	**1 extension or communication card**	**IP 65 enclosure for the remote operator terminal**	**PowerSuite advanced dialogue solutions** Software workshop	Magelis XBT display unit	**RS 485 interconnection**
380…460 V 3-phase	3	–	**ATV 38ED05N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	4	*5*	**ATV 38ED07N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	5.5	*7.5*	**ATV 38ED09N4**	VW3 A66503	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	7.5	*10*	**ATV 38ED12N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	11	*15*	**ATV 38ED16N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	15	*20*	**ATV 38ED23N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	18.5	*25*	**ATV 38ED25N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	22	*30*	**ATV 38ED28N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	30	*40*	**ATV 38ED33N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	37	*50*	**ATV 38ED46N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	45	*60*	**ATV 38ED54N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	55	*75*	**ATV 38ED64N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306
	75	*100*	**ATV 38ED79N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	HM017010A8	VW3 A58306

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(1) In most cases this filter is unnecessary as the ready-assembled drive can be located very close to the motor.

Options *(continued)*

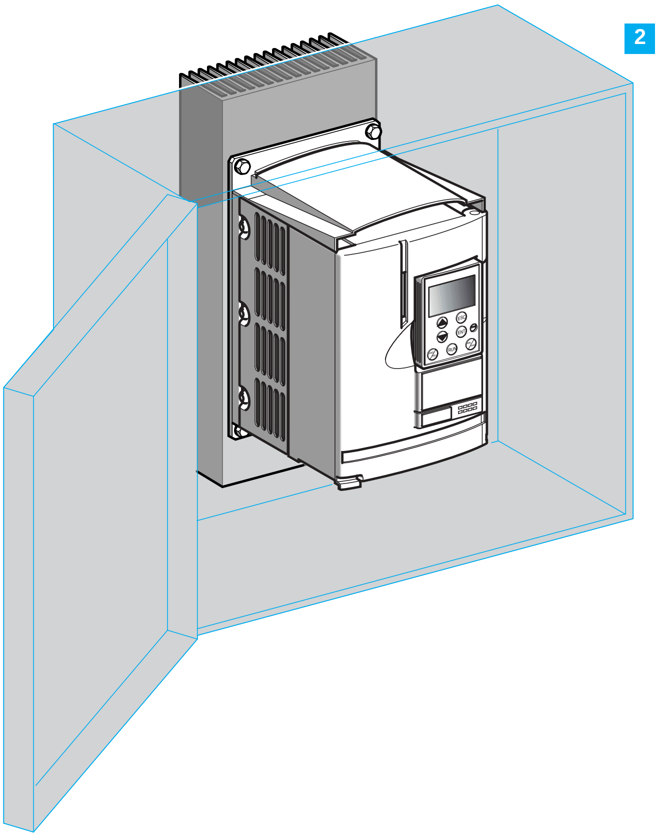
Additional input filter *(1)*		Output filter *(1)*	Braking module	IP 00 braking resistor	IP 30 braking resistor	Kit for mounting IP 23 air exchanger	Control card fan kit	Separate control circuit supply kit	Removable power terminals
400 V	440…460 V								
VW3 A58402	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	–	VW3 A58822	VW3 A58602	VW3 A58812
VW3 A58402	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	–	VW3 A58822	VW3 A58602	VW3 A58812
VW3 A58402	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	–	VW3 A58822	VW3 A58602	VW3 A58812
VW3 A58403	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734	–	VW3 A58823	VW3 A58603	VW3 A58813
VW3 A58403	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734	–	VW3 A58823	VW3 A58603	VW3 A58813
VW3 A58403	VW3 A58403	VW3 A58452	Integrated	–	VW3 A58735	–	VW3 A58823	VW3 A58603	VW3 A58813
VW3 A58404	VW3 A58404	VW3 A58453	Integrated	–	VW3 A58735	–	VW3 A58824	VW3 A58604	–
VW3 A58404	VW3 A58404	VW3 A58453	Integrated	–	VW3 A58736	–	VW3 A58824	VW3 A58604	–
VW3 A58405	VW3 A58405	VW3 A58453	Integrated	–	VW3 A58736	–	VW3 A58824	VW3 A58604	–
VW3 A58406	VW3 A58406	VW3 A66412	Integrated	–	VW3 A58737	VW3 A58806	VW3 A58825	–	–
VW3 A58406	VW3 A58406	VW3 A66412	Integrated	–	VW3 A58737	VW3 A58806	VW3 A58825	–	–
VW3 A58406	VW3 A58406	VW3 A66412	Integrated	–	VW3 A58737	VW3 A58806	VW3 A58825	–	–
VW3 A58406	VW3 A58406	VW3 A66412	Integrated	–	VW3 A58737	VW3 A58806	VW3 A58825	–	–
VW3 A58407	VW3 A58407	VW3 A66412	Integrated	–	VW3 A58737	VW3 A58806	VW3 A58825	–	–
VW3 A58407	VW3 A58407	VW3 A66413	Integrated	–	VW3 A66704	VW3 A58807	VW3 A58826	–	–
VW3 A58407	VW3 A58407	VW3 A66413	Integrated	–	VW3 A58737	VW3 A58806	VW3 A58825	–	–
VW3 A58407	VW3 A58407	VW3 A66413	Integrated	–	VW3 A66704	VW3 A58807	VW3 A58826	–	–
VW3 A58408	VW3 A58408	VW3 A66413	Integrated	–	VW3 A66704	VW3 A58807	VW3 A58826	–	–
VW3 A58408	VW3 A58408	VW3 A66413	Integrated	–	VW3 A66704	VW3 A58807	VW3 A58826	–	–
VW3 A58408	VW3 A58408	VW3 A66413	Integrated	–	VW3 A66704	VW3 A58807	VW3 A58826	–	–
VW3 A58408	VW3 A58408	VW3 A66413	Integrated	–	VW3 A66704	VW3 A58807	VW3 A58826	–	–
VW3 A58408	VW3 A58408	VW3 A66507	–	–	–	–	–	–	–
VW3 A58408	VW3 A58408	VW3 A66421	–	–	–	–	–	–	–
VW3 A68401	VW3 A68415	VW3 A68551	–	–	–	–	–	–	–
VW3 A68402	VW3 A68435	VW3 A68552	–	–	–	–	–	–	–
VW3 A68402	VW3 A68435	VW3 A68552	–	–	–	–	–	–	–
VW3 A68402	VW3 A68435	VW3 A68552	–	–	–	–	–	–	–
VW3 A68403	VW3 A68465	VW3 A68553	–	–	–	–	–	–	–
VW3 A68403	VW3 A68465	VW3 A68553	–	–	–	–	–	–	–
VW3 A68403	VW3 A68465	VW3 A68553	–	–	–	–	–	–	–
VW3 A68403	VW3 A68465	VW3 A68553	–	–	–	–	–	–	–
VW3 A68403	VW3 A68465	VW3 A68553	–	–	–	–	–	–	–

Options *(continued)*

Additional input filter *(1)*		Output filter *(1)*	Braking module	IP 00 braking resistor	IP 30 braking resistor
400 V	440…460 V				
VW3 A58403	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734
VW3 A58403	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734
VW3 A58403	VW3 A58403	VW3 A58452	Integrated	–	VW3 A58735
VW3 A58404	VW3 A58404	VW3 A58453	Integrated	–	VW3 A58735
VW3 A58404	VW3 A58404	VW3 A58453	Integrated	–	VW3 A58736
VW3 A58405	VW3 A58405	VW3 A58453	Integrated	–	VW3 A58736
–	–	VW3 A66412	Integrated	–	VW3 A58737
–	–	VW3 A66412	Integrated	–	VW3 A58737
–	–	VW3 A66412	Integrated	–	VW3 A58737
–	–	VW3 A66413	Integrated	–	VW3 A66704
–	–	VW3 A66413	Integrated	–	VW3 A66704
–	–	VW3 A66413	Integrated	–	VW3 A66704
–	–	–	Integrated	–	VW3 A66704

Variable speed drives for asynchronous motors

Altivar 58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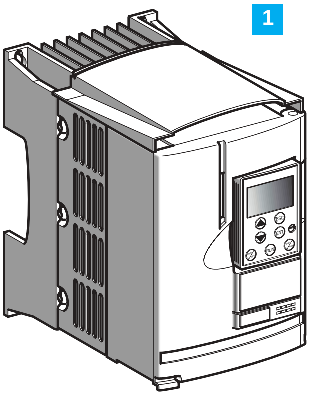
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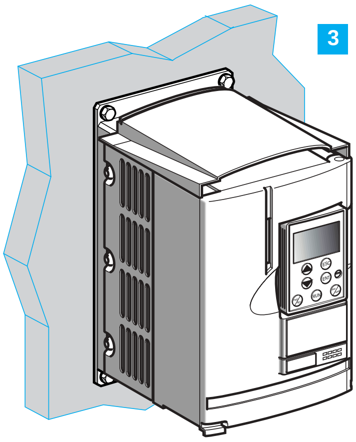
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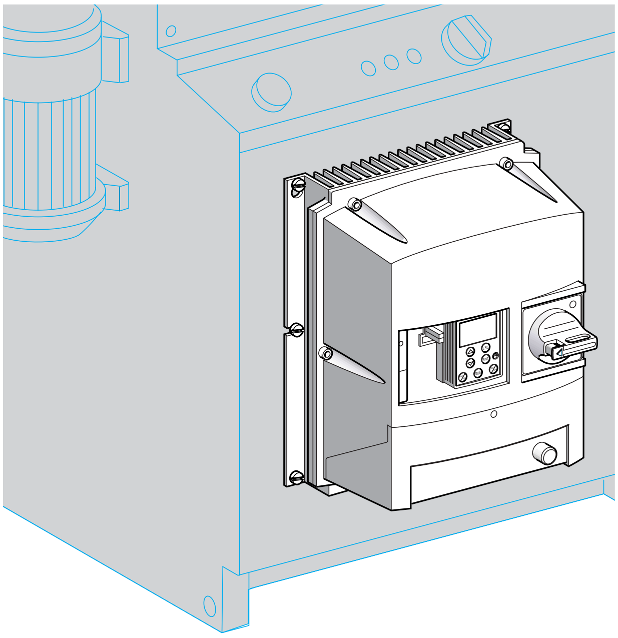
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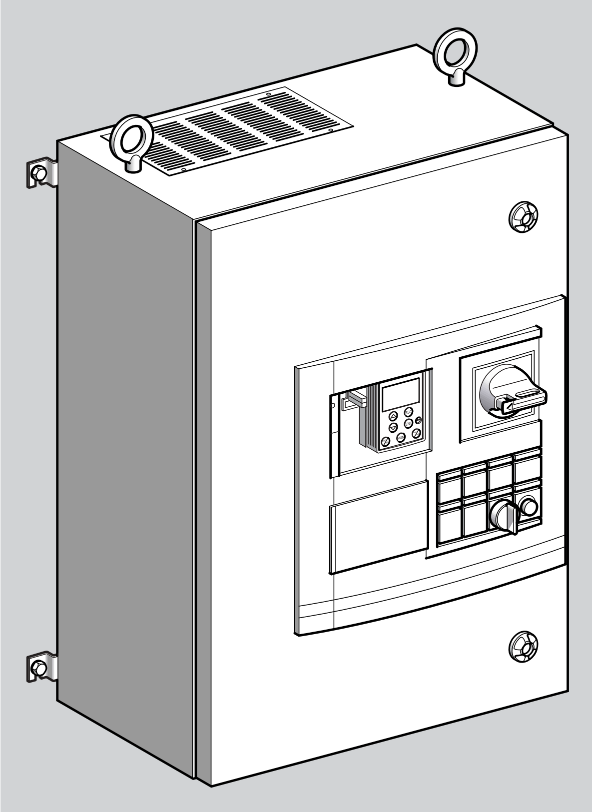

5

Variable speed drives for asynchronous motors

Altivar 58

Applications

The Altivar 58 is a frequency inverter for three-phase squirrel cage asynchronous motors which incorporates the latest technological developments and functions suitable for the most common applications, including:

- horizontal and vertical materials handling,
- packing/packaging,
- special machines,
- ventilation/air conditioning,
- pumps and compressors.

Its numerous integrated options enable it to be adapted to sophisticated and advanced control systems.

For applications in which only a small amount of overtorque is required, drives with power ratings of ≥ 11 kW at 208…240 V and ≥ 18.5 kW at 380…500 V can be oversized.

Functions

The main functions are:

- starting, dynamic braking and braking to a standstill, and speed control,
- energy saving, PI regulator (flow rate, pressure, etc.),
- brake sequence,
- speed loop with tachogenerator or pulse generator,
- +/- speed, S ramps, U ramps, preset speeds, JOG operation,
- automatic catching a spinning load with speed detection (catch on the fly),
- adaptation of current limiting according to speed for ventilation applications,
- automatic limitation of low speed operating time, motor and drive protection, etc.

Standard versions

The Altivar 58 is available in three versions for integration into machines.

Standard drive with heatsink (1)

For normal environments and ventilated enclosures

Drive on base plate (2 and 3)

This version is designed for applications in which the degree of protection required for the prevailing environmental conditions prevents ventilation.

The drive can be mounted in the following ways:

- in a dust and damp proof enclosure sold separately in order to dissipate heat externally (2),
- on the machine chassis if the chassis frame can absorb the heat (3)

In both cases, no special cut-outs other than the fixing holes for the drive are needed.

Ready-assembled drive (4 and 5)

- **Altivar 58 COMPACT**, power rating between 0.37 and 5.5 kW (4)

This ready-to-use IP 55 enclosure is equipped with a drive on a base plate with an external heatsink, a circuit-breaker to provide type 2 coordination and protection, and a downstream contactor.

This enclosure can be installed next to the motor.

- **Altivar 58 ENERGY**, power rating between 3 and 75 kW (5)

The IP 55 enclosure is equipped with a drive with a cooling system and a Vario switch disconnector. A slot is provided for an additional contactor. The drives are supplied with an integrated line choke.

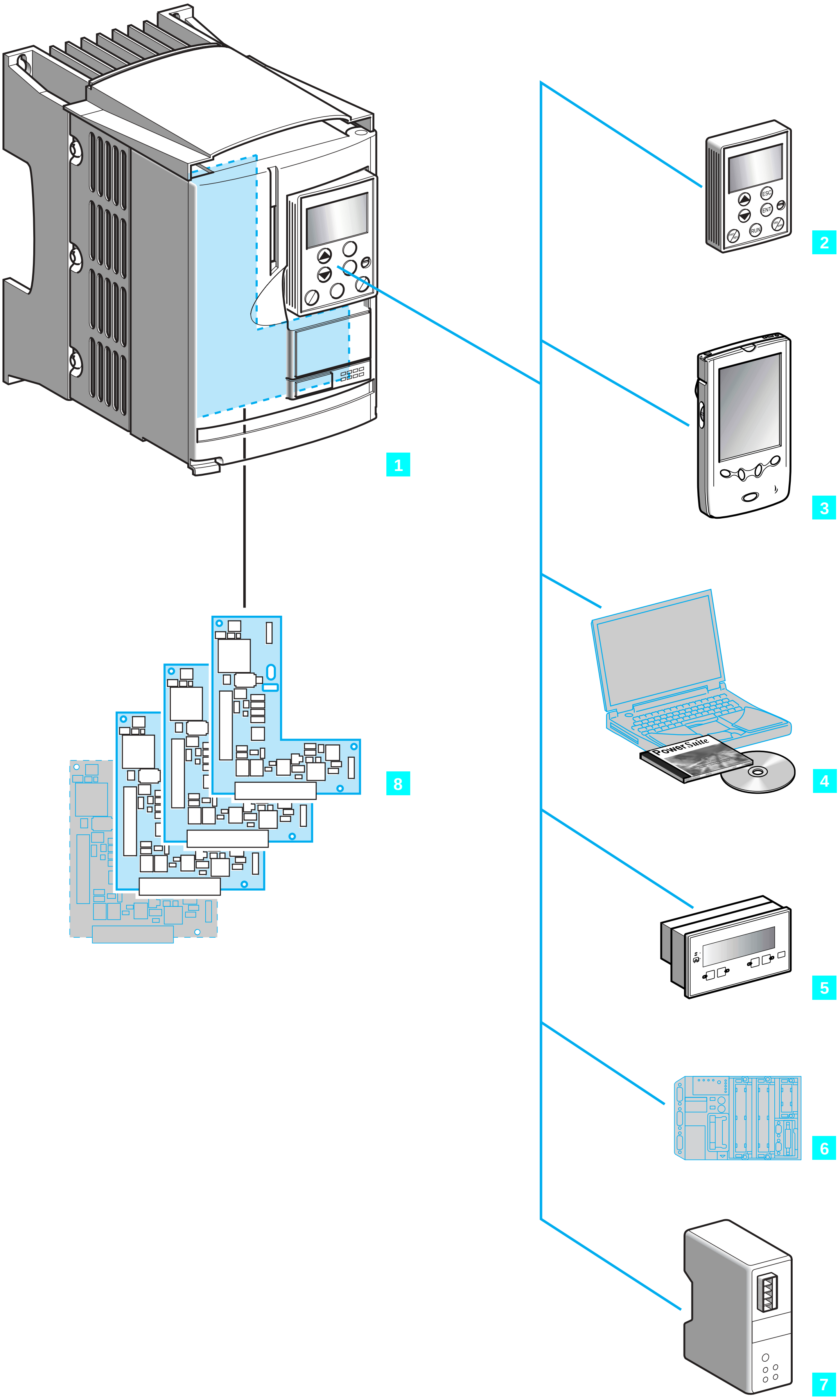
This enclosure can be installed next to the motor.

Characteristics:
pages 2/127 to 2/129

References:
pages 2/130 and 2/131

Dimensions, schemes:
pages 2/160 to 2/170

Functions:
pages 2/190 to 2/205


ESC
ENT
RUN
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PowerSuite
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8
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7

Variable speed drives for asynchronous motors

Altivar 58

Quick programming using macro-configurations

The Altivar 58 can be programmed quickly and easily using macro-configurations which correspond to the various functions and applications: materials handling, general use, variable torque.
Each of these configurations can of course be modified as required.

Dialogue functions

The Altivar 58 (1) has an RS 485 multidrop serial link with a simplified Modbus protocol integrated into the base product. This serial link can be used to connect PLCs (6), a PC, a communication gateway or one of the available programming tools.

4 advanced dialogue solutions, with plain text display in 5 languages (English, French, German, Spanish, Italian) and configuration memory:

- operator terminal, on drive or enclosure door (2),
- PowerSuite advanced dialogue solutions:
  - Pocket PC for PowerSuite (3),
  - PowerSuite software workshop for PC (4),
  - Magelis display unit with matrix screen (5).

Customizing the application

Functions can be extended by adding an extension card or a communication bus.

- I/O extension cards (8):
  - I/O and speed loop with analogue input or encoder input.

- Communication bus (7 and 8):
  - Fipio, Uni-Telway/Modbus, INTERBUS-S, Modbus Plus, AS-Interface, Profibus DP, Ethernet, CANopen, DeviceNet, METASYS N2 communication bus,
  - Lonworks communication gateway.

- Customer-specific card (8) on request:
  - software functions, for example special cycles and servo control,
  - hardware functions, for example specific inputs or outputs.

Cards are already available for:
- pump switching,
- multi-motor function,
- multi-parameter settings,
- simple position control.

Electromagnetic compatibility EMC

- Integrated EMC filters:

ATV 58 drives can be supplied with integrated EMC filters. Incorporation of the filters in the drives facilitates machine installation and conformity for CE marking purpose at low cost.
They have been sized to conform to IEC/EN 61800-3 standards (residential and industrial environments).

ATV 58 drives with power ratings ≥ 18.5 kW at 380…500 V are also available without EMC filters for applications which do not require EMC conformance.

Drives with power ratings ≤ 11 kW at 208…240 V are available with integrated EMC filters. For ratings ≥ 11 kW, EMC filters are available as an option.

- Line chokes:

ATV 58 drives with power ratings ≥ 11 kW at 208…240 V and ≥ 18.5 kW at 380…500 V are available with integrated line chokes which limit the line current to the value of the nominal current of the motor.
Separate line chokes are available as an option for other ratings.

Characteristics:
pages 2/127 to 2/129

References:
pages 2/132 to 2/134

Dimensions, schemes:
pages 2/160 to 2/170

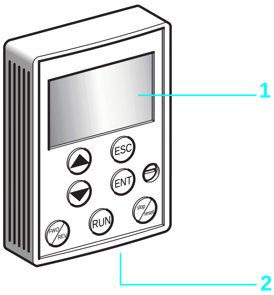
Functions:
pages 2/190 to 2/205

Operator terminal

The Altivar 58 has a slot on the front panel for a removable operator terminal which can be supplied with the drive or ordered separately. It can be used:

- in 5 languages (English, French, German, Spanish, Italian),
- to control, adjust and configure the drive,
- for visible remote signalling,
- to save and download configurations (4 storage files).

A "remote terminal" option enables the terminal to be used remotely (using a 3 m cable) and to be mounted on the door of an enclosure with IP 65 protection on the front panel.



Backlit display (1)

↺	Flashing: indicates the selected direction of rotation.
↻	Steady: indicates the direction of motor rotation.
LOC	Indicates control via the terminal.
PROG	Appears in setup and programming mode. Flashing: indicates that a value has been modified but not saved.

4 digits visible at 5 m: displays numeric values and codes.
One line of 16 characters: displays messages in plain text.

The keys are used (2):

To adjust and configure the drive.
To control the drive.

PowerSuite advanced dialogue solutions

See pages 3/2 and 3/3.

Characteristics:
pages 2/127 to 2/129

References:
pages 2/132 to 2/134

Dimensions, schemes:
pages 2/160 to 2/170

Functions:
pages 2/190 to 2/205

Variable speed drives for asynchronous motors
Altivar 58

Environment characteristics

Conforming to standards			Altivar 58 drives have been developed to conform to the strictest national and international standards and the recommendations relating to electrical industrial control devices (IEC, EN, NFC, VDE), in particular: ■ Low voltage EN 50178 ■ EMC immunity: □ IEC/EN 61000-4-2 level 3 □ IEC/EN 61000-4-3 level 3 □ IEC/EN 61000-4-4 level 4 □ IEC/EN 61000-4-5 level 3 □ IEC/EN 61800-3, environments 1 and 2 ■ EMC, radiated and conducted emissions: □ IEC/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply) restricted distribution □ EN 55011 class A (drives with built-in radio interference filters) □ EN 55022 class B, with additional filters
CE marking			The drives have been designed to meet the requirements of the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives. Altivar 58 drives are therefore permitted to carry the CE European Union mark.
Product certifications			UL, CSA, DNV
Degree of protection			Unprotected drives: IP 21 and IP 41 on upper part (conforming to EN 50178)
Vibration resistance			Conforming to IEC 60068-2-6: ■ 1.5 mm peak from 2 to 13 Hz ■ 1 gn from 13 to 200 Hz
Shock resistance			Conforming to IEC 60068-2-27: 15 gn for 11 ms
Maximum ambient pollution			Drives **ATV 58HD16M2X** to **HD46M2X**, **●D28N4** to **●D79N4** and **HD28N4X** to **HD79N4X**: Degree 3 conforming to UL 508C Other drives: degree 2 conforming to IEC 664-1 and EN 50178
Maximum relative humidity			93 % without condensation or dripping water conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage	**°C**	- 25…+ 65
	Operation	**°C**	**ATV 58P●●●●** drives, all ratings: - 10…+ 40 Drives **ATV 58HU09M2** to **HU72M2** and **HU18N4** to **HU90N4**: ■ - 10…+ 50 without ventilation kit, without derating ■ Up to + 60 with ventilation kit, with current derating of 2.2 % per °C above 50 °C Drives **ATV 58HU90M2** to **HD12M2** and **HD12N4** to **HD23N4**: ■ - 10…+ 40 without ventilation kit, without derating ■ Up to + 50 with ventilation kit, with current derating of 2.2 % per °C above 40 °C Drives **ATV 58HD16M2X** to **HD46M2X**, **HD28N4** to **HD79N4** and **HD28N4X** to **HD79N4X**: ■ - 10…+ 40 without ventilation kit, without derating ■ Up to + 60 with ventilation kit, current derating of 2.2 % per °C above 40 °C
Maximum operating altitude		**m**	1000 without derating (above this, derate the current by 1 % per additional 100 m)
Operating position			Vertical

Drive characteristics

Output frequency range	**Hz**	0.1…500
Configurable switching frequency	**kHz**	■ Without derating, in continuous operation: □ 0.5-1-2-4 for drives **ATV 58●U09M2** to **●D12M2**, **HD16M2X** and **HD23M2X**, **●U18N4** to **●D46N4** and **HD28N4X** to **HD46N4X** □ 0.5-1-2 for drives **ATV 58HD28M2X** to **HD46M2X** , **●D54N4** to **●D79N4** and**HD54N4X** to **HD79N4X** ■ Without derating with intermittent operating cycle or with derating by one power rating in continuous operation: □ 8-12-16 for drives **ATV 58●U09M2** to **●D12M2** and **●U18N4** to **●D23N4** □ 8-12 for drives **ATV 58HD16M2X**, **HD23M2X**, **●D28N4** to **●D46N4** and **HD28N4X** to **HD46N4X** □ 4-8 for drives **ATV 58HD28M2X** to **HD46M2X**, **●D54N4** to **●D79N4** and **HD54N4X** to **HD79N4**X
Speed range		1…100
Speed precision For a torque variation of 0.2 Tn to Tn		■ ± 1 % of nominal speed, without speed feedback ■ ± 0.1 % of nominal speed, with tachogenerator feedback (option card) ■ ± 0.2 % of nominal speed, with encoder feedback (option card)
Transient overtorque		200 % (140 % in standard torque) of the nominal motor torque (typical value at ± 10 %) for 2 s 170 % (120 % in standard torque) of the nominal motor torque (typical value at ± 10 %) for 60 s
Braking torque		30 % of the nominal motor torque without braking resistor (typical value). Up to 150 % with braking resistor fitted as option
Voltage/frequency ratios		Sensorless flux vector control: at constant torque, variable torque or in energy saving mode, configurable

Presentation:
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References:
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Dimensions, schemes:
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Functions:
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Variable speed drives for asynchronous motors

Altivar 58

Electrical characteristics

Power supply	a.c. voltage	**V**	Drives ATV 58●●●●M2: 200 - 10 % to 240 + 10 % single-phase and 3-phase Drives ATV 58HD●●M2X: 208 - 10 % to 240 + 10 % 3-phase Drives ATV 58●●●●N4 and ●●●●N4X: 380 - 10 % to 500 + 10 % 3-phase
	Frequency	**Hz**	50 ± 5 % or 60 ± 5 %
	d.c. voltage	**V**	Drives **ATV 58H●●●●●**Z290: 540 - 10 % to 700 + 10 %
Output voltage			Maximum voltage equal to line supply voltage
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Available internal supplies			Short-circuit and overload protection 1 x + 10 V (- 0, + 010%) supply for the reference potentiometer (1 to 10 kΩ), maximum current 10 mA 1 x + 24 V supply (min. 20 V, max. 30 V) for control inputs, maximum current 200 mA
Analogue inputs A1			1 analogue voltage input AI1: 0-10 V, impedance 30 kΩ 1 analogue current input AI2: 0-20 mA, impedance 100 kΩ (reassignable to X-Y mA by programming X and Y with a definition of 0.1 mA) Frequency resolution in analogue reference: 0.1 Hz for 100 Hz (10 bits) Precision accuracy ± 1 %, linearity ± 0.5 % of the maximum output frequency Sampling time: 4 ms max. Other inputs: see option cards
Analogue output AO1			Assignable analogue output 0-20 mA, max. load impedance 500 Ω (reassignable to X-Y mA by programming X and Y from 0 to 20 with a definition of 0.1 mA) Resolution 0.04 mA (9 bits), linearity ± 0.1 mA, precision ± 0.2 mA Max. sampling time 2 ms Other analogue outputs: see option cards
Logic inputs LI			4 assignable logic inputs, impedance 3.5 kΩ, compatible with level 1 PLC, IEC 65A-68 standard Maximum length of shielded cable: 100 m Power supply + 24 V (min. 11 V, max. 30 V) State 0 if < 5 V, state 1 if ⩾ 11 V Sampling time: 2 ms max. Other inputs: see option cards
Logic outputs			2 relay logic outputs R1 (fault relay) and R2 (assignable) 1 C/O contact protected against overvoltages (relay R1) 1 N/O contact protected against overvoltages (relay R2) Minimum switching capacity: 10 mA for ⎓ 24 V Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for ∿ 250 V or ⎓ 30 V ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for ∿ 250 V or ⎓ 30 V Other outputs: see option cards
Communication			RS 485 multidrop serial link with simplified Modbus protocol as part of the standard product Transmission speed: 19200 bps, no parity Use: ■ connecting a terminal (option) or ■ connecting a microprocessor card or ■ connecting a PC (option) or ■ connecting one or more PLCs
Acceleration and deceleration ramps			Ramp profiles can be selected: linear, S or U Factory-set to 3 s Possibility of 2 ramp ranges which can be switched via frequency threshold or logic input Can be adjusted separately from 0.05-0.1 to 999.9 s (definition 0.1 s) Automatic adaptation of deceleration ramp times if the braking capacity is exceeded (configurable option)
Braking to a standstill			By d.c. injection: ■ by a signal on an assignable logic input ■ automatically on stopping as soon as the frequency drops below 0.1 Hz, for a time which can be set between 0 and 30 s or continuous
Main protection and safety features of the drive			Short-circuit protection: ■ between output phases ■ between output phases and earth ■ on internal supply outputs Thermal protection against overheating and overcurrents Line supply undervoltage and overvoltage safety circuits Loss of supply phase safety circuit (prevents single-phase operation of 3-phase drives)
Motor protection			Thermal protection integrated in drive via continuous calculation of I^2t taking speed into account: ■ the motor thermal state is saved when the drive is powered down ■ the function can be modified via the terminal, depending on the type of motor (force-cooled or self-cooled). Protection against motor loss of phase Protection via PTC probes with option card
Insulation resistance to earth		**MΩ**	> 500 (electrical isolation) at ⎓ 500 V
Dielectric strength		**V**	⎓ 2830 earth/power
		V	∿ 2000 control/power

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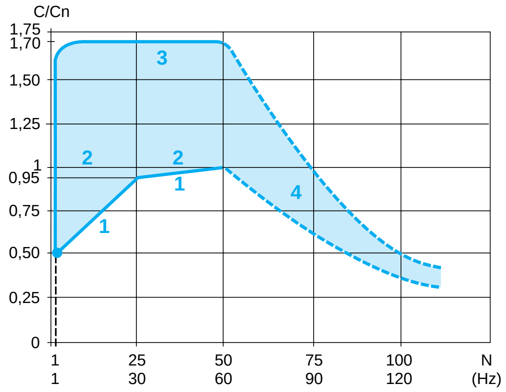
Variable speed drives for asynchronous motors
Altivar 58

Torque characteristics (typical curves)

The curves below define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

High torque applications



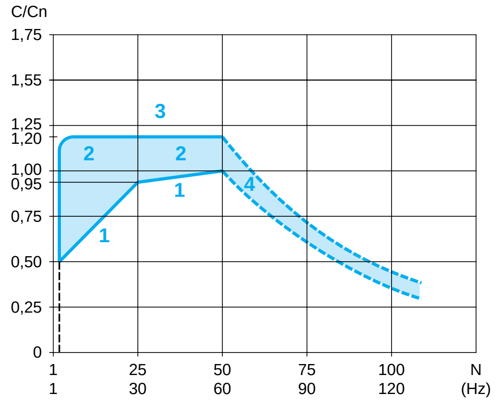
1 Self-cooled motor: continuous useful torque *(1)*

2 Force-cooled motor: continuous useful torque

3 Transient overtorque

4 Torque in overspeed at constant power *(2)*

Standard torque applications



1 Self-cooled motor: continuous useful torque *(1)*

2 Force-cooled motor: continuous useful torque

3 Transient overtorque

4 Torque in overspeed at constant power *(2)*

Motor thermal protection

The Altivar 58 drive features motor thermal protection designed specifically for self-cooled or forced-cooled variable speed motors.

This motor thermal protection is designed for a maximum ambient temperature of 40 °C around the motor.

If the temperature around the motor exceeds 40 °C, external thermal protection should be provided directly by thermistor probes integrated into the motor using one of the available option cards.

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(1) For power ratings ≤ 250 W, derate the motor by 20 % instead of 50 % at very low frequencies.
(2) The nominal frequency of the motor and the maximum output frequency can be adjusted between 40 and 500 Hz.
***Caution**: check the mechanical overspeed characteristics of the selected motor with the manufacturer.*

Variable speed drives for asynchronous motors
Altivar 58

Special uses

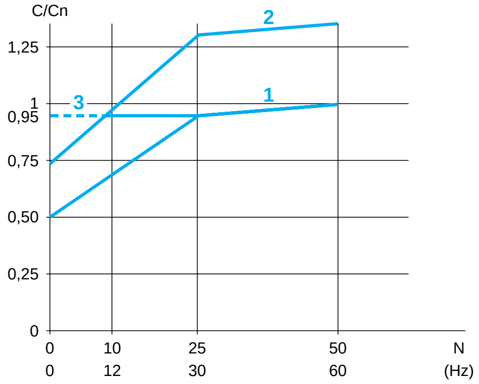
Motor power lower than drive power

The Altivar 58 drive can supply any motor which has a power rating lower than that for which it is designed. Using the drive in this way provides a possible solution for applications requiring high intermittent overtorques.
Examples: machine with very high starting torque, grinder, kneader, etc.

Nota : *in this case, it is advisable to increase the rating of the drive to the standardised power rating immediately above that of the motor.*

Example: an 11 kW motor connected to a 15 kW drive.

Motor power greater than drive power



A motor with a power rating greater than that of the drive may be used as long as the current taken by the motor is less than or equal to the nominal current of the drive. This gives a self-cooled motor a greater speed range in continuous operation.

Nota : *the motor power should be limited to the standardised power rating immediately above that of the drive.*

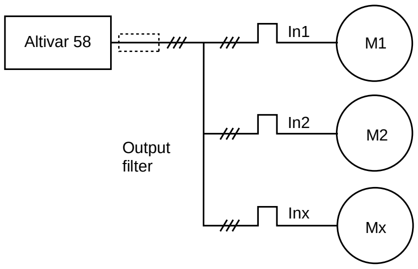
Example: a 2.2 kW drive connected to a 3 kW motor (the 3 kW motor will be used as a 2.2 kW motor with a speed range between 10 and 50 Hz).

1 Continuous motor torque
Example: 2.2 kW
Motor power = drive power

2 Continuous motor torque
Example: 3 kW
Motor power > drive power

3 2.2 kW drive: nominal current

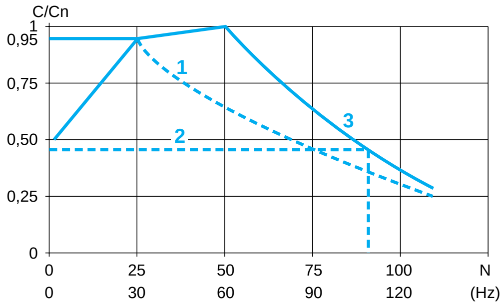
Connecting motors in parallel



The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, provide external thermal protection for each motor using probes or thermal overload relays. If the number of motors connected in parallel is ≥ 3, it is advisable to install an output filter between the drive and the motors or to reduce the switching frequency.

Calculating the drive rating:
In drive > In1 + In2 + …Inx
If several motors are used in parallel, there are 2 possible scenarios:
- the motors have equal power ratings, in which case the torque characteristics will remain optimised after the drive has been configured,
- the motors have different power ratings, in which case the drive configuration will be incompatible for the motors with the lowest power ratings and the overtorque at low speed will be considerably reduced.

Using a motor at overspeed



The maximum output frequency of the drive can be adjusted between 40 and 500 Hz. Before using a standard asynchronous motor at overspeed, check the mechanical overspeed characteristics of the selected motor with the manufacturer.
Above its nominal speed (corresponding to a frequency of 50/60 Hz), the motor operates with decreasing flux and its torque drops significantly (see the graph opposite).
The application must support this mode of operation at reduced torque and very high speed.

1 Machine torque (decreasing torque)
2 Machine torque (low motor torque)
3 Continuous motor torque

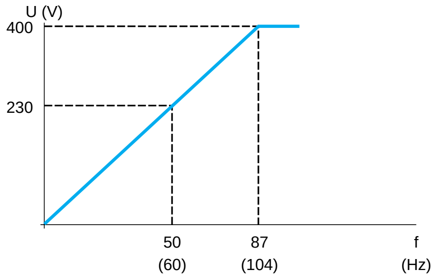
Typical applications: wood-working machine and increase of the operating speed range on motors with low loads.

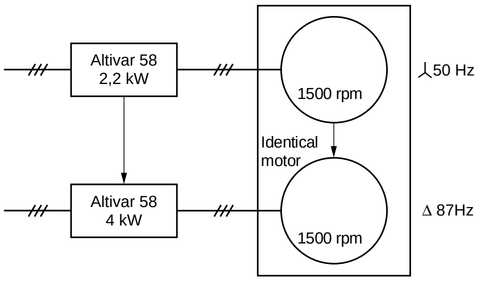
Variable speed drives for asynchronous motors

Altivar 58

Special uses (continued)

Using a motor at constant torque up to 87/104 Hz





One 400 V, 50 Hz motor with a ⅄ connection can be used at constant torque up to 87 Hz if it has a Δ connection.
In this special case, the initial power of the motor and the power of the first drive connected are multiplied by √3 (you must select a drive with a suitable power rating).
Example: a 2.2 kW, 50 Hz motor with a ⅄ connection supplies 3.8 kW at 87 Hz with a Δ connection.
(Check that it can operate at overspeed).

Using special motors

- Special brake motors: tapered rotor or flux bypass

This is the magnetic field of the motor which releases the brake. In order to operate the Altivar 58 in this way, the voltage must be set at low frequency.

***Nota :** the no-load current can be high but operation at low speed may only be intermittent.*

- Synchronised synchronous or asynchronous motors

These motors have a low level of self-inductance and require the use of chokes connected in series. The low speed torque remains limited. Special settings are required (suppression of slip compensation, adjustment of the motor power supply ratio).

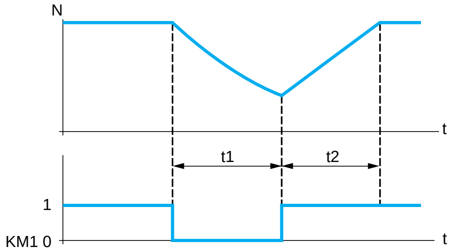
- Asynchronous motors with resistive rotor

The excessive slip on these motors limits the low speed torque. Special settings are required (adjustment of slip compensation and motor power supply ratio).

- Special high-speed motors

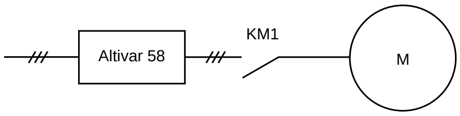
These motors are designed for constant torque applications with high frequency ranges: 0 to 200/500 Hz. In some cases, it is advisable to install an output filter between the drive and the motor.

Switching the motor at the drive output



Example: breaking of downstream contactor

t1: deceleration without ramp (freewheel)
t2: acceleration with ramp



Switching is possible with the drive locked or unlocked. With switching on-the-fly (drive unlocked), the motor is controlled and accelerates smoothly until it reaches the reference speed following the acceleration ramp.
The "flying restart" must be configured for this type of use and the "output phase loss" protection function must be disabled.

Typical applications: safety breaking at the drive output, bypass function, switching of motors connected in parallel.

Operation with intermittent cycle and high switching frequency

It is possible to operate at a high switching frequency *(1)* without derating the power if the operating conditions are intermittent within the following limits:
cumulative running time 36 s maximum per 60 s cycle (load factor 60 %).

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(1) Possible frequencies (in kHz):
8-12-16 for drives ATV 58●U09M2 to ●D12M2 and ●U18N4 to ●D23N4
8-12 for drives ATV 58HD16M2X, HD23M2X and HD28N4 to HD46N4
4-8 for drives ATV 58HD28M2X to HD46M2X and HD54N4 to HD79N4

Variable speed drives for asynchronous motors

Altivar 58 with heatsink and integrated EMC filters

for asynchronous motors from 0.37 to 75 kW or 0.5 to 100 HP

ATV 58HU18M2

ATV 58HD28N4

ATV 58HD54N4

High torque applications (170 % Tn)

Motor		Line supply				Altivar 58				
Power indicated on rating plate *(1)*		Line current *(2)*		Max. prospective line Isc		Nominal drive current	Max. transient current *(3)*	Power dissipated at nominal load *(4)*	Reference to be completed *(5)*	Weight
		at U min.	at U max.	at U min.	at U max.					
kW	HP	A	A	kA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V *(6)* 50/60 Hz										
0.37	0.5	5.6	4.7	2	2	2.3	3.1	42	**ATV 58HU09M2**	2.200
0.75	1	9.8	8.3	2	2	4.1	5.6	64	**ATV 58HU18M2**	2.200
1.5	2	18.5	15.6	5	5	7.8	10.6	107	**ATV 58HU29M2**	3.800
2.2	3	24.8	21.1	5	5	11	15	145	**ATV 58HU41M2**	3.800
3	–	24.7	21.3	5	5	13.7	18.6	220	**ATV 58HU72M2** *(7)*	6.900
4	5	35	30	22	22	18.2	24.7	235	**ATV 58HU90M2** *(7)*	13.000
5.5	7.5	46	39.4	22	22	24.2	32.9	310	**ATV 58HD12M2** *(7)*	13.000
3-phase supply voltage: 200…240 V *(6)* 50/60 Hz										
1.5	2	9.7	8.3	5	5	7.8	10.6	107	**ATV 58HU29M2** *(8)*	3.800
2.2	3	13.4	11.4	5	5	11	15	145	**ATV 58HU41M2** *(8)*	3.800
3	–	17.2	15	5	5	13.7	18.6	170	**ATV 58HU54M2** *(8)*	6.900
4	5	22.4	19.5	5	5	18.2	24.7	220	**ATV 58HU72M2** *(8)*	6.900
5.5	7.5	34.7	30	22	22	24.2	32.9	235	**ATV 58HU90M2** *(8)*	13.000
7.5	10	44.4	38.2	22	22	31	42.2	310	**ATV 58HD12M2** *(8)*	13.000
3-phase supply voltage: 380…500 V *(6)* 50/60 Hz										
0.75	1	3.4	2.6	5	5	2.3	3.1	55	**ATV 58HU18N4** *(8)*	3.800
1.5	2	6	4.5	5	5	4.1	5.6	65	**ATV 58HU29N4** *(8)*	3.800
2.2	3	7.8	6	5	5	5.8	7.9	105	**ATV 58HU41N4** *(8)*	3.800
3	–	10.2	7.8	5	5	7.8	10.6	145	**ATV 58HU54N4** *(8)*	6.900
4	5	13	10.1	5	5	10.5	14.3	180	**ATV 58HU72N4** *(8)*	6.900
5.5	7.5	17	13.2	5	5	13	17.7	220	**ATV 58HU90N4** *(8)*	6.900
7.5	10	26.5	21	22	22	17.6	24	230	**ATV 58HD12N4** *(8)*	13.000
11	15	35.4	28	22	22	24.2	32.9	340	**ATV 58HD16N4** *(8)*	13.000
15	20	44.7	35.6	22	22	33	44.9	410	**ATV 58HD23N4** *(8)*	15.000
18.5	25	43	35	22	65	41	55	670	**ATV 58HD28N4**	34.000
22	30	51	41	22	65	48	66	780	**ATV 58HD33N4**	34.000
30	40	68	55	22	65	66	90	940	**ATV 58HD46N4**	34.000
37	50	82	66	22	65	79	108	940	**ATV 58HD54N4**	57.000
45	60	101	82	22	65	94	127	1100	**ATV 58HD64N4**	57.000
55	75	121	98	22	65	116	157	1475	**ATV 58HD79N4**	57.000
Standard torque applications (120 % Tn)										
3-phase supply voltage: 380…500 V *(6)* 50/60 Hz										
22	30	51	41	22	65	44	55	750	**ATV 58HD28N4**	34.000
30	40	67	53	22	65	60	66	925	**ATV 58HD33N4**	34.000
37	50	82	66	22	65	72	90	1040	**ATV 58HD46N4**	34.000
45	60	99	79	22	65	85	108	1045	**ATV 58HD54N4**	57.000
55	75	121	97	22	65	105	127	1265	**ATV 58HD64N4**	57.000
75	100	160	130	22	65	138	157	1730	**ATV 58HD79N4**	57.000

(1) These power levels are given for the maximum switching frequency permitted by the drive (2 or 4 kHz depending on the rating) in continuous operation without derating. For higher switching frequencies, the drive must be in intermittent operation or it must be set one rating lower (see special uses on the previous pages).

(2) Typical value without additional choke for a 4-pole motor. Exceptions: ***ATV 58HU72M2****,* ***HU90M2*** *and* ***HD12M2*** *(single phase) (7).*

(3) For 60 seconds.

(4) These power levels are given for the maximum switching frequency permitted by the drive in continuous operation (2 or 4 kHz depending on the rating).

(5) Drive supplied with an operator terminal mounted on it. To obtain a drive without an operator terminal, add the letter ***Z*** *at the end of the reference.*
Example: for ***ATV 58HU09M2*** *without operator terminal, the reference is* ***ATV 58HU09M2Z****.*

(6) Nominal supply voltages, U min…U max.

(7) A line choke must be used if these drives are connected to a single phase supply.

(8) These drives are available with power supplied via the d.c. bus, without an operator terminal. To order these drives, add ***Z290*** *at the end of the reference.*
Example: ***ATV 58HU18N4*** *becomes* ***ATV 58HU18N4Z290*** *with power supply via the d.c. bus.*

Note: *please refer to the table summarising the possible combinations for drives, options and accessories on pages 2/154 and 2/155.*

Variable speed drives for asynchronous motors

Altivar 58 with heatsink and no EMC filters

for asynchronous motors from 0.37 to 75 kW or 0.5 to 100 HP

ATV 58HD28N4X

ATV 58HD54N4X

High torque applications (170 % Tn)

Motor		Line supply				Altivar 58				
Power indicated on rating plate *(1)*		Line current *(2)*		Max. prospective line Isc		Nominal drive current	Max. transient current *(3)*	Power dissipated at nominal load *(4)*	Reference to be completed *(5)*	Weight
		at U min.	at U max.	at U min.	at U max.					
kW	HP	A	A	kA	kA	A	A	W		kg
Single phase supply voltage: 208…240 V *(6)* 50/60 Hz										
11	15	43	40	10	22	48	64	745	**ATV 58HD16M2X**	34.000
15	20	59	54	10	22	66	82	900	**ATV 58HD23M2X**	34.000
18.5	25	71	64	10	22	79	102	895	**ATV 58HD28M2X**	57.000
22	30	84	78	10	22	94	120	1030	**ATV 58HD33M2X**	57.000
30	40	115	104	10	22	116	158	1315	**ATV 58HD46M2X**	57.000
3-phase supply voltage: 380…500 V *(6)* 50/60 Hz										
18.5	25	43	35	22	65	41	55	660	**ATV 58HD28N4X**	34.000
22	30	51	41	22	65	48	66	775	**ATV 58HD33N4X**	34.000
30	40	68	55	22	65	66	90	925	**ATV 58HD46N4X**	34.000
37	50	82	66	22	65	79	108	930	**ATV 58HD54N4X**	57.000
45	60	101	82	22	65	94	127	1085	**ATV 58HD64N4X**	57.000
55	75	121	98	22	65	116	157	1455	**ATV 58HD79N4X**	57.000
Standard torque applications (120 % Tn)										
3-phase supply voltage: 208…240 V *(6)* 50/60 Hz										
15	20	58	52	10	22	66	64	890	**ATV 58HD16M2X**	34.000
18.5	25	70	63	10	22	79	82	980	**ATV 58HD23M2X**	34.000
22	30	82	74	10	22	94	102	975	**ATV 58HD28M2X**	57.000
30	40	114	102	10	22	116	120	1215	**ATV 58HD33M2X**	57.000
37	50	141	125	10	22	143	158	1610	**ATV 58HD46M2X**	57.000
3-phase supply voltage: 380…500 V *(6)* 50/60 Hz										
22	30	51	41	22	65	44	55	735	**ATV 58HD28N4X**	34.000
30	40	67	53	22	65	60	66	915	**ATV 58HD33N4X**	34.000
37	50	82	66	22	65	72	90	1020	**ATV 58HD46N4X**	34.000
45	60	99	79	22	65	85	108	1030	**ATV 58HD54N4X**	57.000
55	75	121	97	22	65	105	127	1245	**ATV 58HD64N4X**	57.000
75	100	160	130	22	65	138	157	1700	**ATV 58HD79N4X**	57.000

(1) These power levels are given for the maximum switching frequency permitted by the drive (2 or 4 kHz depending on the rating) in continuous operation without derating. For higher switching frequencies, the drive must be in intermittent operation or it must be set one rating lower (see special uses on the previous pages).

(2) Typical value for a 4-pole motor.

(3) For 60 seconds.

(4) These power levels are given for the maximum switching frequency permitted by the drive in continuous operation (2 or 4 kHz depending on the rating).

*(5) Drive supplied with an operator terminal mounted on it. To obtain a drive without an operator terminal, add the letter **Z** at the end of the reference. Example: for **ATV 58HD16M2X** without operator terminal, the reference is **ATV 58HD16M2XZ**.*

(6) Nominal supply voltages, U min…U max.

***Note:** please refer to the table summarising the possible combinations for drives, options and accessories on pages 2/154 and 2/155.*

Variable speed drives for asynchronous motors

Altivar 58 on base plate, with integrated EMC filters

for asynchronous motors from 0.37 to 15 kW or 0.5 to 20 HP

ATV 58PU18M2

High torque applications (170 % Tn)

Motor		Line supply				Altivar 58				
Power indicated on rating plate *(1)*		**Line current** *(2)*		**Max. prospective line Isc**		**Nominal drive current**	**Max. transient current** *(3)*	**Power dissipated at nominal load** *(4)*	**Reference to be completed** *(5)*	**Weight**
		at U min.	**at U max.**	**at U min.**	**at U max.**					
kW	**HP**	**A**	**A**	**kA**	**kA**	**A**	**A**	**W**		**kg**
Single phase supply voltage: 200…240 V *(6)* **50/60 Hz**										
0.37	0.5	5.6	4.7	2	2	2.3	3.1	25	**ATV 58PU09M2**	1.800
0.75	1	9.8	8.3	2	2	4.1	5.6	30	**ATV 58PU18M2**	1.800
1.5	2	18.5	15.6	5	5	7.8	10.6	40	**ATV 58PU29M2**	2.900
2.2	3	24.8	21.1	5	5	11	15	50	**ATV 58PU41M2**	2.900
3	–	24.7	21.3	5	5	13.7	18.6	70	**ATV 58PU72M2** (7)	4.800
4	5	35	30	22	22	18.2	24.7	75	**ATV 58PU90M2** (7)	11.500
5.5	7.5	46	39.4	22	22	24.2	32.9	100	**ATV 58PD12M2** (7)	11.500
3-phase supply voltage: 200…240 V *(6)* **50/60 Hz**										
1.5	2	9.7	8.3	5	5	7.8	10.6	40	**ATV 58PU29M2**	2.900
2.2	3	13.4	11.4	5	5	11	15	50	**ATV 58PU41M2**	2.900
3	–	17.2	15	5	5	13.7	18.6	60	**ATV 58PU54M2**	4.800
4	5	22.4	19.5	5	5	18.2	24.7	70	**ATV 58PU72M2**	4.800
5.5	7.5	34.7	30	22	22	24.2	32.9	75	**ATV 58PU90M2**	11.500
7.5	10	44.4	38.2	22	22	31	42.2	100	**ATV 58PD12M2**	11.500
3-phase supply voltage: 380…500 V *(6)* **50/60 Hz**										
0.75	1	3.4	2.6	5	5	2.3	3.1	35	**ATV 58PU18N4**	2.900
1.5	2	6	4.5	5	5	4.1	5.6	40	**ATV 58PU29N4**	2.900
2.2	3	7.8	6	5	5	5.8	7.9	50	**ATV 58PU41N4**	2.900
3	–	10.2	7.8	5	5	7.8	10.6	55	**ATV 58PU54N4**	4.800
4	5	13	10.1	5	5	10.5	14.3	65	**ATV 58PU72N4**	4.800
5.5	7.5	17	13.2	5	5	13	17.7	80	**ATV 58PU90N4**	4.800
7.5	10	26.5	21	22	22	17.6	24	90	**ATV 58PD12N4**	11.500
11	15	35.4	28	22	22	24.2	32.9	110	**ATV 58PD16N4**	11.500
15	20	44.7	35.6	22	22	33	44.9	140	**ATV 58PD23N4**	13.500

(1) These power levels are given for the maximum switching frequency permitted by the drive (2 or 4 kHz depending on the rating) in continuous operation without derating. For higher switching frequencies, the drive must be in intermittent operation or it must be set one rating lower (see special uses on the previous pages).

*(2) Typical value without additional choke for a 4-pole motor. Exceptions: **ATV 58PU72M2**, **58PU90M2** et **58PD12M2** (single phase) (7).*

(3) For 60 seconds.

(4) These power levels are given for the maximum switching frequency permitted by the drive in continuous operation (2 or 4 kHz depending on the rating).

*(5) Drive supplied with an operator terminal mounted on it. To obtain a drive without an operator terminal, add the letter **Z** at the end of the reference.*
*Example: for **ATV 58PU09M2** without operator terminal, the reference is **ATV 58PU09M2Z**.*

(6) Nominal supply voltages, U min…U max.

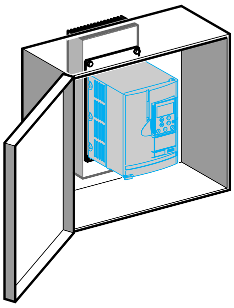
(7) A line choke must be used if these drives are connected to a single phase supply.

***Note:** please refer to the table summarising the possible combinations for drives, options and accessories on pages 2/154 and 2/155.*

Variable speed drives for asynchronous motors

Altivar 58

Options: accessories



VW3 A5880●

Kit for mounting in dust and damp proof enclosure

(IP 54 degree of protection)

This kit is used to mount the drive on a base plate inside a dust and damp proof enclosure, evacuating heat via an externally mounted heatsink. The only work to be done on the enclosure involves drilling the fixing holes.

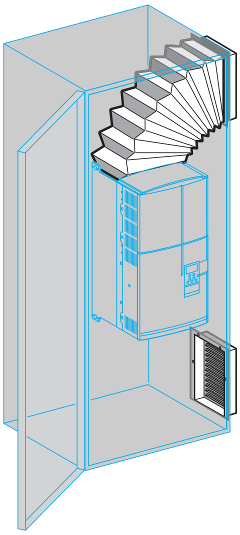
The kit consists of:
- sealing joints,
- a heatsink,
- a set of instructions.

This does not apply to the ATV 58PU09M2 and 58PU18M2, as the power dissipated by models on a heatsink is low enough for these products to be mounted in an enclosure (the ATV 58PU09M2 and 58PU18M2 are only designed for direct mounting on machine frames).

Characteristics of the enclosure

The surface of the cabinet or enclosure used for mounting the drive must have the following characteristics:
- thickness 1.5 to 3 mm,
- metal sheet: stainless or painted steel, adequately smooth,
- heat-treated epoxy paintwork (do not use lacquer), max. thickness 70µm, fine or medium texture.

For drives	Reference	Weight kg
ATV 58PU29M2, PU41M2, PU18N4, PU29N4, PU41N4	**VW3 A58802**	3.800
ATV 58PU54M2, PU72M2, PU54N4, PU72N4, PU90N4	**VW3 A58803**	8.300
ATV 58PU90M2, PD12M2, PD12N4, PD16N4	**VW3 A58804**	6.000
ATV 58PD23N4	**VW3 A58805**	7.600



VW3 A5880●

Kit for mounting “air exchanger” (IP 23 degree of protection)

This kit is used for mounting certain drives with heatsinks (ATV 58HD●●M2X, HD28N4 to HD79N4 and HD28N4X to HD79N4X) inside a dust and damp proof enclosure. It evacuates heat using fittings which allow the fan to draw in cold air at the bottom, and to evacuate hot air to the outside at the top. This requires two cut-outs in the enclosure.

The mounting kit consists of:
- 1 set of bellows (max. length = 1 m),
- 2 grilles,
- 1 set of instructions.

For drives	Reference	Weight kg
ATV 58HD16M2X, HD23M2X ATV 58HD28N4, HD33N4, HD46N4 ATV 58HD28N4X, HD33N4X, HD46N4X	**VW3 A58806**	4.000
ATV 58HD28M2X, HD33M2X, HD46M2X ATV 58HD54N4, HD64N4, HD79N4 ATV 58HD54N4X, HD64N4, HD79N4X	**VW3 A58807**	5.000

Variable speed drives for asynchronous motors

Altivar 58

Options: accessories

VW3 A58823

Control card fan kit

The fan kit enables the drive to operate at an ambient temperature of 60 °C, for example if it is mounted in an IP 54 enclosure. The circulation of air around the electronic cards prevents the formation of hot spots but not the derating: see page 2/127.

This kit is mounted on the upper part of the drive. It is powered by the drive.

The kit consists of:
- a fan subassembly,
- mounting accessories.

For drives	Reference	Weight kg
ATV 58●U09M2, ●U18M2	**VW3 A58821**	0.350
ATV 58●U29M2, ●U41M2, ●U18N4, ●U29N4, ●U41N4	**VW3 A58822**	0.450
ATV 58●U54M2, ●U72M2, ●U54N4, ●U72N4, ●U90N4	**VW3 A58823**	0.450
ATV 58●U90M2, ●D12M2, ●D12N4, ●D16N4, ●D23N4	**VW3 A58824**	0.500
ATV 58HD16M2X, HD23M2X ATV 58HD28N4, HD33N4, HD46N4 ATV 58HD28N4X, HD33N4X, HD46N4X	**VW3 A58825**	1.200
ATV 58HD28M2X, HD33M2X, HD46M2X ATV 58HD54N4, HD64N4, HD79N4 ATV 58HD54N4X, HD64N4X, HD79N4X	**VW3 A58826**	1.200

Separate control circuit supply kit

The separate control circuit supply kit enables the drive control circuit to be supplied when the power is off. For drives connected on a communication bus, this option enables the dialogue and hence the diagnostics to be maintained if the power is interrupted.

This kit is designed for drives with a rating of < 15 kW. It is mounted on the upper part of the drive. The power supplies must be separated by an isolation transformer. The kit must be supplied at 230 V (see isolation transformer characteristics below).

The kit consists of:
- a power supply subassembly,
- removable screw terminals for 230 V power supply,
- mounting and wiring accessories.

Characteristics of the isolation transformer, to be ordered separately:
- power part 30 VA,
- secondary 200 V - 10 %...240 V + 10 %, 50/60 Hz.

For drives	Reference	Weight kg
ATV 58●U18N4, ●U29N4, ●U41N4	**VW3 A58602**	0.450
ATV 58●U54N4, ●U72N4, ●U90N4	**VW3 A58603**	0.450
ATV 58●D12N4, ●D16N4, ●D23N4	**VW3 A58604**	0.450

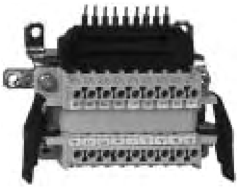
Presentation:
pages 2/122 to 2/126

Dimensions:
page 2/162

Variable speed drives for asynchronous motors

Altivar 58

Options: accessories



VW3 A58811

Kit for removable power terminals

The Altivar 58 "control" terminals are removable. This kit enables the drive's power terminals to be removed for applications which require speedy repairs.

It is only designed for low-power drives (see below).

The kit consists of:
- removable prewired terminals,
- mounting accessories,
- a set of instructions.

For drives	Reference	Weight kg
ATV 58●U09M2, ●U18M2	**VW3 A58811**	0.300
ATV 58●U29M2, ●U41M2, ●U18N4, ●U29N4, ●U41N4	**VW3 A58812**	0.300
ATV 58●U54M2, ●U72M2, ●U54N4, ●U72N4, ●U90N4	**VW3 A58813**	0.300

Presentation:
pages 2/122 to 2/126

Dimensions:
page 2/162

Variable speed drives for asynchronous motors

Altivar 58
Options: dialogue

Operator terminal (this terminal can be supplied with the drive or ordered separately)

VW3-A58101

This plug-in terminal is inserted into a slot provided for this purpose on the front panel of the drive.
Its maximum operating temperature is 60 °C.

Description	For drives	Reference (if ordered separately)	Weight kg
Operator terminal	ATV-58 all ratings	**VW3-A58101**	0.200

Kit for remote location of operator terminal

The plug-in terminal can be used remotely, fixed to the door of the enclosure, using this kit.

Description	For drives	Reference	Weight kg
Kit comprising: - 1 cable with connectors, length 3 m, - seals and screws for IP 65 mounting on enclosure door, - manual.	ATV-58 all ratings	**VW3-A58103**	0.200

Presentation:
pages 2/122 to 2/126

Variable speed drives for asynchronous motors

Altivar 58
Options: dialogue

PowerSuite advanced dialogue solutions

See pages 3/2 and 3/3.

RS 485 connection kit

This kit is used for RS 485 multidrop serial link connection to PLCs, Human/machine interface terminals, etc. It is connected in place of the operator terminal and cannot therefore be used at the same time.

Description	For drives	Reference	Weight kg
RS 485 connection kit comprising: - 1 cable, length 3 m with 1 male 9-way SUB-D connector and 1 male 15-way SUB-D connector, - manual.	Altivar 58 all ratings	**VW3-A58306**	0.200

Presentation:
pages 2/122 to 2/126

Variable speed drives for asynchronous motors

Altivar 58

Options: I/O extension cards, customer-specific cards

Presentation

I/O extension cards

The Altivar 58 drive can be specially adapted to suit certain types of application by installing an I/O extension card in the drive. Two models are available:

- **Card with analogue input**
  Includes two ⎓ 24 V logic inputs, one ⎓ 24 V open collector logic output, one 0/20 mA analogue output and one bipolar ± 10 V analogue input. The analogue input can be used for speed correction with a tachogenerator, for feedback of the PI function, for processing of PTC motor protection probes or for summing the frequency reference.
- **Card with encoder inputs**
  Includes two ⎓ 24 V logic inputs, one ⎓ 24 V open collector logic output, one 0/20 mA analogue output and A+, A-, B+, B- inputs which can be used for speed correction with an incremental encoder (Telemecanique XCC-H for example) or with an inductive or photoelectric sensor.

Customer specific cards

To meet the requirements of special applications for which neither the standard product nor I/O extension cards are suitable, we can design and supply cards on request which incorporate:
- hardware functions (I/O),
- software functions, (special cycles and servo controls, etc).

Cards are already available for:
pump switching, multimotor operation, multiparameter entry and positioning.

- **Pump switching card**
  This is used for controlling a complete pumping or compression installation using a single Altivar 58, and provides:
  - constant pressure in the supply, regardless of flow rate,
  - ease of setup and diagnosis of the installation, using the Altivar 58,
  - control of a variable speed pump and up to 4 fixed speed pumps, avoiding systematic wear of the same pumps.

  For more information, please consult your Regional Sales Office.
- **Multimotor card**
  Has 2 ⎓ 24 V reassignable logic inputs, 1 ⎓ 24 V open collector logic output, one 0/20 mA analogue output, and one bipolar ± 10 V analogue input.The analogue input can be used for speed correction with a tachogenerator, for feedback of the PI function, for processing of PTC motor protection probes, or for summing the frequency reference.
  Two drive configurations can be switched when the motor is stopped.
  Functions:
  loading two configurations with an Altivar 58 operator dialogue terminal, switching configurations via logic input or with an operator dialogue terminal, automatic auto-tuning possible after switching.
- **Multiparameter card**
  This is used to switch (automatically or via logic input) up to 16 sets of 13 parameters, 6 of which are pre-defined and 7 are user-definable. Only the adjustment functions are taken into account when the motor is running.
- **Simple position indexer card**
  This is used to define a cycle which manages the motion of a moving part along an axis with a limit switch as the end stop preceded by another end stop imposing the change to low speed.
  Positioning can be performed in both directions:
  - forward,
  - reverse.

  The card is equipped with:
  - 6 logic inputs ⎓ 24 V,
  - 1 logic output ⎓ 24 V with open collector,
  - 1 bipolar analogue input ± 10 V,
  - 1 analogue output 0-20 mA.

The Altivar 58 is designed to take a card mounted in the I/O extension card slot.
These special cards are for use with standard machines. Please consult your Regional Sales Office for a quotation.

Schemes:
pages 2/168 and 2/169

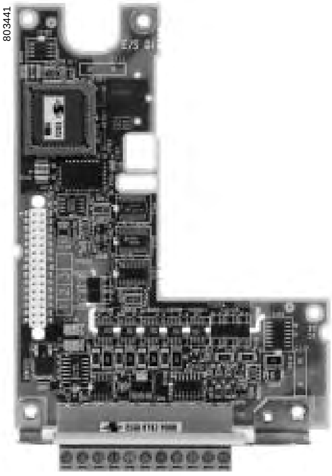
Variable speed drives for asynchronous motors

Altivar 58

Options: I/O extension cards, customer-specific cards

Characteristics of I/O extension cards

Internal sources available	Protected against short circuits and overloads - 1 output + 10 V ± 1 %, maximum flow rate 10 mA - 1 output - 10 V ± 1 %, maximum flow rate 10 mA - 1 output + 24 V (min. 20 V, max. 30 V), maximum flow rate 200 mA for all 24 V drive outputs
LI logic inputs	Assignable logic inputs, impedance 3.5 kΩ, compatible with level 1 PLC, IEC standard 65A-68 Maximum length of shielded cable: 100 m Power supply + 24 V (min. 12 V, max. 30 V). Status 0 if < 5 V, status 1 if > 11 V Sampling time 2 ms max.
LO logic output	Assignable open collector logic output, compatible with level 1 PLC, IEC standard 65A-68 Power supply + 24 V (min. 12 V, max. 30 V), max. current 20 mA with internal source and 200 mA with external source Sampling time 2 ms max.
AO analogue output	Assignable logic output 0/20 mA, max. load impedance 500 Ω (reassignable to X-YmA, by programming X and Y from 0 to 20 with a definition of 0.1 mA) Resolution 0.04 mA (9 bits), linearity ± 0.1 mA, precision ± 0,2 mA Sampling time 2 ms max.
AI analogue input or	1 assignable differential bipolar input 0 ± 10 V, impedance 30 kΩ. Adjustable gain Frequency reference resolution: 0.1 Hz for 100 Hz (10 bits plus sign) Precision ± 0.5 %, linearity ± 0.2 %, of max. output frequency Sampling time 2 ms max. Max. length of shielded cable: 20 m If configured for PTC probe processing, use at 750 Ω max. at 20 °C (3 x 250 Ω probes in series)
Logic inputs A+, A-, B+, B-	For encoders or detectors with NPN-type open collector outputs, nominal voltage 24 V ⎓ (19.2 at 30 V) Input impedance 785 Ω ± 10 % Max. signal frequency 33 kHz at max. speed HSP We recommend the use of an external 24 V source when using the drive with incremental coders



VW3-A5820●

I/O extension cards

Description	For drives	Reference	Weight kg
Card with analogue input	ATV-58 all ratings	**VW3-A58201**	0.200
Card with encoder inputs	ATV-58 all ratings	**VW3-A58202**	0.200

Customer specific cards

Description	For drives	Reference	Weight kg
Pump switching card	ATV-58 all ratings	**VW3-A58210**	0.200
Multimotor card	ATV-58 all ratings	**VW3-A58211**	0.200
Multiparameter card	ATV-58 all ratings	**VW3-A58212**	0.200
Simple position indexer card	ATV-58 all ratings	**VW3-A58213**	0.200

Schemes:
pages 2/168 and 2/169

Variable speed drives for asynchronous motors

Altivar 58

Communication options

Presentation

The Altivar 38 or Altivar 58 can be connected to the communication networks or buses via communication cards or gateways.

Communication cards are available for the following buses or networks:

- Fipio.
- Modbus Plus.
- Uni-Telway, Modbus ASCII, Modbus RTU/Jbus.
- INTERBUS-S.
- AS-Interface.
- Profibus DP.
- Ethernet.
- CANopen.
- DeviceNet.
- METASYS N2.

Communication gateways are available for the Profibus DP bus and the LonWorks network.

(see pages 4/2 to 4/25)

Functions

Cards for Fipio, Modbus Plus, Uni-Telway/Modbus, INTERBUS-S, Profibus DP, Ethernet, CANopen, DeviceNet, METASYS N2 bus or networks

Using these communication cards will enable you to benefit from the entire range of functions offered by the Altivar 38 or Altivar 58:

- **Configuration** (accessible in read and write modes): line supply frequency, motor voltage, ramp profile, I/O assignment, etc.
- **Adjustment** (accessible in read and write modes): d.c. injection time and amplitude, thermal protection, speed range, ramp time, current limitation, etc.
- **Control** (accessible in read and write modes): run/stop, braking, frequency reference, fault reset, etc.
- **Signalling** (accessible in read only mode): drive status register, motor speed, motor current, logic I/O status register, fault register, etc.
- **Authorisation** of local control (via the terminals)

Card for the AS-Interface bus

Using this communication card will enable you to benefit from the entire range of functions offered by the Altivar 38 or Altivar 58:

- **Control**: run/stop, braking, frequency reference (preset values), fault reset, +/- speed
- **Signalling**: drive status (ready, running, faulty, frequency reference reached, thermal threshold reached, local forcing)
- **Authorisation** of control via the terminals (local forcing)

Characteristics

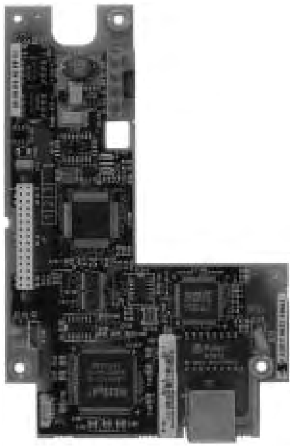
Bus or network		Maximum number of drives controlled on the bus	Transmission speed
Fipio		62	1 Mbps
Modbus Plus		64	1 Mbps
Uni-Telway, Modbus ASCII, Modbus RTU/Jbus		31	4800…19,200 bps
INTERBUS-S		64	1 Mbps
AS-Interface		31	166 Kbps
Profibus DP	With card	126	9600 bps …12 Mbps
	With gateway	15 Modbus + 126 Profibus DP	9600 bps …12 Mbps
Ethernet		–	10/100 Mbps
CANopen		63	125/250/500/1000 Kbps
DeviceNet		63	125/250/500 Kbps
METASYS N2		255	–
LonWorks		2	78 Kbps

Variable speed drives for asynchronous motors

Altivar 58

Communication options

VW3 A58302



VW3 A58310

Communication card

For bus or network	Reference	Weight kg
Fipio: the card is equipped with a male 9-way SUB-D connector, which will take a TSX FP ACC 12 removable connector with TSX FP CC●● connecting cable or TSX FP CA●● tap cable. Configuration and adjustment access to predefined functions in the PL7 software screens. Card incompatible with the ATV 38 drive.	**VW3 A58301**	0.300
Fipio: hardware description identical to reference VW3 A58301. The card is used for read/write access to all functions via the application program of the PLC.	**VW3 A58311**	0.300
Modbus Plus: the card is equipped with a female 9-way SUB-D connector, which can take a Modbus Plus drop cable with connectors, reference 990NAD21110 or 990NAD21130. This cable should be connected to a Modbus Plus tap, reference 990NAD23000, for connection to the Modbus Plus trunk cable, reference 490NAA271●●.	**VW3 A58302**	0.300
Uni-Telway/Modbus: the card is equipped with a female 9-way SUB-D connector and supplied with a 3 m cable fitted with a male 9-way SUB-D connector and a male 15-way SUB-D connector for connection on TSX SCA 62 subscriber sockets.	**VW3 A58303**	0.300
INTERBUS-S: the card is equipped with one male and one female 9-way SUB-D connector for connection with cables with connectors and 2 screw terminals for separate ⎓ 24 V supplies. Power supply: ⎓ 24 V, 200 mA min., to be ordered separately.	**VW3 A58304E**	0.300
AS-Interface: the card is equipped with removable terminals. Example of connection accessory: use a tap-off for the AS-Interface cable, reference XZ-CG0122.	**VW3 A58305**	0.300
Profibus DP: the card is equipped with a female 9-way SUB-D connector for connection to cables with connectors.	**VW3 A58307**	0.300
Ethernet: the card is equipped with an RJ 45 connector for connection to cables with connectors, reference 490NTW000●●.	**VW3 A58310**	0.300
CANopen: the card is equipped with removable screw terminals.	**VW3 A58308**	0.300
DeviceNet: the card is equipped with removable screw terminals. The card supports: ■ The ODVA (Open Device Vendor Association) profile. ■ The drive profile defined previously.	**VW3 A58309**	0.300
METASYS N2: the card is equipped with a female 9-way SUB-D connector. Card incompatible with the ATV 58F drive	**VW3 A58354U**	0.300

Communication module and gateway

For bus or network	Reference	Weight kg
LonWorks: the module is equipped with a removable 5-way screw connector for the network *(1)*. The LonWorks module is connected either on the Modbus VW3 A58303 card via a cable supplied with the module, or on the drive terminal port. If the LonWorks module is connected on the drive terminal port, it will not be possible to use the operator terminal. Module incompatible with the ATV 58F drive.	**VW3 A58312PU**	0.300
Profibus DP: the gateway is equipped with an RJ 45 connector for connection to a cable fitted with connectors, reference VW3 P07306R10, and a 9-way SUB-D connector for connection to a stripped cable, reference VW3 A8306D30 *(1)* (see pages 4/24 and 4/25).	**LA9 P307**	–

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(1) The module or gateway must be powered with a ⎓ 24 V supply.
Power supply ⎓ 24 V, 140 mA min., to be ordered separately.

Nota : *to order connection cables and accessories, please consult our "Modicon Premium and PL7 software" and "Modicon TSX Micro and PL7 software" specialist catalogues or the manufacturers' catalogues.*

Variable speed drives for asynchronous motors

Altivar 58
Options: braking module and resistors

Presentation

The resistor enables the Altivar 58 speed drive to operate when braking to a standstill or during slowdown braking, by dissipating the braking energy.

Presentation

There are two types available:
- a model in an IP 30 or IP 23 unit designed for EMC, protected by a temperature controlled switch or thermal relay,
- an model without protection, for low power ratings only.

Applications

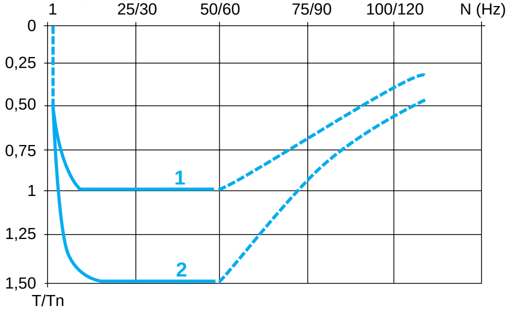
Machines with high inertia, driving loads, machine with fast cycles.
Braking is integrated in the Altivar 58 with the exception of the ATV-58●U09M2 and ATV-58●U18M2 drives, which require an additional braking module.

Characteristics

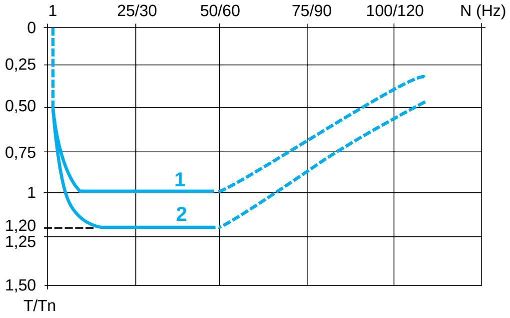
References		**VW3-A58732 to VW3-A58735**	**VW3-A58736 and VW3-A58737**	**VW3-A58702 to VW3-A58704**	**VW3-A66704**
Ambient air temperature	**°C**	40	40	40	40
Degree of protection of the unit		IP 30	IP 30	IP 00	IP 23
Protection of the resistor		By temperature controlled switch (1)	By temperature controlled switch (1)	None	By thermal relay (1) (2)
Temperature controlled switch					
Tripping temperature	**°C**	130 ± 5 %	260 ± 14 %		
Max voltage - max current		∼ 110 V - 0.3 A	∼ 220 V - 6 A	–	–
Min voltage - min current		⎓ 24 V - 0.01 A	⎓ 24 V - 0.01 A	–	–
Maximum contact resistance	**mΩ**	150	50	–	–
Load factor of resistors		The average value of the power which can be dissipated at 40 °C by the resistor in the unit is determined for a load factor during braking which corresponds to most common applications: - 2 seconds braking with a torque of 0.6 Tn every 40 seconds, - 0.8 seconds braking with a torque of 1.5 Tn every 40 seconds.			

Braking torque with resistor (speed drive limits)

High torque applications



Standard torque applications



1 Continuous braking torque (driving load)
Load factor 100 %.
2 Maximum transient braking torque (for 60 s).

1 Continuous braking torque (driving load)
Load factor 100 %.
2 Maximum transient braking torque (for 60 s).

Minimum ohmic value of resistors which can be used with ATV-58 speed drive

ATV-58● speed drive	**U09M2** **U18M2**	**U29M2** **U41M2**	**U54M2**	**U72M2**	**U90M2** **D12M2**	**D16M2X**	**D23M2X**	**D28M2X**	**D33M2X**	**D46M2X**
Min resistance value in ohms	75	38	31	25	13	8	8	4	2.67	2.67

ATV-58● speed drive	**U18N4** **U29N4** **U41N4** **U54N4**	**U72N4**	**U90N4**	**D12N4**	**D16N4** **D23N4**	**D28N4, D28N4X** **D33N4, D33N4X** **D46N4, D46N4X**	**D54N4** **D54N4X**	**D64N4** **D64N4X** **D79N4** **D79N4X**
Min resistance value in ohms	85	57	47	53	19	14	8	5

(1) The switch must be connected in sequence (use for signalling or to control the line contactor).
(2) Please order separately, rating 8 A.

References:
pages 2/146 and 2/147

Dimensions:
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Variable speed drives for asynchronous motors

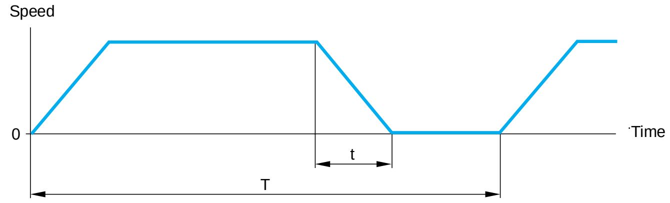
Altivar 58

Options: braking module and resistors

Load factor

The average value of power which can be dissipated at 40 °C by the resistor in the unit is determined for a load factor when braking, which corresponds to most common applications.

This load factor is given in the table on the previous page.



Load factor: $\frac{t}{T}$

t: braking time in s

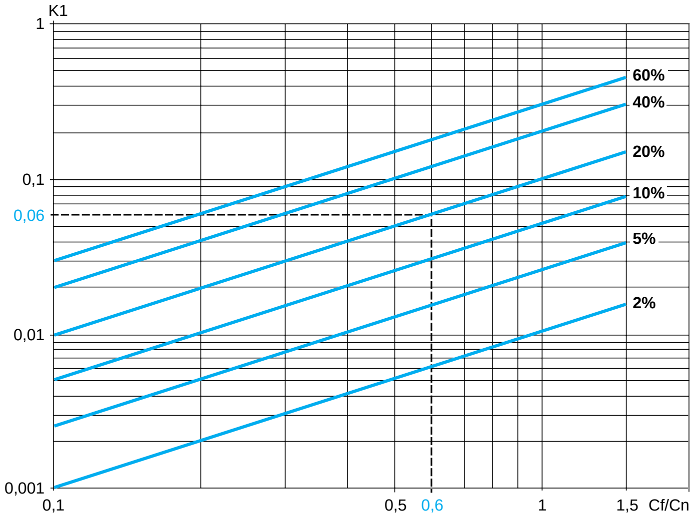
T: cycle time in s

For a specific application (hoisting, materials handling), it is necessary to redefine the nominal power of the resistor, taking into account the new load factor.

Determining the nominal power

Graph no. 1

Average power depending on the braking torque for a load factor



Example:

Motor power Pm = 4 kW

Motor efficiency η = 0.85

Braking torque Tf = 0.6 Tn

Braking time t = 10 s

Cycle time T = 50 s

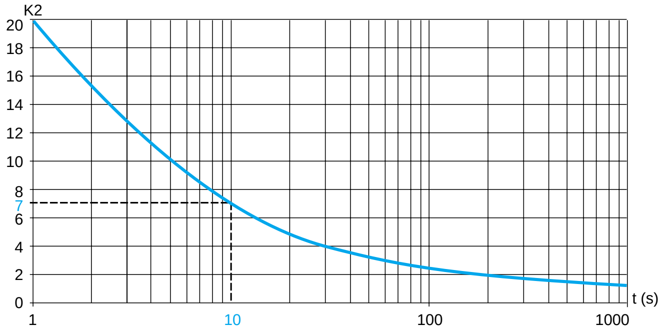
Load factor fm = $\frac{t}{T}$ = 20 %

From graph no. 1 calculate the coefficient K1 corresponding to a braking torque of 0.6 Tn and a load factor of 20 %.

K1 = 0.06

Graph no. 2

Permissible resistor overload depending on time (typical curve)



From graph no. 2 calculate the coefficient K2 corresponding to a braking time of 10 seconds.

K2 = 7

Nominal power of the resistor (Pn) must be greater than:

$$Pn = Pm \times K1 \times \eta\ (1 + \frac{1}{K2 \times fm}) = 4.10^3 \times 0.06 \times 0.85\ (1 + \frac{1}{7 \times 0.2}) = 350\ W$$

Variable speed drives for asynchronous motors

Altivar 58
Options: braking module and resistors

Braking module

For speed drives	Reference	Weight kg
ATV-58●U09M2, ●U18M2	**VW3-A58701**	0.250

Unprotected braking resistors

VW3-A58702

For speed drives	Ohmic value	Average power available at 40 °C (1)	Reference	Weight
	Ω	**W**		kg
ATV-58●U09M2, ●U18M2, ●U29M2, ATV-58●U18N4, ●U29N4, ●U41N4	100	32	**VW3-A58702**	0.600
ATV-58●U41M2, ●U54M2	68	32	**VW3-A58704**	0.600
ATV-58●U54N4, ●U72N4	100	40	**VW3-A58703**	0.850

---

(1) Power which can be dissipated by the resistor at a maximum temperature of 115 °C, corresponding to a maximum temperature limit of 75 °C in an ambient temperature of 40 °C.

Characteristics:
pages 2/144 and 2/145

Dimensions:
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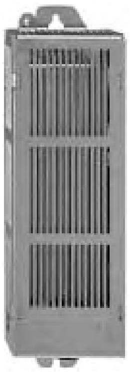
Variable speed drives for asynchronous motors

Altivar 58
Options: braking module and resistors

Protected braking resistors



VW3-A5873●

For speed drives	Ohmic value	Average available power at 40 °C (1)	Reference	Weight
	Ω	**W**		kg
ATV-58●U09M2, ●U18M2, ●U29M2, ATV-58●U18N4, ●U29N4, ●U41N4	100	32	**VW3-A58732**	2.000
ATV-58●U41M2, ●U54M2	68	32	**VW3-A58733**	2.000
ATV-58●U54N4, ●U72N4	100	40	**VW3-A58734**	–
ATV-58●U90N4, ●D12N4	60	80	**VW3-A58735**	3.400
ATV-58●U72M2, ●D16N4, ●D23N4	28	200	**VW3-A58736**	5.100
ATV-58●U90M2, ●D12M2, ATV-58●D28N4, ●D33N4, ●D46N4, ATV-58HD28N4X, HD33N4X, HD46N4X	14	400	**VW3-A58737**	6.100
ATV-58HD16M2X, ●D54N4, HD54N4X	10	1000	**VW3-A66704** (2)	17.000
ATV-58HD23M2X	7.5			
ATV-58HD28M2X, HD33M2X	5			
ATV-58●D64N4, ●D79N4	5			
ATV-58HD64N4X, HD79N4X	5			
ATV-58HD46M2X	4.16			

---

(1) Power which can be dissipated by the resistor at a maximum temperature of 115 °C, corresponding to a maximum temperature limit of 75 °C in an ambient temperature of 40 °C.
(2) The different ohmic values are obtained depending on the connection and are detailed in the resistor manual.

Characteristics:
pages 2/144 and 2/145

Dimensions:
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Variable speed drives for asynchronous motors

Altivar 58
Options: line chokes

Presentation

The line chokes provide improved protection against mains overvoltages and reduce the current harmonic distortion produced by the speed drive.

The chokes recommended are used to limit the line current.

The use of line chokes is especially recommended in the following cases:

- severe disturbance of mains supply by other receivers (interference, overvoltages),
- mains supply with voltage imbalance between phases > 1.8 % of the nominal voltage,
- speed drive supplied by a line with very low impedance (close to power transformers 10 times more powerful than the speed drive rating),
- installation of a large number of frequency inverters on the same line (reduction of line current),
- reduction of overload of the cos φ power factor correction capacitors, if the installation has a bank of power factor correction capacitors.

Line chokes must be used for supplying ATV-58●U72M2, ●U90M2 and ●D12M2 3-phase speed drives via a single-phase 220 V supply.

Certain ATV-58 speed drives are available with an integrated line choke which limits the line current to the nominal motor current value:

- ATV-58HD16M2X to HD46M2X, HD28N4 to HD79N4 and HD28N4X to HD79N4X speed drives,
- ready-assembled ATV-58ED12N4 to ED79N4 speed drives.

Characteristics

Conforming to standards		EN 50178 (VDE 0160 level 1 high-energy overvoltages on the mains supply)								
Voltage drop		Between 3 and 5 % inclusive of the supply nominal voltage. Higher values may cause a loss of torque.								
Type of choke		**VZ1-L 004M010**	**VZ1-L 007UM50**	**VZ1-L 018UM20**	**VW3-A58501**	**VW3-A58502**	**VW3-A66501**	**VW3-A66502**	**VW3-A66503**	**VW3-A66504**
Degree of protection	Choke	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
	Terminals	IP 20	IP 20	IP 20	IP 10	IP 10	IP 20	IP 20	IP 20	IP 10
Value of inductance (mH)		10	5	2	2	1	10	4	2	1
Nominal current (A)		4	7	18	25	45	4	10	16	30
Losses (W)		17	20	30	45	50	45	65	75	90

**Dimensions:
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Variable speed drives for asynchronous motors

Altivar 58
Options: line chokes

VW3-A6650●

Altivar 58						Choke	
Prospective line Isc	Single phase or 3-phase	Line current without choke at U min	Line current without choke at U max	Line current with choke at U min	Line current with choke at U max	Reference	Weight
kA		**A**	**A**	**A**	**A**		kg
Single phase supply voltage: 200…240 V (1) **50/60 Hz**							
2	ATV-58●U09M2	5.6	4.7	3.7	3.1	**VZ1-L004M010**	0.630
2	ATV-58●U18M2	9.8	8.3	7.1	5.7	**VZ1-L007UM50**	0.880
5	ATV-58●U29M2	18.5	15.6	13.2	12	**VZ1-L018UM20**	1.990
5	ATV-58●U41M2	24.8	21.1	18.6	16	**VZ1-L018UM20**	1.990
5	ATV-58●U72M2	(2)	(2)	24.7	21.3	**VW3-A58501**	3.500
22	ATV-58●U90M2	(2)	(2)	35	30	**VW3-A58502**	3.500
22	ATV-58●D12M2	(2)	(2)	46	39.4	**VW3-A58502**	3.500
3-phase supply voltage: 200…240 V (1) **50/60 Hz**							
5	ATV-58●U29M2	9.7	8.3	6.3	5.3	**VW3-A66502**	3.000
5	ATV-58●U41M2	13.4	11.4	5.5	5.1	**VW3-A66503**	3.500
5	ATV-58●U54M2	17.2	15	12	10	**VW3-A66503**	3.500
5	ATV-58●U72M2	24.4	19.5	16	13.5	**VW3-A66504**	6.000
22	ATV-58●U90M2	34.7	30	22	18.5	**VW3-A66504**	6.000
22	ATV-58●D12M2	44.4	38.2	29.5	24.3	**VW3-A66504**	6.000
3-phase supply voltage: 380…500 V (1) **50/60 Hz**							
5	ATV-58●U18N4	3.4	2.6	1.8	1.5	**VW3-A66501**	1.500
5	ATV-58●U29N4	6	4.5	3.3	2.5	**VW3-A66501**	1.500
5	ATV-58●U41N4	7.8	6	4.8	3.8	**VW3-A66502**	3.000
5	ATV-58●U54N4	10.2	7.8	6.4	5	**VW3-A66502**	3.000
5	ATV-58●U72N4	13	10.1	8.3	6.4	**VW3-A66502**	3.000
5	ATV-58●U90N4	17	13.2	11.6	9.3	**VW3-A66503**	3.500
22	ATV-58●D12N4	26.5	21	15.4	11.9	**VW3-A66503**	3.500
22	ATV-58●D16N4	35.4	28	22.7	17.9	**VW3-A66504**	6.000
22	ATV-58●D23N4	44.7	35.6	29.4	22.7	**VW3-A66504**	6.000

(1) Nominal supply voltage: U min…U max.

(2) Compulsory line choke.

Dimensions:
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Variable speed drives for asynchronous motors

Altivar 58
Options: additional radio interference suppression input filters

Presentation

Function

The Altivar 58 incorporates radio interference suppression input filters to comply with the EMC “products” standards IEC 1800-3 and EN 61800-3 concerning variable speed drives. Compliance with these standards meets the requirements of the European directive on EMC.

Certain ATV-58 speed drives are available without input filters, in situations where EMC conformity is not necessary:
- ATV-58HD28N4 to HD79N4 speed drives are available with or without integrated input filters (in this case, the speed drive reference ends with **X**),
- ATV-58HD16M2X to HD46M2X speed drives are not available with integrated input filters.

Certain ATV-58 speed drives cannot be ordered without integrated input filters:
- ATV-58●U09M2 to ●D12M2 speed drives,
- ATV-58●U18N4 to ●D23N4 speed drives.

The additional filters meet the strictest requirements: these filters are designed to reduce conducted emissions on the mains supply to below the limits of standards EN 55011 class A (1) or EN 55022 class B.

The filters are mounted under the ATV-58H speed drives (with heatsinks). They have tapped holes for fixing to the speed drives which they support. In the case of ATV-58P speed drives (on baseplate), and of ATV-58E (ready-assembled) the filters are fixed to the side of the speed drive.

(1) If the cable is longer than 5 m for ATV-58●U09M2 to ●D12M2 and ●U18N4 to ●D23N4 speed drives.
If the cable is longer than 25 m for ATV-58HD28N4 to HD79N4 speed drives.

Use according to the type of mains supply

These filters can only be used on TN type (connected to neutral) and TT type (neutral to earth) mains supplies.
These filters must not be used with IT (impeding or isolated neutral) mains supplies.
Standard IEC 1800-3, appendix D2.1, states that, for this type of supply, filters must not be used as they prevent the earth leakage detectors from working reliably.

In addition, the effectiveness of the filters on this type of supply depends on the type of impedance between neutral and earth and is therefore not recommended.

In the case of a machine which must be installed on an IT supply, the solution is to insert an isolation transformer and operate the machine locally using a TN or TT supply.

Characteristics

Conforming to standards			EN 133200
Degree of protection			IP 21 and IP 41 on upper part
Maximum relative humidity			93 % with no condensation or dripping water conforming to IEC 68-2-3
Ambient air temperature around the device	Operation	**°C**	-10... + 60
	Storage	**°C**	- 25…+ 70
Maximum operating altitude	Without derating	**m**	1000 (above this derate the current by 1% for each additional 100m)
Maximum nominal voltage	50/60 Hz single phase	**V**	240 + 10 %
	50/60 Hz 3-phase	**V**	500 + 10 %

Dimensions:
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Schemes:
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Variable speed drives for asynchronous motors

Altivar 58

Options: additional radio interference suppression input filters

For speed drives	Filter				
Reference	Maximum length of shielded cable		In	Reference	Weight
	EN 55011 class A (1)	EN 55022 class B (1)	(2)		
	m	m	A		kg
Single phase supply voltage: 200...240 V (3) **- 50/60 Hz**					
ATV-58●U09M2, ●U18M2	50	20	10	**VW3-A58401**	1.700
ATV-58●U29M2, ●U41M2	50	20	25	**VW3-A58402**	3.600
ATV-58●U72M2	50	20	25	**VW3-A58403**	5.000
ATV-58●U90M2, ●D12M2	50	20	45	**VW3-A58404**	10.000
3-phase supply voltage: 200...240 V (3) **- 50/60 Hz**					
ATV-58●U29M2, ●U41M2	50	20	25	**VW3-A58402**	3.600
ATV-58●U54M2, ●U72M2	50	20	25	**VW3-A58403**	5.000
ATV-58●U90M2, ●D12M2	50	20	45	**VW3-A58404**	10.000
3-phase supply voltage: 208...240 V (3) **- 50/60 Hz**					
ATV-58HD16M2X, HD23M2X	50	20	80	**VW3-A58407**	13.000
ATV-58HD28M2X, HD33M2X ATV-58HD46M2X	50	20	160	**VW3-A58408**	20.000
3-phase supply voltage: 380...500 V (3) **- 50/60 Hz**					
ATV-58●U18N4, ●U29N4, ATV-58●U41N4	50	20	25	**VW3-A58402**	3.600
ATV-58●U54N4, ●U72N4, ATV-58●U90N4	50	20	25	**VW3-A58403**	5.000
ATV-58●D12N4, ●D16N4	50	20	45	**VW3-A58404**	10.000
ATV-58●D23N4	50	20	45	**VW3-A58405**	13.000
ATV-58HD28N4 ATV-58HD28N4X	200 50	100 20	50 50	**VW3-A58406**	13.000
ATV-58HD33N4, HD46N4 ATV-58HD33N4X, HD46N4X	200 50	100 20	80 80	**VW3-A58407**	13.000
ATV-58HD54N4, HD64N4, HD79N4, ATV-58HD54N4X, HD64N4X, HD79N4X	200 50	100 20	160 160	**VW3-A58408**	20.000

(1) The filter selection tables give the maximum length for the shielded cables which connect the motors to the speed drives, for a switching frequency of 0.5 to 12 kHz. These limits are given for information only as they depend on the interference capacity of the motors and the cables used. For motors connected in parallel, the total of the lengths must be taken into account.

(2) In: nominal current of the filter.

(3) Nominal supply voltage : U min...U max.

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Variable speed drives for asynchronous motors

Altivar 58

Options: output filters and motor line chokes

Presentation

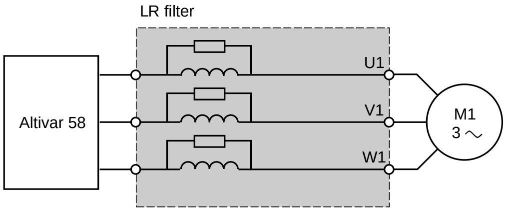
An output filter inserted between the speed drive and the motor provides:

- limitation of $\frac{dv}{dt}$ at motor terminals (500 to 1500 V/µs), for cables over 50 m long,
- filtering of interference caused by the opening of a contactor placed between the filter and the motor,
- reduction of the motor earth leakage current.

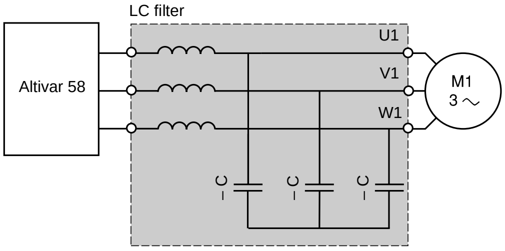
Our range offers three types of filter.

Principle

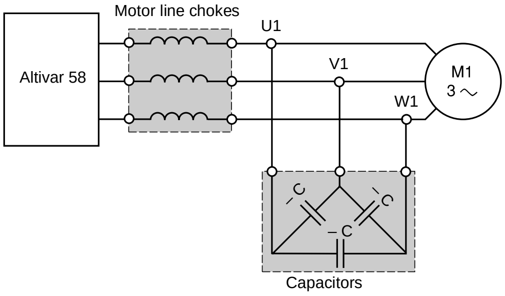
LR filter cell: this cell comprises 3 high frequency line chokes and 3 resistors.



LC filter cell: this cell comprises 3 high frequency line chokes and 3 capacitors.

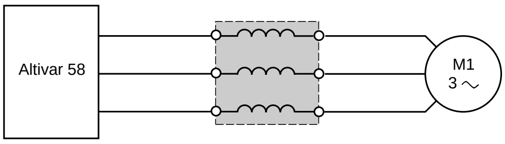


Line choke + capacitor combination: this assembly comprises 3 capacitors in delta connection mounted in a box connected to a 3-phase line choke VW3-A6650●.



Motor line chokes

For standard motor cable lengths over 100 m (50 m for shielded cables), a line choke limits overvoltages at the motor terminals.



Dimensions: page 2/163

Variable speed drives for asynchronous motors

Altivar 58

Options: output filters and motor line chokes

Characteristics (1)

LR filter cells

Speed drive switching frequency	**kHz**	0.5…4 max (2)
Length l of motor cable	**m**	Shielded wires: 80 ; unshieldes wires: 100
Degree of protection		IP 20

LC filter cells

Types of LC filter		Line chokes: **VW3-A6650●** + capacitors **VW3-A66421**		LC filter cell: **VW3-A6641●**	
Speed drive switching frequency	**kHz**	2 or 4	12	2 or 4	12
Length l of motor cable Shielded wires	**m**	≤ 40	≤ 20	≤ 100	≤ 50
Length l of motor cable Unshielded wires	**m**	≤ 80	≤ 40	≤ 200	≤ 100

References

LR filter cells

For speed drives	Losses	Nominal current	Reference	Weight kg
ATV-58●U18M2, ●U29M2, ATV-58●U18N4, ●U29N4, ●U41N4, ●U54N4, ATV-58●U72N4	150 W	10 A	**VW3-A58451**	7.400
ATV-58●U41M2, ●U54M2, ATV-58●U90N4	180 W	16 A	**VW3-A58452**	7.400
ATV-58●D12M2, ●U72M2, ●U90M2, ATV-58●D23N4, ●D12N4, ●D16N4	220 W	33 A	**VW3-A58453**	12.500

Line choke (3) **+ capacitor combinations**

For speed drives	Description	Reference	Weight kg
ATV-58HD16M2X	Motor line chokes	**VW3-A66505**	11.000
	Capacitors (4)	**VW3-A66421**	0.250
ATV-58HD23M2X, HD28M2X, HD33M2X, ATV-58●D28N4, ●D33N4, ●D46N4, ATV-58HD28N4X, HD33N4X, HD46N4X	Motor line chokes	**VW3-A66506**	16.000
	Capacitors (4)	**VW3-A66421**	0.250
ATV-58HD46M2X, ●D54N4, ●D64N4, ●D79N4, ATV-58HD54N4X, HD64N4X, HD79N4X	Motor line chokes	**VW3-A66507**	45.000
	Capacitors (4)	**VW3-A66421**	0.250

LC filter cell in high torque applications

ATV-58●D28N4, ●D33N4, ●D46N4, ATV-58HD28N4X, HD33N4X, HD46N4X, ATV-58HD16M2X, HD23M2X	LC filter cell	**VW3-A66412**	35.000
ATV-58●D54N4, ●D64N4, ●D79N4, ATV-58HD54N4X, HD64N4X, HD79N4X, ATV-58HD28M2X, HD33M2X	LC filter cell	**VW3-A66413**	40.000

LC filter cell in standard torque applications

ATV-58●D28N4, ●D33N4, HD28N4X, HD33N4X	LC filter cell	**VW3-A66412**	35.000
ATV-58●D46N4, ●D54N4, ●D64N4, ATV-58HD46N4X, HD54N4X, HD64N4X, ATV-58HD16M2X, HD23M2X	LC filter cell	**VW3-A66413**	40.000

Motor line chokes (5)

ATV-58HD16M2X	Motor line choke	**VW3-A66505**	11.000
ATV-58HD23M2X, HD28M2X, HD33M2X, ATV-58●D23N4, ●D28N4, ●D33N4, ●D46N4 ATV-58HD28N4X, HD33N4X, HD46N4X	Motor line choke	**VW3-A66506**	16.000
ATV-58HD46M2X, ●D54N4, ●D64N4, ●D79N4 ATV-58HD54N4X, HD64N4X, HD79N4X	Motor line choke	**VW3-A66507**	45.000

(1) To ensure the filters perform at optimum level, observe the cable length between the motor and the speed drive given in the table above. For an application using several motors connected in parallel, the cable length must be the total length including all tap-offs. There is a risk of the filters overheating if a cable longer than the recommended length is used.

(2) For frequencies above 4 kHz or cables longer than 100 metres, consult your Regional Sales Office.

(3) It is not advisable to connect option VW3-A66421 to the speed drive terminals without line chokes, as this could cause the speed drive to fail.

(4) Connection to the S1, S2, S3 terminals of the selected line choke using wires of 1.5 mm^2 cross-section.

(5) Degree of protection IP 20.

Dimensions:
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Compatibility with integrated EMC filters (see page 2/132)

Supply	Motor		ATV-58 drives for applications		Options				
Supply voltage 50/60 Hz	Power indicated on rating plate		with standard torque (120 % Tn)	with high torque (170 % Tn)	Line chokes	1 extension or communication card	Remote operator terminal	PowerSuite advanced dialogue solutions	
	kW	HP			See p. 2/149	See p. 2/141 See p. 2/143	See p. 2/138	Software workshop and Pocket PC See p. 3/2	Magelis display
200…240 V single-phase	0.37	0,5	–	**ATV-58HU09M2**	VZ1-L004M010	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	0.75	1	–	**ATV-58HU18M2**	VZ1-L007UM50	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	1.5	2	–	**ATV-58HU29M2**	VZ1-L018UM20	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2.2	3	–	**ATV-58HU41M2**	VZ1-L018UM20	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	–	**ATV-58HU72M2**	VW3-A58501	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	–	**ATV-58HU90M2**	VW3-A58502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5.5	7,5	–	**ATV-58HD12M2**	VW3-A58502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
200…240 V 3-phase	1.5	2	–	**ATV-58HU29M2**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2.2	3	–	**ATV-58HU41M2**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	–	**ATV-58HU54M2**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	–	**ATV-58HU72M2**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5.5	7.5	–	**ATV-58HU90M2**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	7.5	10	–	**ATV-58HD12M2**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
380…500 V 3-phase	0.75	1	–	**ATV-58HU18N4**	VW3-A66501	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	1.5	2	–	**ATV-58HU29N4**	VW3-A66501	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2.2	3	–	**ATV-58HU41N4**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	–	**ATV-58HU54N4**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	–	**ATV-58HU72N4**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5.5	7.5	–	**ATV-58HU90N4**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	7.5	10	–	**ATV-58HD12N4**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	11	15	–	**ATV-58HD16N4**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	15	20	–	**ATV-58HD23N4**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	18.5	25	–	**ATV-58HD28N4**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	22	30	–	**ATV-58HD33N4**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
			ATV-58HD28N4	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	30	40	–	**ATV-58HD46N4**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
			ATV-58HD33N4	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	37	50	–	**ATV-58HD54N4**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
			ATV-58HD46N4	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	45	60	–	**ATV-58HD64N4**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
			ATV-58HD54N4	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	55	75	–	**ATV-58HD79N4**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
			ATV-58HD64N4	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	75	100	**ATV-58HD79N4**	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8

RS 485 inter-connection See p. 2/139	Additional input filter See p. 2/151	Output filter See p. 2/153	Braking module See p. 2/146	IP 00 braking resistor See p. 2/146	IP 30 braking resistor See p. 2/147	Kit for mounting IP 23 air exchanger See p. 2/135	Control card fan kit See p. 2/136	Separate control circuit supply kit See p. 2/136	Plug-in power terminal block See p. 2/137
VW3-A58306	VW3-A58401	–	VW3-A58701	VW3-A58702	VW3-A58732	–	VW3-A58821	–	VW3-A58811
VW3-A58306	VW3-A58401	VW3-A58451	VW3-A58701	VW3-A58702	VW3-A58732	–	VW3-A58821	–	VW3-A58811
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	–	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58452	Integrated	VW3-A58704	VW3-A58733	–	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58403	VW3-A58453	Integrated	–	VW3-A58736	–	VW3-A58823	–	VW3-A58813
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	–	VW3-A58824	–	–
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	–	VW3-A58824	–	–
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	–	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58452	Integrated	VW3-A58704	VW3-A58733	–	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58403	VW3-A58452	Integrated	VW3-A58704	VW3-A58733	–	VW3-A58823	–	VW3-A58813
VW3-A58306	VW3-A58403	VW3-A58453	Integrated	–	VW3-A58736	–	VW3-A58823	–	VW3-A58813
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	–	VW3-A58824	–	–
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	–	VW3-A58824	–	–
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	–	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	–	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	–	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A58403	VW3-A58451	Integrated	VW3-A58703	VW3-A58734	–	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A58403	VW3-A58451	Integrated	VW3-A58703	VW3-A58734	–	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A58403	VW3-A58452	Integrated	–	VW3-A58735	–	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58735	–	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58736	–	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A58405	VW3-A58453	Integrated	–	VW3-A58736	–	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A58406	VW3-A66412	Integrated	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	VW3-A58407	VW3-A66412	Integrated	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	VW3-A58406	VW3-A66412	Integrated	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	VW3-A58407	VW3-A66412	Integrated	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	VW3-A58407	VW3-A66412	Integrated	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	VW3-A58408	VW3-A66413	Integrated	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	VW3-A58407	VW3-A66413	Integrated	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	VW3-A58408	VW3-A66413	Integrated	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	VW3-A58408	VW3-A66413	Integrated	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	VW3-A58408	VW3-A66413	Integrated	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	VW3-A58408	VW3-A66413	Integrated	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	VW3-A58408	VW3-A66413	Integrated	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–

Variable speed drives for asynchronous motors

Altivar 58
with heatsink

Compatibility without integrated EMC filters (see page 2/133)

Supply	Motor		ATV-58 drives for applications		Options			
Supply voltage 50/60 Hz	Power indicated on rating plate		with standard torque (120 % Tn)	with high torque (170 % Tn)	Line choke	1 extension or communication card	Remote operator terminal	PowerSuite advanced dialogue solutions Software workshop and Pocket PC
	kW	HP			See p. 2/149	See p. 2/141 See p. 2/143	See p. 2/138	See p. 3/2
208…240 V 3-phase	**11**	**15**	–	**ATV-58HD16M2X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	15	**20**	–	**ATV-58HD23M2X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD16M2X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	18.5	**25**	–	**ATV-58HD28M2X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD23M2X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	22	**30**	–	**ATV-58HD33M2X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD28M2X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	30	**40**	–	**ATV-58HD46M2X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD33M2X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	37	**50**	**ATV-58HD46M2X**	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
380…500 V 3-phase	**18.5**	**25**	–	**ATV-58HD28N4X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	22	**30**	–	**ATV-58HD33N4X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD28N4X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	30	**40**	–	**ATV-58HD46N4X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD33N4X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	37	**50**	–	**ATV-58HD54N4X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD46N4X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	45	**60**	–	**ATV-58HD64N4X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD54N4X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	55	**75**	–	**ATV-58HD79N4X**	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
			ATV-58HD64N4X	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●
	75	**100**	**ATV-58HD79N4X**	–	Integrated	VW3-A58●●●	VW3-A58103	VW3-A81●●

PowerSuite advanced dialogue solutions Magelis display	RS 485 interconnection	Additional input filter	Output filter	Braking module	IP 30 braking resistor	Kit for mounting IP 23 air exchanger	Control card fan kit
See p. 3/2	See p. 2/139	See p. 2/151	See p. 2/153	See p. 2/146	See p. 2/147	See p. 2/135	See p. 2/136
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66412	Integrated	VW3-A66704	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66412	Integrated	VW3-A66704	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66413	Integrated	VW3-A66704	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66413	Integrated	VW3-A66704	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	–	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	–	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	–	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	–	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58406	VW3-A66412	Integrated	VW3-A58737	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66412	Integrated	VW3-A58737	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58406	VW3-A66412	Integrated	VW3-A58737	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66412	Integrated	VW3-A58737	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66412	Integrated	VW3-A58737	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58407	VW3-A66413	Integrated	VW3-A58737	VW3-A58806	VW3-A58825
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	VW3-A66413	Integrated	VW3-A66704	VW3-A58807	VW3-A58826
XBT-HM017010A8	VW3-A58306	VW3-A58408	–	Integrated	VW3-A66704	VW3-A58807	VW3-A58826

Variable speed drives for asynchronous motors

Altivar 58
on baseplate

Compatibility with integrated EMC filters (see page 2/134)

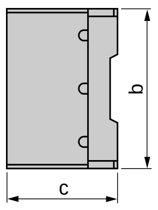
Supply	Motor		ATV-58 drive for applications		Options				
Supply voltage 50/60 Hz	Power indicated on rating plate		with standard torque (120 % Tn)	with high torque (170 % Tn)	Line choke	1 extension or communication card	Remote operator terminal	PowerSuite advanced dialogue solutions	
								Software workshop and Pocket PC	Magelis display
	kW	HP			See p. 2/149	See p. 2/141 See p. 2/143	See p. 2/138	See p. 3/2	
200…240 V single-phase	0.37	0.5	–	**ATV-58PU09M2**	VZ1-L004M010	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	0.75	1	–	**ATV-58PU18M2**	VZ1-L007UM50	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	1.5	2	–	**ATV-58PU29M2**	VZ1-L018UM20	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2.2	3	–	**ATV-58PU41M2**	VZ1-L018UM20	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	–	**ATV-58PU72M2**	VW3-A58501	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	–	**ATV-58PU90M2**	VW3-A58502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5.5	7.5	–	**ATV-58PD12M2**	VW3-A58502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
200…240 V 3-phase	1.5	2	–	**ATV-58PU29M2**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2.2	3	–	**ATV-58PU41M2**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	–	**ATV-58PU54M2**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	–	**ATV-58PU72M2**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5.5	7.5	–	**ATV-58PU90M2**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	7.5	10	–	**ATV-58PD12M2**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
380…500 V 3-phase	0.75	1	–	**ATV-58PU18N4**	VW3-A66501	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	1.5	2	–	**ATV-58PU29N4**	VW3-A66501	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2.2	3	–	**ATV-58PU41N4**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	–	**ATV-58PU54N4**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	–	**ATV-58PU72N4**	VW3-A66502	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5.5	7.5	–	**ATV-58PU90N4**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	7.5	10	–	**ATV-58PD12N4**	VW3-A66503	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	11	15	–	**ATV-58PD16N4**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	15	20	–	**ATV-58PD23N4**	VW3-A66504	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8

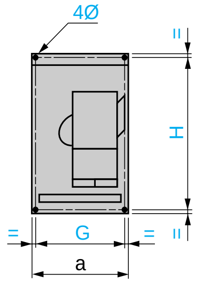
RS 485 inter-connection See p. 2/139	Additional input filter See p. 2/151	Output filter See p. 2/153	Braking module See p. 2/146	IP 00 braking resistor See p. 2/146	IP 30 braking resistor See p. 2/147	Kit for mounting in IP 54 enclosure See p. 2/135	Control card fan kit See p. 2/136	Separate control circuit supply kit See p. 2/136	Plug-in power terminal block See p. 2/137
VW3-A58306	VW3-A58401	–	VW3-A58701	VW3-A58702	VW3-A58732	–	VW3-A58821	–	VW3-A58811
VW3-A58306	VW3-A58401	VW3-A58451	VW3-A58701	VW3-A58702	VW3-A58732	–	VW3-A58821	–	VW3-A58811
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	VW3-A58802	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58452	Integrated	VW3-A58704	VW3-A58733	VW3-A58802	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58403	VW3-A58453	Integrated	–	VW3-A58736	VW3-A58803	VW3-A58823	–	VW3-A58813
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	VW3-A58804	VW3-A58824	–	–
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	VW3-A58804	VW3-A58824	–	–
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	VW3-A58802	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58452	Integrated	VW3-A58704	VW3-A58733	VW3-A58802	VW3-A58822	–	VW3-A58812
VW3-A58306	VW3-A58403	VW3-A58452	Integrated	VW3-A58704	VW3-A58733	VW3-A58803	VW3-A58823	–	VW3-A58813
VW3-A58306	VW3-A58403	VW3-A58453	Integrated	–	VW3-A58736	VW3-A58803	VW3-A58823	–	VW3-A58813
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	VW3-A58804	VW3-A58824	–	–
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58737	VW3-A58804	VW3-A58824	–	–
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	VW3-A58802	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	VW3-A58802	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A58402	VW3-A58451	Integrated	VW3-A58702	VW3-A58732	VW3-A58802	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A58403	VW3-A58451	Integrated	VW3-A58703	VW3-A58734	VW3-A58803	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A58403	VW3-A58451	Integrated	VW3-A58703	VW3-A58734	VW3-A58803	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A58403	VW3-A58452	Integrated	–	VW3-A58735	VW3-A58803	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58735	VW3-A58804	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A58404	VW3-A58453	Integrated	–	VW3-A58736	VW3-A58804	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A58405	VW3-A58453	Integrated	–	VW3-A58736	VW3-A58805	VW3-A58824	VW3-A58604	–

Variable speed drives for asynchronous motors

Altivar 58

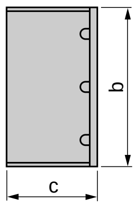
ATV-58H●●●● (with heatsink)

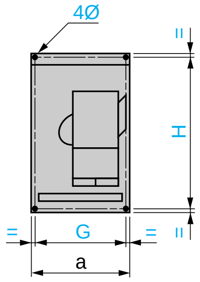




ATV-58H	a	b	c	G	H	Ø
U09M2, **U18M2**	113	206	167	96	190	5
U29M2, **U41M2**, **U18N4**, **U29N4**, **U41N4**	150	230	184	133	210	5
U54M2, **U72M2**, **U54N4**, **U72N4**, **U90N4**	175	286	184	155	270	5.5
U90M2, **D12M2**, **D12N4**, **D16N4**	230	325	210	200	310	5.5
D23N4	230	415	210	200	400	5.5
D16M2X, D23M2X, D28N4, D33N4, D46N4	240	550	283	205	530	7
D28N4X, D33N4X, D46N4X	240	550	283	205	530	7
D28M2X, D33M2X, D46M2X, D54N4, D64N4, D79N4	350	650	304	300	619	9
D54N4X, D64N4X, D79N4X	350	650	304	300	619	9

ATV-58P●●●● (on baseplate)





ATV-58P	a	b	c	G	H	Ø
U09M2, **U18M2**	113	206	132	96	190	5
U29M2, **U41M2**, **U18N4**, **U29N4**, **U41N4**	150	230	145	133	210	5
U54M2, **U72M2**, **U54N4**, **U72N4**, **U90N4**	175	286	151	155	270	5.5
U90M2, **D12M2**, **D12N4**, **D16N4**	230	325	159	200	310	5.5
D23N4	230	415	159	200	400	5.5

Presentation:
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Characteristics:
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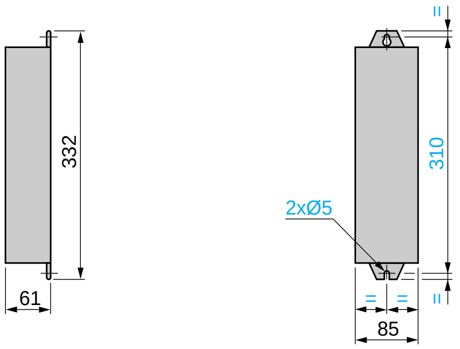
References:
pages 2/132 to 2/134

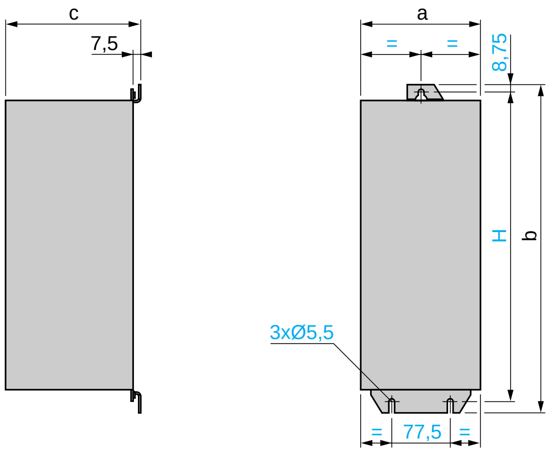
Variable speed drives for asynchronous motors

Altivar 58

Protected braking resistors
VW3-A58732 to **A58734**

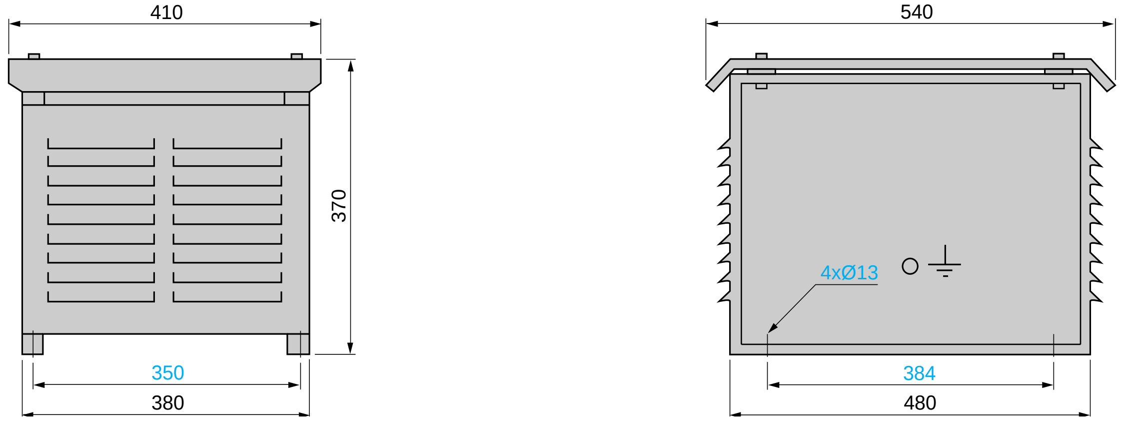


VW3-A58735 to **A58737**

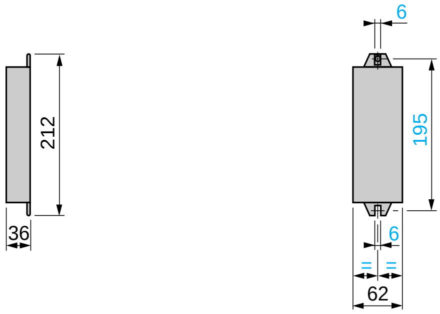


VW3-	a	b	c	H
A58735	163	340	61	320
A58736, A58737	156	434	167	415

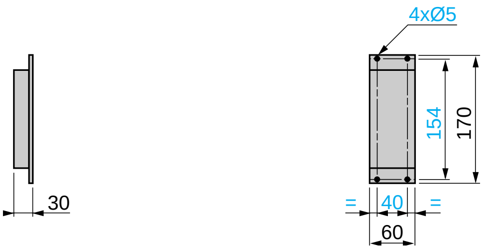
VW3-A66704



Unprotected braking resistors
VW3-A58703
2-wire output, length 0.5 m



VW3-A58702 and **A58704**
2-wire output, length 0.5 m



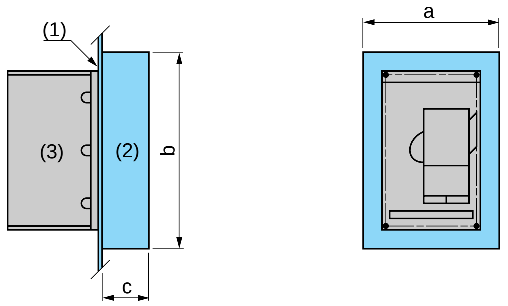
Braking module VW3-A58701
(mounted on AM1-ED mounting rail)

Presentation:
page 2/144

Characteristics:
pages 2/144 and 2/145

References:
pages 2/146 and 2/147

Kit for mounting in dust and damp proof enclosure
VW3-A58802 to **A58805**

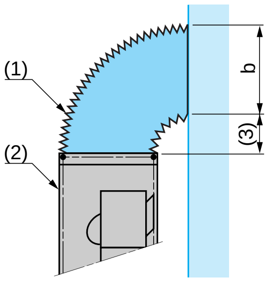


VW3-	a	b	c
A58802	150	226	80
A58803	175	450	80
A58804	225	381	63
A58805	225	460	63

(1) Metal plate of enclosure
(2) VW3-A58802 to VW3-A58805
(3) Drive

Kit for mounting air exchanger
VW3-A58806 and **A58807**

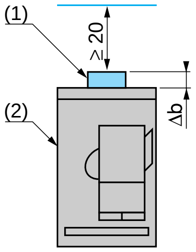
Example of connecting upper bellows on a side panel



VW3-	b
A58806	240
A58807	350

(1) VW3-A58806 and VW3-A58807
(2) Drive
(3) 300 mm minimum

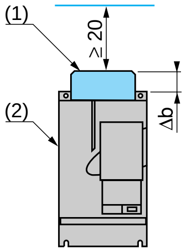
Control card fan kit
VW3-A58821 to **A58826**



VW3-	Δb
A58821	16
A58822	25
A58823	25
A58824	25
A58825	60
A58826	60

(1) VW3-A58821 to VW3-A58824
(2) Drive

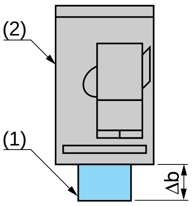
Separate control circuit supply kit
VW3-A58602 to **A58604**



VW3-	Δb
A58602	25
A58603	25
A58604	25

(1) VW3-A58602 to A58604
(2) Drive

Kit for removable power terminals
VW3-A58811 to **A58813**



VW3-	Δb
A58811	52
A58812	54
A58813	54

(1) VW3-A58811 to VW3-A58813
(2) Drive

Presentation:
pages 2/122 to 2/126

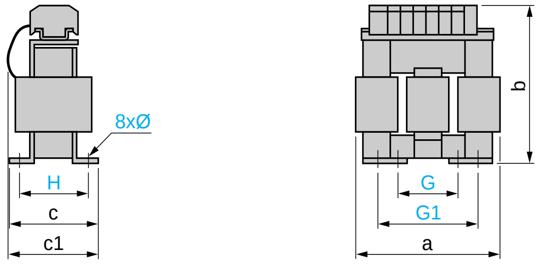
References:
pages 2/135 to 2/137

Variable speed drives for asynchronous motors

Altivar 58

3-phase chokes

VW3-A66501 to **A66507**



VW3-	a	b	c	c1	G	G1	H	Ø
A66501	100	135	55	60	40	60	42	6 x 9
A66502	130	155	85	90	60	80.5	62	6 x 12
A66503	130	155	85	90	60	80.5	62	6 x 12
A66504	155	170	115	135	75	107	90	6 x 12
A66505	180	210	125	165	85	122	105	6 x 12
A66506	275	210	130	160	105	181	100	11 x 22
A66507	320	290	172	215	190	230	142	–

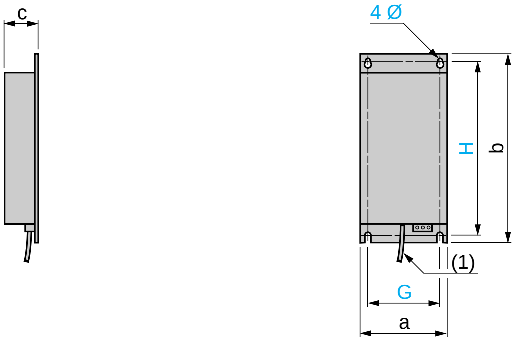
Single phase chokes

VZ1-L●●●●●●●, **VW3-A58501** and **VW3-A58502**

	a	b	c	G	H	Ø
VZ1-L004M010	60	100	80	50	44	4 x 9
VZ1-L007UM50	60	100	95	50	60	4 x 9
VZ1-L018UM20	85	120	105	70	70	5 x 11
VW3-A58501	128	150	95	70	65	5 x 11
VW3-A58502	128	150	105	70	77	6 x 12

Radio interference suppression filters (EMC)

VW3-A58401 to **A58408**

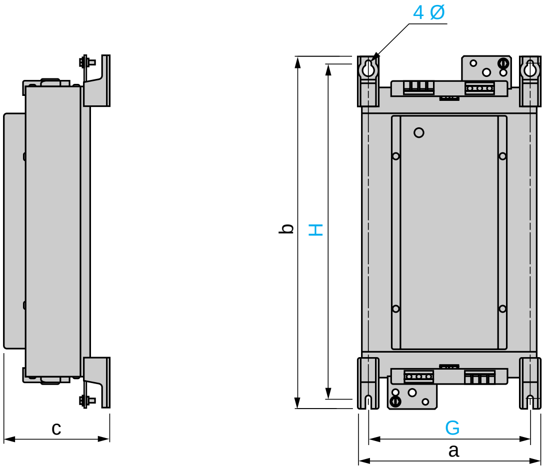


VW3-	a	b	c	G	H	Ø
A58401	113	246	36	94.5	230	5
A58402	150	276	50	133	260	5
A58403	175	340	60	153	320	6
A58404	230	390	60	200	370	6
A58405	230	480	60	200	460	6
A58406, A58407	240	690	85	205	650	7
A58408	350	770	90	300	770	9

(1) Cable

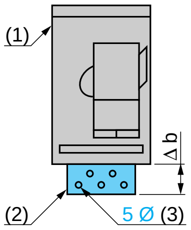
Output filters

VW3-A58451 to **A58453**



VW3-	a	b	c	G	H	Ø
A58451, A58452	169.5	340	123	150	315	7
A58453	239	467.5	139.5	212	444	7

Plate for EMC mounting (supplied with the drive)



Mounting on ATV-58●	Δb	Ø (3)
U09M2, U18M2	63	M4
U29M2, U41M2, U18N4, U29N4, U41N4	64.5	M4
U54M2, U72M2, U54N4, U72N4, U90N4	64.5	M4
U90M2, D12M2, D12N4, D16N4	62	M4
D23N4	62	M4
D16M2X, D23M2X, D28N4, D33N4, D46N4	80	M5
D28M2X, D33M2X, D46M2X, D54N4, D64N4, D79N4	110	M5

(1) Drive

(2) Plate

(3) Tapped holes for fixing EMC clamps

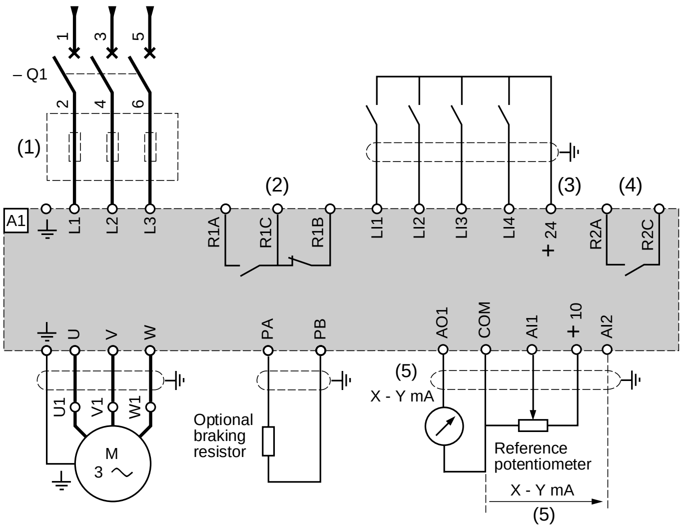
Presentation: pages 2/148 to 2/153
Characteristics: pages 2/148 to 2/153
References: pages 2/149 to 2/153

Variable speed drives for asynchronous motors

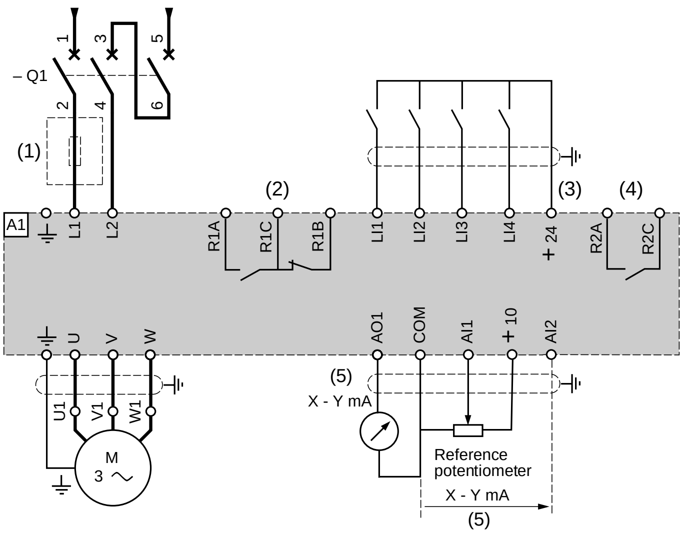
Altivar 58

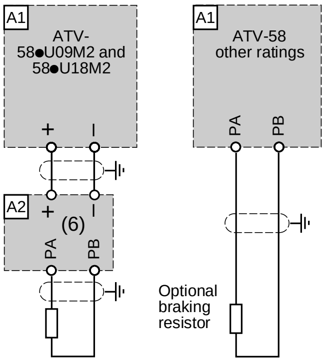
Schemes without contactor, recommended for machines which are not dangerous

3-phase supply



Single phase supply





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(1) Optional line choke.

(2) Fault relay contacts; for remote signalling of drive status.

(3) Internal + 24 V. If an external + 24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 24 of the drive, and connect the common of the LI inputs to the + 24 V of the external supply.

(4) R2 relay can be reassigned.

(5) X and Y can be configured between 0 and 20 mA independently for AI2 and AO1.

(6) VW3-A58701 braking module, if a braking resistor is used, for ratings ATV-58●U09M2 and ●U18M2 only.

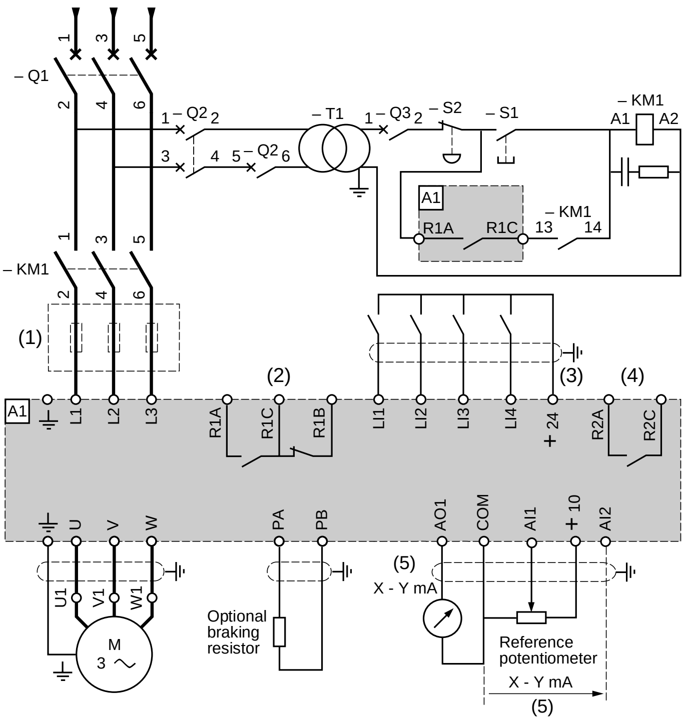
Note:
- all the terminals are located at the bottom of the drive,
- fit suppressors to all the specific circuits close to the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

Compatible components (for complete references, consult our catalogue "Motor starter solutions")

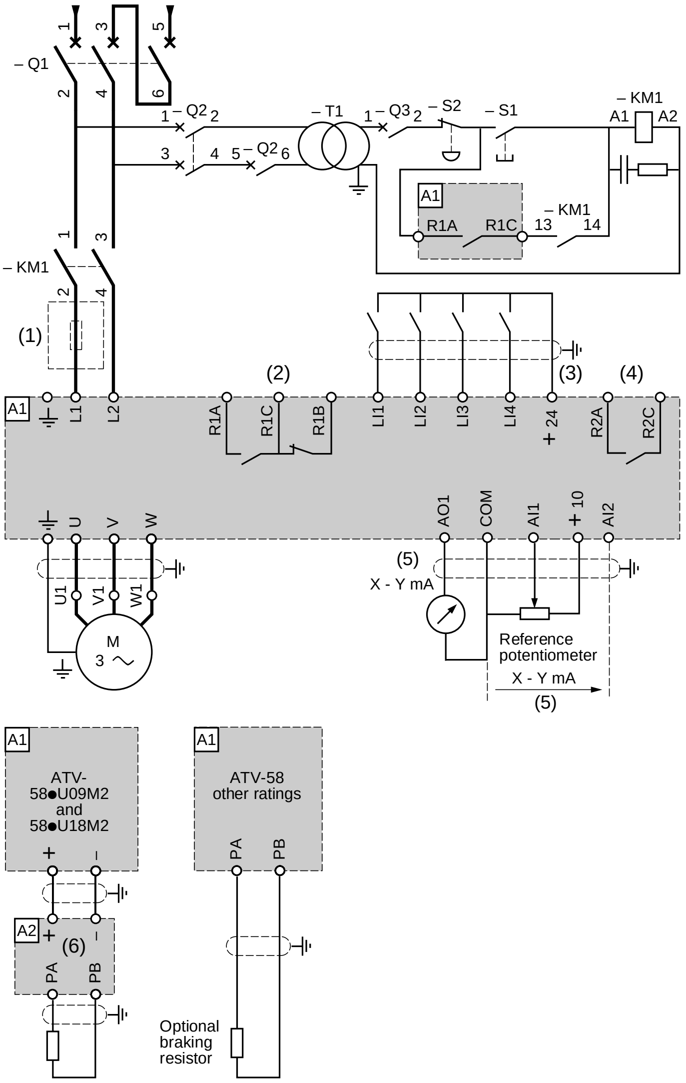
Code	Description
Q1	GV2-L or Compact NS (see following pages)

Schemes with line contactor, recommended for dangerous machines which are switched on or off infrequently

3-phase supply



Single phase supply



(1) Optional line choke.
(2) Fault relay contacts; for remote signalling of drive status.
(3) Internal + 24 V. If an external + 24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 24 of the drive, and connect the common of the LI inputs to the + 24 V of the external supply.
(4) R2 relay can be reassigned.
(5) X and Y can be configured between 0 and 20 mA independently for AI2 and AO1.
(6) VW3-A58701 braking module, if a braking resistor is used, for ratings ATV-58●U09M2 and ●U18M2 only.

Note:
- all the terminals are located at the bottom of the drive,
- fit suppressors to all the specific circuits close to the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

Compatible components (for complete references, consult our catalogue "Motor starter solutions")

Code	Description
Q1	GV2-L or Compact NS (see following pages)
KM1	LC1-D●● + LA4-DA2U (see following pages)
S1, S2	XB2-B or XA2-B pushbuttons
T1	100 VA transformer 220 V secondary
Q2	GV2-L rated at twice the nominal primary current of T1
Q3	GB2-CB05

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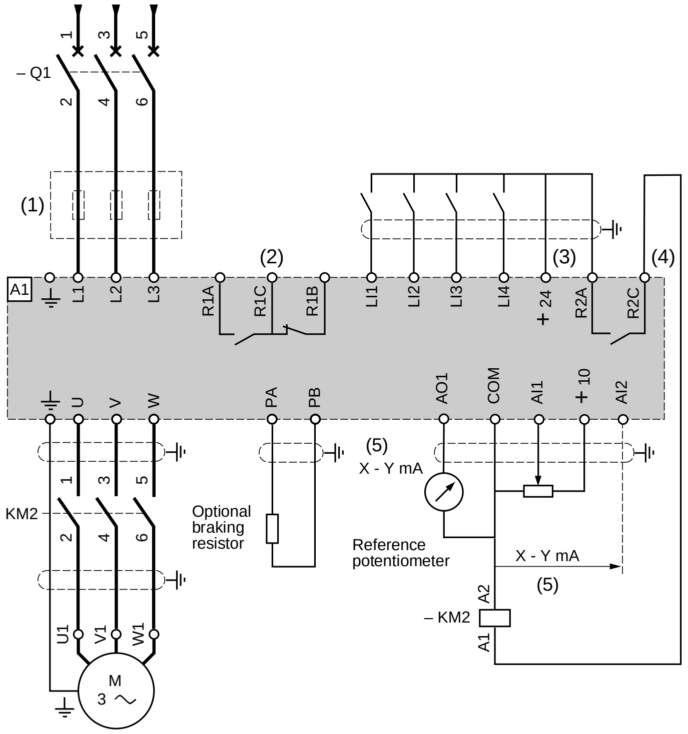
Characteristics: pages 2/127 to 2/129
References: pages 2/132 to 2/134
Functions: pages 2/190 to 2/205

Variable speed drives for asynchronous motors

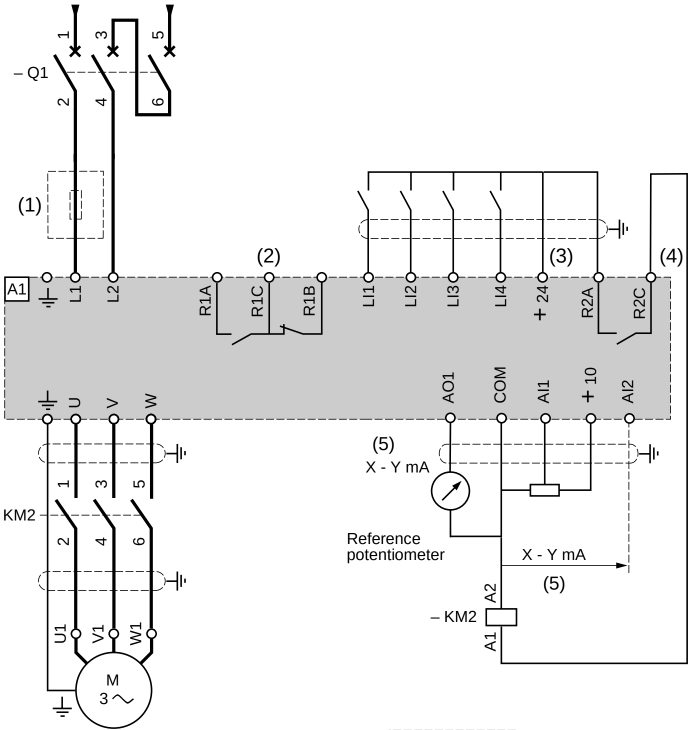
Altivar 58

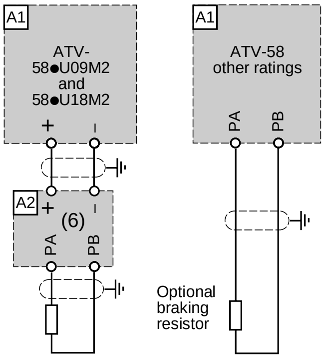
Schemes with downstream contactor, recommended for dangerous machines which are switched on and off frequently

3-phase supply



Single phase supply





(1) Optional line choke.

(2) Fault relay contacts; for remote signalling of drive status.

(3) Internal + 24 V. If an external + 24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 24 of the drive, and connect the common of the LI inputs to the + 24 V of the external supply.

(4) Use the “downstream contactor control” function with relay R2 (or the logic output LO of one of the “I/O extension” cards by relaying).

(5) X and Y can be configured between 0 and 20 mA independently for AI2 and AO1.

(6) VW3-A58701 braking module, if a braking resistor is used, for ratings ATV-58●U09M2 and ●U18M2 only.

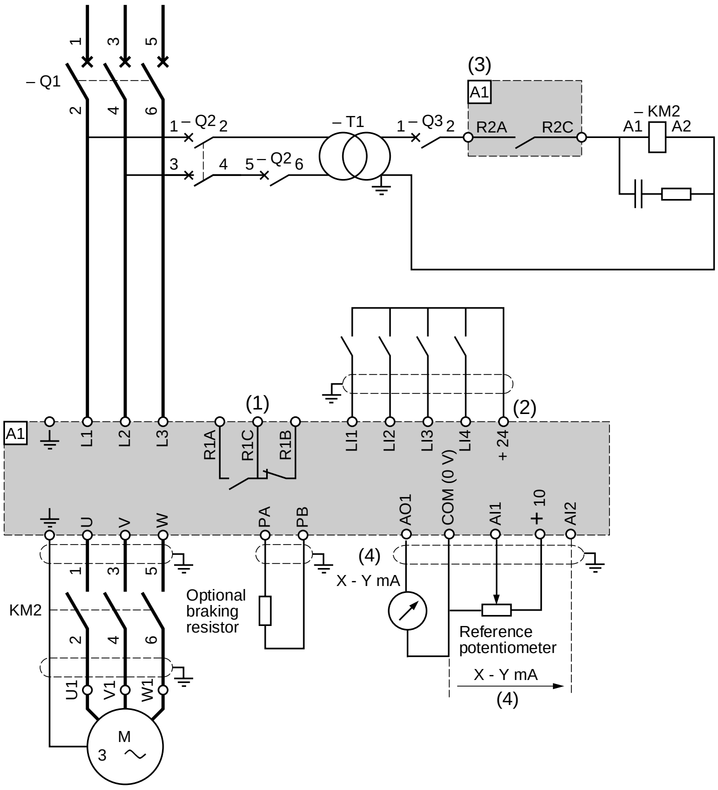
Note:
- all the terminals are located at the bottom of the drive,
- fit suppressors to all the specific circuits close to the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

Compatible components (for complete references, consult our catalogue "Motor starter solutions")

Code	Description
Q1	GV2-L or Compact NS (see following pages)
KM2	LP4-●●●● (see following pages)

Schemes with downstream contactor, recommended for dangerous machines which are switched on and off frequently

3-phase supply



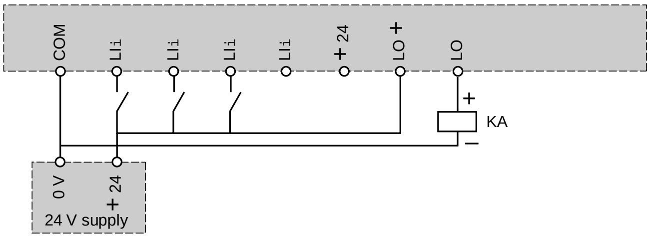
(1) Fault relay contacts; for remote signalling of drive status.
(2) Internal + 24 V. If an external + 24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 24 of the drive, and connect the common of the LI inputs to the + 24 V of the external supply.
(3) Use the "downstream contactor control" function with relay R2 (or the logic output LO of one of the "I/O extension" cards, by relaying).
(4) X and Y can be configured between 0 and 20 mA independently for AI2 and AO1.

Note:
- all the terminals are located at the bottom of the drive,
- fit suppressors to all the specific circuits close to the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.

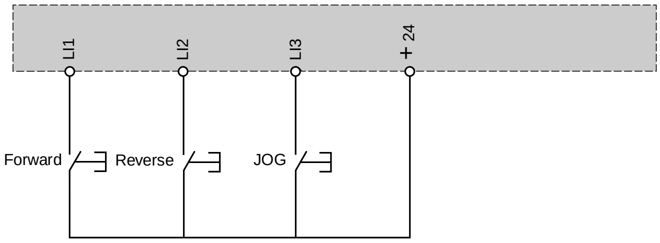
Compatible components (for complete references, consult our catalogue "Motor starter solutions")

Code	Description
Q1	GV2-L or Compact NS (see following pages)
KM2	LC1-D●●● with interference suppressor (see following pages)
T1	100 VA transformer 220 V secondary
Q2	GV2-L rated at twice the nominal primary current of T1
Q3	GB2-CB05

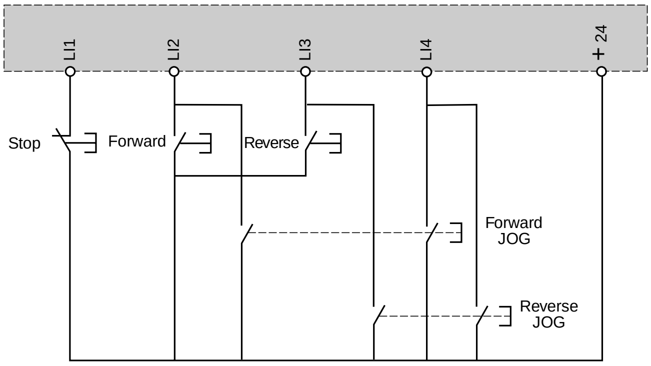
24 V external supply for supplying logic inputs and/or the logic output



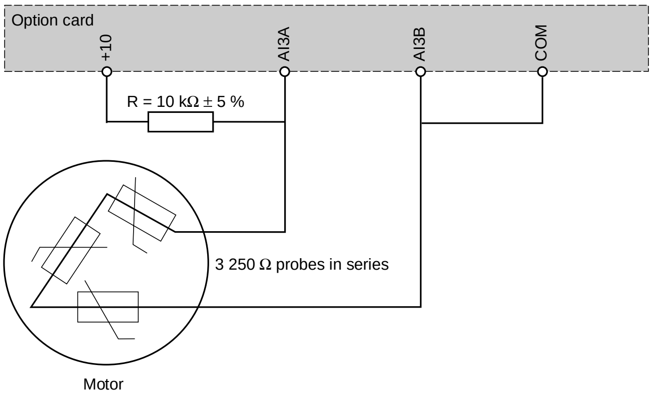
2-wire control and step by step (JOG) operation



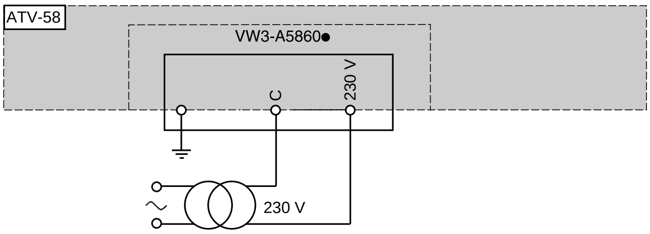
3-wire control and step by step (JOG) operation



Motor protection via PTC probes, with optional analogue input extension card

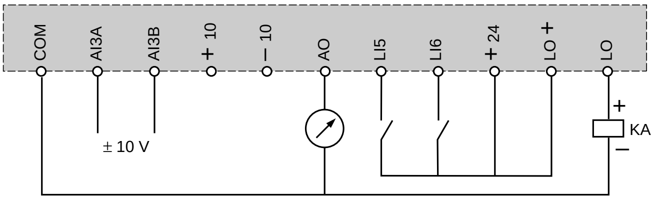


Separate control circuit supply kit
VW3-A58602…A58604

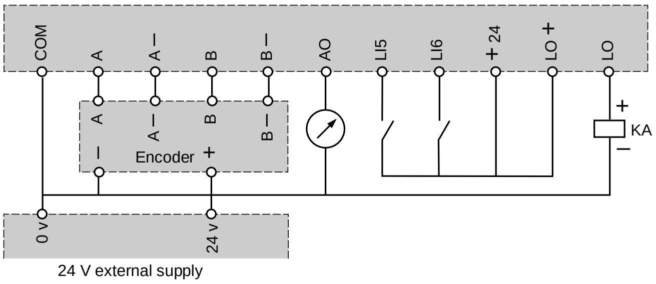


Note: the drive control is supplied in the following cases:
- power on,
- separate control circuit supply on,
- power and separate control circuit supply on.

I/O extension card with analogue input



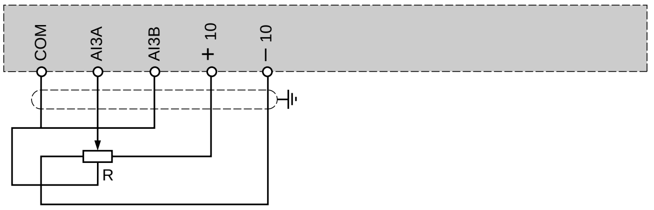
I/O extension card with inputs for encoder



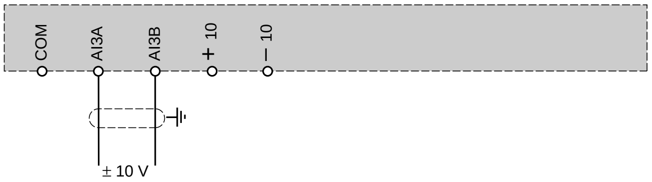
Examples of use with I/O extension cards

VW3-A5820●

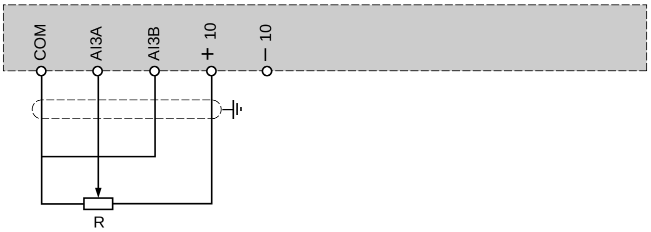
Bipolar speed reference



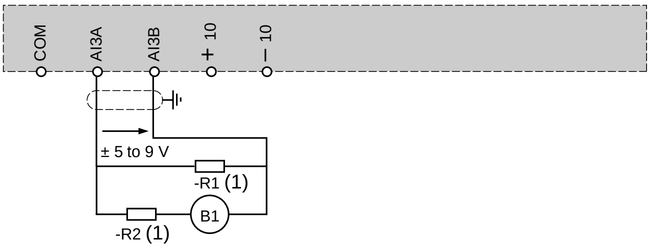
Bipolar speed reference on external ± 10 V supply



Unipolar speed reference



Speed regulation with tachometer feedback



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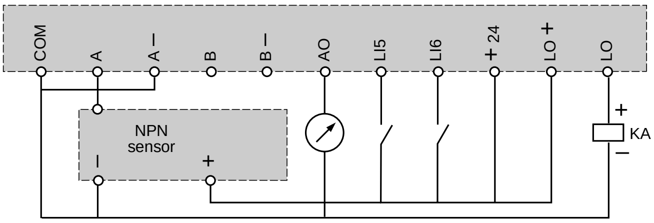
(1) See page 2/144 the section on functions to determine the resistances.

VW3-A58202 I/O extension card with inputs for encoder used with 3-wire inductive or photoelectric proximity sensor

Speed regulation with reduced precision at low speed and increased response time

1 direction only



Presentation:
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Characteristics:
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References:
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Functions:
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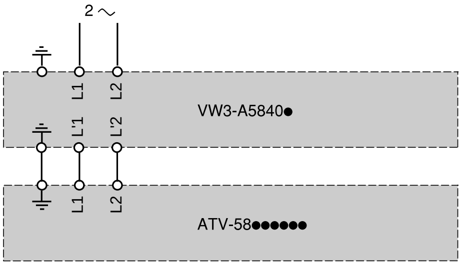
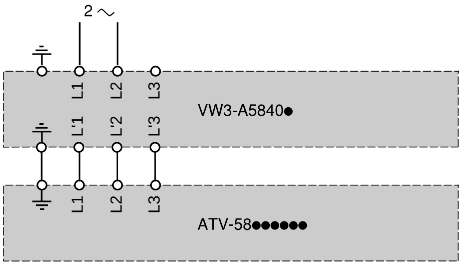
Additional input filters, radio interference suppression filters

VW3-A5840●

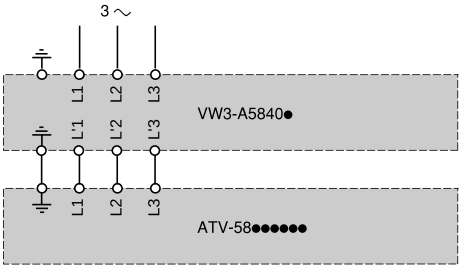
Single phase supply, single phase filter



Single phase supply, 3-phase filters



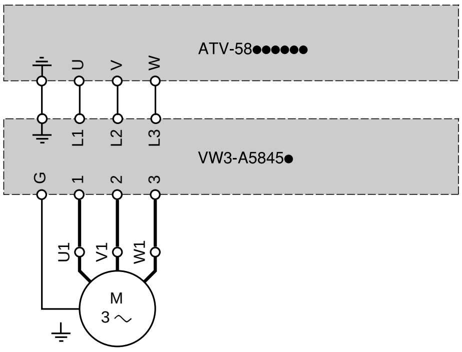
3-phase supply



Output filters

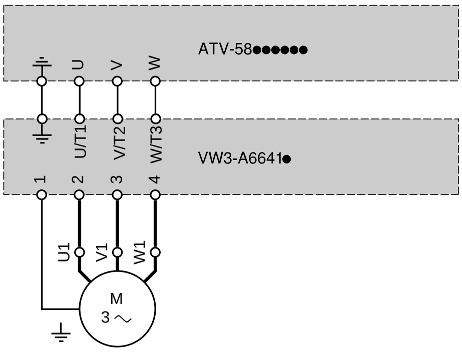
VW3-A5845●

LR cell



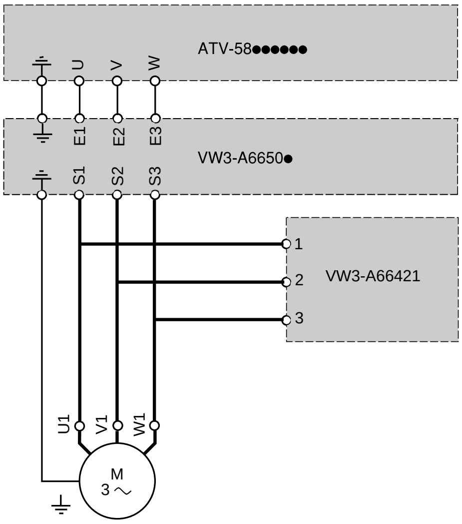
VW3-A6641●

LC cell



VW3-A6650● + **VW3-A66421**

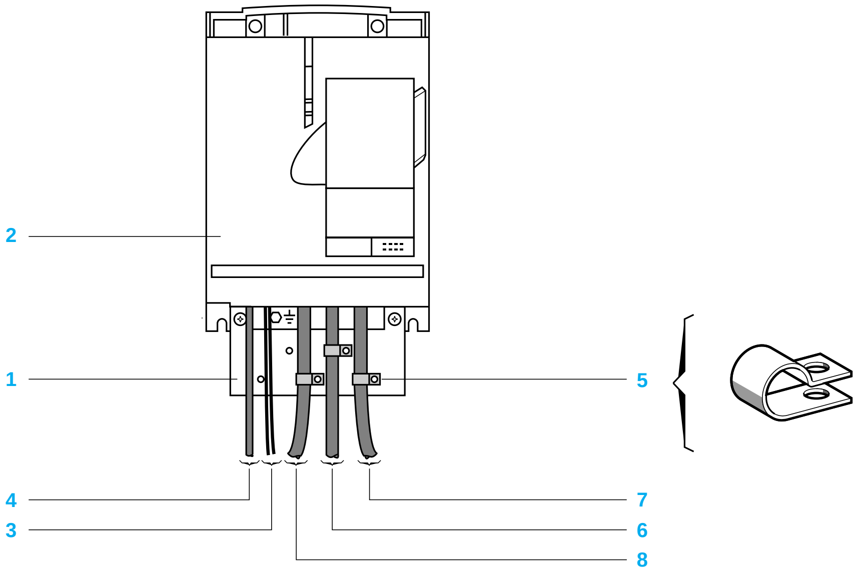
Motor line chokes + capacitors



Principle

- The earths between the drive, motor and cable shielding must have "high frequency" equipotentiality.
- Use shielded cables with shielding connected to earth at 360° at both ends of the motor cable, braking resistor (if fitted) and control-command cables. Tubes or metal ducting can be used for part of the shielding length provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (mains supply) and the motor cable.

Installation diagram



1 Metal plate supplied with the drive, to be mounted as shown (machine earth).

2 Altivar 58.

3 Non-shielded power supply wires or cable.

4 Non-shielded wires for fault relay contacts output.

5 Fix and earth the shielding of cables 6, 7 and 8 as close as possible to the drive:
- strip the shielding,
- use the correct size clamps on the stripped part of the shielding to fix to metal plate 1 ;
  the shielding must be clamped tightly enough to the metal plate to ensure good contact,
- clamp types: stainless steel.

6 Shielded cable for motor connection with shielding connected to earth at both ends.
The shielding must be continuous and intermediate terminal blocks must be in EMC shielded metal cases.

7 Shielded cable for connecting the control/command system.
For applications requiring several conductors, use small cross-sections (0.5 mm^2).
The shielding must be connected to earth at both ends. The shielding must be continuous and intermediate terminal blocks must be in EMC shielded metal cases.

8 Shielded cable for connecting brake resistor (if fitted). The shielding must be connected to earth at both ends. The shielding must be continuous and intermediate terminal blocks must be in EMC shielded metal cases.

Notes:
1 The HF equipotential earth connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.

2 If using an additional input filter, it should be mounted under the drive (drive with heatsink) or to one side (drive on a baseplate), and connected directly to the mains supply via an unshielded cable. Link 3 is via the filter cable.

**Presentation:
pages 2/122 to 2/126**

Variable speed drives for asynchronous motors

Altivar 58

Motor starters

GV2 L
+
LC1 D
+
ATV 58

Applications

Circuit-breaker/contactor/drive combinations can be used to ensure continuous service of the installation with optimum safety.
The type of coordination selected between the circuit-breaker and the contactor can reduce maintenance costs in the event of a short-circuit by minimising the time required to make necessary repairs and the cost of replacement equipment. The combinations suggested provide type 2 coordination.
Type 2 coordination: a short-circuit will not damage the device or affect its settings. The motor starter should be able to operate once the electrical fault has been removed. The electrical isolation provided by the circuit-breaker will not be affected by the short-circuit. The risk of welding of the line contactor contacts is permissible if they can be separated easily.

The downstream contactor is not affected by type 2 coordination.

The drive controls the motor, provides protection against short-circuits between the drive and the motor and protects the motor cable against overloads. The overload protection is provided by the drive's motor thermal protection.
If this protection is removed, external thermal protection should be provided.
Before restarting the installation, the cause of the trip must be removed.

Single phase supply voltage: 200 to 240 V
(for motors 0.37 to 5.5 kW or *0.5 to 7.5 HP)*

Motor circuit-breaker: NS80HMA product sold under the Merlin Gerin brand.
Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.

Motor *(1)*	**Circuit-breaker**		**Line contactor**	**Downstream contactor**	**Variable speed drive**
Power kW/*HP* *(2)*	**Reference** *(3)*	**Rating A**	**Reference** *(4)*	**Reference** *(5)*	**Reference** *(6)*
0.37/*0.5*	**GV2 L10**	6.3	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U09M2**
0.75/*1*	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U18M2**
1.5/*2*	**GV2 L20**	18	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U29M2**
2.2/*3*	**GV2 L22**	25	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U41M2**
3/*–*	**GV2 L22**	25	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U72M2** *(7)*
4/*5*	**NS80HMA50**	50	**LC1 D40●●**	**LC1 D09BL**	**ATV 58●U90M2** *(7)*
5.5/*7.5*	**NS80HMA50**	50	**LC1 D50●●**	**LC1 D18BL**	**ATV 58●D12M2** *(7)*

3-phase supply voltage: 200 to 230 V
(for motors 1.5 to 7.5 kW or *2 to 10 HP)*

Motor circuit-breaker: NS80HMA product sold under the Merlin Gerin brand.
Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.

Motor *(1)*	**Circuit-breaker**		**Line contactor**	**Downstream contactor**	**Variable speed drive**
Power kW/*HP* *(2)*	**Reference** *(3)*	**Rating A**	**Reference** *(4)*	**Reference** *(5)*	**Reference** *(6)*
1.5/*2*	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U29M2**
2.2/*3*	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U41M2**
3/*–*	**GV2 L20**	18	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U54M2**
4/*5*	**GV2 L22**	25	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U72M2**
5.5/*7.5*	**NS80HMA50**	50	**LC1 D40●●**	**LC1 D18BL**	**ATV 58●U90M2**
7.5/*10*	**NS80HMA50**	50	**LC1 D50●●**	**LC1 D25BL**	**ATV 58●D12M2**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
(2) The HP values given are NEC-compliant (National Electrical Code).
(3) Breaking capacity:

200/240 V	**Icu (kA)**
GV2 L	50
NS80HMA50	100

(4) Replace ●● with the control circuit voltage reference indicated in the table below.

a.c. control circuit					
Volts ~	24	48	110	220	240
50/60 Hz	**B7**	**E7**	**F7**	**M7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.
(5) LC1 D●●BL contactors have 24 V d.c. low consumption coils (100 mA). Up to 15 kW, they are powered by the internal drive power supply. For power ratings above this level, use an external supply and complete the contactor coil voltage according to footnote (4).
(6) Replace the ● in the reference according to the type of drive required (see pages 2/132 to 2/134).
(7) A line choke must be added.

Variable speed drives for asynchronous motors

Altivar 58

Motor starters

NS80HMA
+
LC1 D
+
ATV 58

3-phase supply voltage: 208 to 240 V

(for motors 11 to 37 kW or *15 to 50 HP)*

Motor circuit-breaker: NS●●●●MA product sold under the Merlin Gerin brand.
Composition of contactors:
LC1 D32 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.

High torque application

Motor *(1)*	Circuit-breaker		Line contactor	Downstream contactor	Variable speed drive
Power kW/*HP* *(2)*	**Reference** *(3)*	**Rating A**	**Reference** *(4)*	**Reference** *(4)*	**Reference**
11/*15*	**NS80HMA50**	80	**LC1 D40●●**	**LC1 D32●●**	**ATV 58HD16M2X**
15/*20*	**NS100HMA80**	80	**LC1 D65●●**	**LC1 D40●●**	**ATV 58HD23M2X**
18.5/*25*	**NS100NMA100**	100	**LC1 D80●●**	**LC1 D50●●**	**ATV 58HD28M2X**
22/*30*	**NS100NMA100**	100	**LC1 D80●●**	**LC1 D80●●**	**ATV 58HD33M2X**
30/*40*	**NS160NMA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD46M2X**

Standard torque application

Motor *(1)*	Circuit-breaker		Line contactor	Downstream contactor	Variable speed drive
Power kW/*HP* *(2)*	**Reference** *(3)*	**Rating A**	**Reference** *(4)*	**Reference** *(4)*	**Reference**
15/*20*	**NS80HMA80**	80	**LC1 D65●●**	**LC1 D40●●**	**ATV 58HD16M2X**
18.5/*25*	**NS100NMA100**	100	**LC1 D80●●**	**LC1 D50●●**	**ATV 58HD23M2X**
22/*30*	**NS100NMA100**	100	**LC1 D80●●**	**LC1 D80●●**	**ATV 58HD28M2X**
30/*40*	**NS160NMA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD33M2X**
37/*50*	**NS160NMA150**	150	**LC1 D115●●**	**LC1 D115●●**	**ATV 58HD46M2X**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
(2) The HP values given are NEC-compliant (National Electrical Code).
(3) Breaking capacity of circuit-breaker according to standard IEC60947-2.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

a.c. control circuit

Volts ∿	24	48	110	220	240
50/60 Hz	**B7**	**E7**	**F7**	**M7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 58

Motor starters

NS80HMA
+
LC1 D
+
ATV 58

3-phase supply voltage: 380 to 415 V

(for motors 0.75 to 75 kW or *1 to 100 HP)*

Motor circuit-breaker: NS●●●●MA product sold under the Merlin Gerin brand.
Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.

High torque application

Motor *(1)*	Circuit-breaker		Line contactor	Downstream contactor	Variable speed drive
Power	Reference	Rating	Reference	Reference	Reference
kW/*HP (2)*	*(3)*	A	*(4)*	*(4) (5)*	*(6)*
0.75/*1*	**GV2 L08**	4	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U18N4**
1.5/*2*	**GV2 L10**	6.3	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U29N4**
2.2/*3*	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U41N4**
3/*–*	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U54N4**
4/*5*	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U72N4**
5.5/*7.5*	**GV2 L22**	25	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U90N4**
7.5/*10*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D09BL**	**ATV 58●D12N4**
11/*15*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D25BL**	**ATV 58●D16N4**
15/*20*	**NS80●MA50**	50	**LC1 D50●●** *(7)*	**LC1 D25BL**	**ATV 58●D23N4**
18.5/*25*	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25●●**	**ATV 58HD28N4**
22/*30*	**NS80●MA80**	80	**LC1 D65●●**	**LC1 D32●●**	**ATV 58HD33N4**
30/*40*	**NS80●MA80**	80	**LC1 D65●●**	**LC1 D50●●**	**ATV 58HD46N4**
37/*50*	**NS100●MA100**	100	**LC1 D80●●**	**LC1 D50●●**	**ATV 58HD54N4**
45/*60*	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD64N4**
55/*75*	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD79N4**

Standard torque application

Motor *(1)*	Circuit-breaker		Line contactor	Downstream contactor	Variable speed drive
Power	Reference	Rating	Reference	Reference	Reference
kW/*HP (2)*	*(3)*	A	*(4)*	*(4) (5)*	*(6)*
0.75/*1*	**GV2 L08**	4	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U18N4**
1.5/*2*	**GV2 L10**	6.3	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U29N4**
2.2/*3*	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U41N4**
3/*–*	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U54N4**
4/*5*	**GV2 L16**	14	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U72N4**
5.5/*7.5*	**GV2 L22**	25	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U90N4**
7.5/*10*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D09BL**	**ATV 58●D12N4**
11/*15*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D25BL**	**ATV 58●D16N4**
15/*20*	**NS80●MA50**	50	**LC1 D50●●** *(7)*	**LC1 D25BL**	**ATV 58●D23N4**
18.5/*25*	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D25●●**	**ATV 58HD28N4**
22/*30*	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D32●●**	**ATV 58HD28N4**
30/*40*	**NS80●MA80**	80	**LC1 D65●●**	**LC1 D40●●**	**ATV 58HD33N4**
37/*50*	**NS80●MA80**	80	**LC1 D65●●**	**LC1 D50●●**	**ATV 58HD46N4**
45/*60*	**NS100●MA100**	100	**LC1 D80●●**	**LC1 D80●●**	**ATV 58HD54N4**
55/*75*	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD64N4**
75/*100*	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D115●●**	**ATV 58HD79N4**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
(2) The HP values given are NEC-compliant (National Electrical Code).
(3) Replace ● with N, H or L, according to the breaking capacity, in the table below.

Breaking capacity of circuit-breakers according to standard IEC60947-2

380/415 V	Icu (kA)	
GV2 L	50	
380/415 V	**N**	**H**
NS80●MA50	–	25
NS80●MA80	–	35
NS100●MA	25	–
NS160●MA	35	–

(4) Replace ●● with the control circuit voltage reference indicated in the table below.

a.c. control circuit

Volts ∿	24	48	110	220/230	240
50/60 Hz	**B7**	**E7**	**F7**	**M7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.
(5) LC1 D●●BL contactors have 24 V d.c. low consumption coils (100 mA). Up to 15 kW, they are powered by the internal drive power supply. For power ratings above this level, use an external supply and complete the contactor coil voltage according to footnote (4).
(6) Replace the ● in the reference according to the type of drive required (see pages 2/132 to 2/134).
(7) LC1 D25●● for ready-assembled ATV 58 drives with a built-in line choke.

Variable speed drives for asynchronous motors

Altivar 58

Motor starters

NS80HMA
+
LC1 D
+
ATV 58

3-phase supply voltage: 440 to 500 V

(for motors 0.75 to 75 kW or *1 to 100 HP*)

Motor circuit-breaker: NS●●●●MA product sold under the Merlin Gerin brand.
Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.

High torque application

Motor *(1)*	**Circuit-breaker**		**Line contactor**	**Downstream contactor**	**Variable speed drive**
Power **kW/*HP*** *(2)*	**Reference** *(3)*	**Rating** **A**	**Reference** *(4)*	**Reference** *(4) (5)*	**Reference** *(6)*
0.75/*1*	**GV2 L08**	4	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U18N4**
1.5/*2*	**GV2 L10**	6.3	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U29N4**
2.2/*3*	**GV2 L10**	6.3	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U41N4**
3/*–*	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U54N4**
4/*5*	**GV2 L14**	10	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U72N4**
5.5/*7.5*	**NS80●MA50**	50	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U90N4**
7.5/*10*	**NS80●MA50**	50	**LC1 D40●●** *(6)*	**LC1 D09BL**	**ATV 58●D12N4**
11/*15*	**NS80●MA50**	50	**LC1 D40●●** *(6)*	**LC1 D25BL**	**ATV 58●D16N4**
15/*20*	**NS80●MA50**	50	**LC1 D50●●** *(6)*	**LC1 D25BL**	**ATV 58●D23N4**
18.5/*25*	**NS100●MA50**	50	**LC1 D40●●**	**LC1 D25●●**	**ATV 58HD28N4**
22/*30*	**NS100●MA50**	50	**LC1 D65●●**	**LC1 D32●●**	**ATV 58HD33N4**
30/*40*	**NS100●MA100**	100	**LC1 D65●●**	**LC1 D50●●**	**ATV 58HD46N4**
37/*50*	**NS100●MA100**	100	**LC1 D80●●**	**LC1 D50●●**	**ATV 58HD54N4**
45/*60*	**NS160●MA100**	100	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD64N4**
55/*75*	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD79N4**

Standard torque application

Motor *(1)*	**Circuit-breaker**		**Line contactor**	**Downstream contactor**	**Variable speed drive**
Power **kW/*HP*** *(2)*	**Reference** *(3)*	**Rating** **A**	**Reference** *(4)*	**Reference** *(4) (5)*	**Reference** *(6)*
0.75/*1*	**GV2 L08**	4	**LC1 D18●●**	**LC1 D09BL**	**ATV 58●U18N4**
1.5/*2*	**GV2 L10**	6.3	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U29N4**
2.2/*3*	**GV2 L10**	6.3	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U41N4**
3/*–*	**GV2 L14**	10	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U54N4**
4/*5*	**GV2 L14**	10	**LC1 D25●●**	**LC1 D09BL**	**ATV 58●U72N4**
5.5/*7.5*	**NS80●MA50**	50	**LC1 D40●●**	**LC1 D09BL**	**ATV 58●U90N4**
7.5/*10*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D09BL**	**ATV 58●D12N4**
11/*15*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D25BL**	**ATV 58●D16N4**
15/*20*	**NS80●MA50**	50	**LC1 D40●●** *(7)*	**LC1 D25BL**	**ATV 58●D23N4**
18.5/*25*	**NS100●MA50**	50	**LC1 D80●●**	**LC1 D25●●**	**ATV 58HD28N4**
22/*30*	**NS100●MA50**	50	**LC1 D80●●**	**LC1 D32●●**	**ATV 58HD28N4**
30/*40*	**NS100●MA50**	50	**LC1 D80●●**	**LC1 D40●●**	**ATV 58HD33N4**
37/*50*	**NS100●MA100**	100	**LC1 D80●●**	**LC1 D50●●**	**ATV 58HD46N4**
45/*60*	**NS160●MA100**	100	**LC1 D80●●**	**LC1 D80●●**	**ATV 58HD54N4**
55/*75*	**NS160●MA100**	100	**LC1 D115●●**	**LC1 D80●●**	**ATV 58HD64N4**
75/*100*	**NS160●MA150**	150	**LC1 D115●●**	**LC1 D115●●**	**ATV 58HD79N4**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
(2) The HP values given are NEC-compliant (National Electrical Code).
(3) Replace ● with N, H or L, according to the breaking capacity, in the table below.

Breaking capacity of circuit-breakers according to standard IEC60947-2

440/500 V	**Icu (kA)**
GV2 L08, GV2 L10	50
GV2 L14	10
440/500 V	**L**
NS80●MA	25
NS100●MA, NS160●MA	100

(4) Replace ●● with the control circuit voltage reference indicated in the table below.

a.c. control circuit

Volts ∼	24	48	110	220/230	240
50/60 Hz	**B7**	**E7**	**F7**	**M7**	**U7**

For other voltages between 24 and 660 V, or d.c. control circuit, please consult your Regional Sales Office.
(5) LC1 D●●BL contactors have 24 V d.c. low consumption coils (100 mA). Up to 15 kW, they are powered by the internal drive power supply. For power ratings above this level, use an external supply and complete the contactor coil voltage according to footnote (4).
(6) Replace the ● in the reference according to the type of drive required (see pages 2/132 to 2/134).
(7) LC1 D25●● for ready-assembled ATV 58 drives with a built-in line choke.

Variable speed drives for asynchronous motors

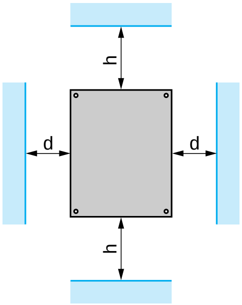
Altivar 58

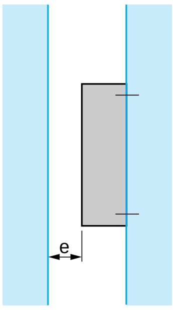
Mounting options

Depending on the conditions in which the speed drive is to be used, setup will require certain installation precautions as well as the appropriate accessories.

Install the unit vertically at ±10°.

- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.





Mounting recommendations

Speed drive with heatsink

ATV-58 speed drives	Temperature		
HU09M2 to **HU72M2** and **HU18N4** to **HU90N4** **e = 10 mm** **h = 50 mm**	- 10…+ 40 °C **d ≥ 50 mm** No special precautions **d = 0 mm** Remove the protective blanking cover from the top of the speed drive (degree of protection is then IP 20)	+ 40…+ 50 °C **d ≥ 50 mm** Remove the protective blanking cover from the top of the speed drive (degree of protection is then IP 20) **d = 0 mm** Add control card fan kit VW3-A5882● (see previous pages)	+ 50…+ 60 °C **d ≥ 50 mm** Add control card fan kit VW3-A5882● (see previous pages) Derate the rated operating current by 2.2 % for each °C over 50 °C
HU90M2 to **HD12M2** and **HD12N4** to **HD23N4** **e = 10 mm** **h = 50 mm**	- 10…+ 40 °C **d ≥ 50 mm** No special precautions **d = 0 mm** Remove the protective blanking cover from the top of the speed drive (degree of protection is then IP 20)	+ 40…+ 50 °C **d ≥ 50 mm** Remove the protective blanking cover from the top of the speed drive (degree of protection is then IP 20) Derate the rated operating current by 2.2 % for each °C over 40 °C **d = 0 mm** Add control card fan kit VW3-A5882● (see previous pages) Derate the rated operating current by 2.2 % for each °C over 40 °C	–
HD16M2X to **HD46M2X**, **HD28N4** to **HD79N4** and **HD28N4X** to **HD79N4X** **e = 50 mm** **h = 100 mm**	- 10…+ 40 °C **d ≥ 50 mm** No special precautions	+ 40…+ 60 °C **d ≥ 50 mm** Add control fan card kit VW3-A5882● (see previous pages) Derate the rated operating current by 2.2 % for each °C over 40 °C	

Mounting recommendations (continued)

Speed drive on a baseplate (use the VW3-A5880● kit, see the following pages)

- **Mounting in a wall-fixing or floor standing enclosure**

  - External ambient temperature (heatsink side VW3-A5880●): - 10…+ 40 °C.

  - Temperature inside the wall-fixing or floor-standing enclosure: this has the same limits, mounting conditions and derating (if any) as for speed drives with heatsinks, see opposite.

- **Mounting on machine frame**

  Ambient temperature: - 10…+ 40 °C.

Recommendations for mounting in a wall-fixing or floor-standing enclosure

Risk of condensation

If the device is left switched off for long periods, a heater must be used (0.2 to 0.5 W per 10 cm^3 of the enclosure) which switches on automatically as soon as the device stops.

This keeps the interior of the enclosure at a temperature slightly above the external temperature, and avoids any risk of condensation or dripping water while the device is switched off.

Alternative solution: keep the device powered up when it is stopped (the heat of the device itself when powered up is generally sufficient to cause this temperature difference).

Dust and damp proof casing

Calculating the size of the enclosure

Usable heat dissipation area of casing (if wall-mounted): $S = \frac{K}{Rth}$

Where:

S (m^2) = area of sides + area of top + area of front panel

K: thermal resistance per m^2 of casing
For metal casing: K = 0.12 with internal fan, K = 0.15 without fan.

Rth: maximum thermal resistance in °C/W:

$Rth = \frac{\theta - \theta e}{P}$ where: θ = maximum temperature inside enclosure in °C,
θe = maximum external temperature in °C,
P = total power dissipated in the enclosure in W.

The total power dissipated in the enclosure consists of: the power dissipated by the speed drive (see reference tables) plus the power dissipated by the other components of the unit.

Attention: Do not use insulated enclosures as they have a poor level of conductivity.

Using the speed drive on a baseplate reduces the power dissipated in the enclosure, which makes the IP 54 degree of protection easier to achieve.

To avoid hot spots, add the control card fan kit to circulate the air inside the speed drive.

Recommendations for mounting in a wall-fixing or floor-standing enclosure (continued)

Ventilated casing

The apertures and/or optional fans must permit a flow rate at least equal to that provided by the speed drive fans.

Fan flow rate according to speed drive rating

Type of speed drive		Fan flow rate
With heatsink	**ATV-58HU09M2, HU18M2,** **ATV-58HU18N4**	Non-ventilated
	ATV-58HU29M2, HU54M2, **ATV-58HU29N4, HU41N4, HU54N4**	36 m^3/hr
	ATV-58HU41M2	47 m^3/hr
	ATV-58HU72M2, HU90M2, HD12M2, **ATV-58HU72N4, HU90N4, HD12N4, HD16N4, HD23N4**	72 m^3/hr
	ATV-58HD16M2X, HD23M2X, **ATV-58HD28N4** to **HD46N4,** **ATV-58HD28N4X** to **HD46N4X** (1)	292 m^3/hr
	ATV-58HD28M2X to **HD46M2X,** **ATV-58HD54N4** to **HD79N4,** **ATV-58HD54N4X** to **HD79N4X** (1)	492 m^3/hr
	Control card fan kit	36 m^3/hr
On baseplate	All ratings except **ATV-58PU41M2**	Non-ventilated
	ATV-58PU41M2	11 m^3/hr
	Control card fan kit	36 m^3/hr

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(1) For these speed drives use the air exchanger mounting kit: see page 2/135.

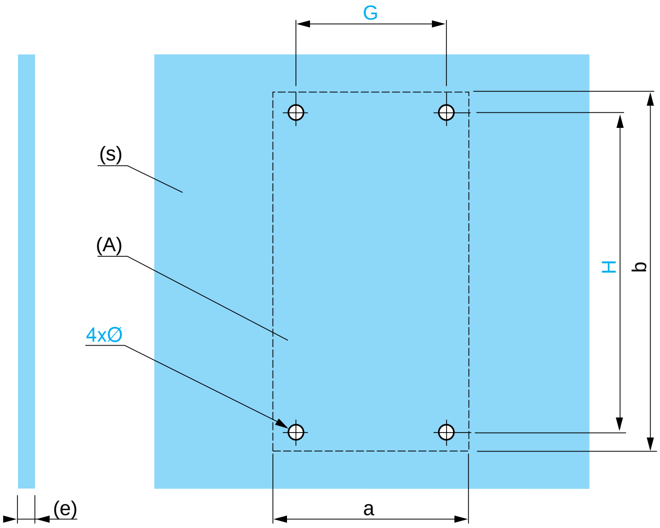
Variable speed drives for asynchronous motors

Altivar 58
Mounting options

Recommendations for mounting on machine frame (speed drives on baseplate)

Speed drives on baseplates with the following ratings can be mounted on (or in) a cast iron or aluminium machine frame as long as the following conditions are observed:
- maximum ambient temperature: 40 °C,
- mating surface (A) on frame machined to provide 100µm max smoothness and 3.2 µm max roughness,
- the speed drive must be mounted in the centre of a support (frame) with minimum thickness (e) and minimum square area of cooling surface (s) exposed to the open air.

This usage should be checked first by a test when the operating conditions are close to the maximum limits (power, cycle and temperature).

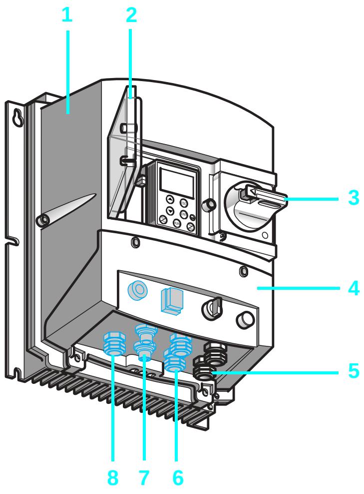


(s) Minimal surface of support
(A) Minimum machined surface
(e) Thickness of support

Speed drives	Minimum surface (s) m²	Minimum thickness (e) mm		a	b	G	H	Ø
		Cast iron	Aluminium					
ATV-58PU09M2, PU18M2	0.25	20	10	120	220	96	189	M4
ATV-58PU29M2, PU41M2, ATV-58PU18N4, PU29N4, PU41N4	1	–	20	160	240	133	209	M5

Variable speed drives for asynchronous motors

Ready-assembled Altivar 58



Presentation

There are two types of ready-assembled drive for the Altivar 58:

■ **Altivar 58 COMPACT** power rating between 0.37 and 5.5 kW:
this ready-to-use IP 55 enclosure is equipped with a drive on a base plate with an external heatsink, a circuit-breaker to provide type 2 coordination and protection, and a downstream contactor.
This enclosure can be installed as close as possible to the drive.

■ **Altivar 58 ENERGY** power rating between 3 and 75 kW:
the IP 55 enclosure is equipped with a drive with a cooling system and a Vario switch disconnector. A slot is provided for an additional contactor. The drives are supplied with a built-in line choke.
This enclosure can be installed next to the motor.

Description

Altivar 58 COMPACT (ready-assembled drives with power ratings from 0.37 to 5.5 kW)

The ready-assembled drives are housed inside a dust and damp proof enclosure 1 which contains:
- an ATV 58 drive,
- a protective circuit-breaker with padlockable front external control 3,
- a "downstream" contactor,
- a transparent cover 2 which can be opened and sealed and through which the indicator lights can be seen and the operator terminal display viewed and accessed for the purposes of configuration.

The cover can only be opened if the circuit-breaker has been tripped manually using 3.

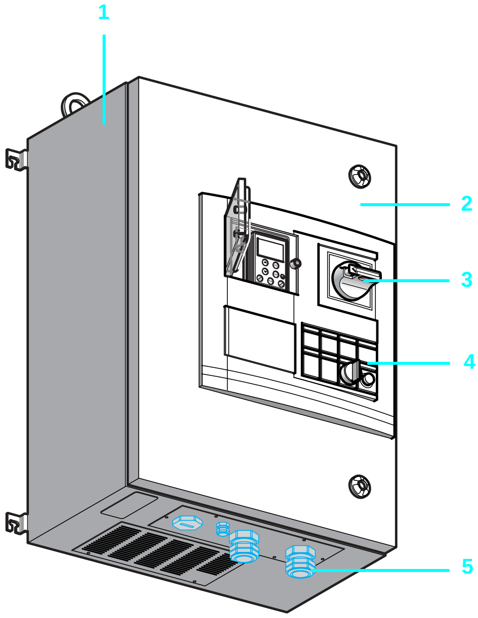
The metal gland plate 4 comprises:

■ On the front panel:
☐ a 3-position switch for selecting the directon of operation (factory-set for one direction only),
☐ a "frequency" reference potentiometer (which can be replaced with a blanking plug supplied with the drive if remote control is to be applied),
☐ 2 slots designed for diameter 16 control units.

■ On the bottom panel:
☐ 2 holes fitted with cable glands 5:
- one EMC PG13 metal gland for the shielded motor cable,
- one PG13 plastic gland for the unshielded power supply cable,

☐ 2 holes fitted with plastic blanking plugs, designed for PG11 cable glands 6,
☐ 3 recesses for additional cables 8,
☐ 3 open cut-outs 7 fitted with blanking plugs, through which cables fitted with connectors (PC link, remote terminal, communication buses) can be routed without having to be disconnected.

As the connections between the gland plate and the devices inside the enclosure are removable, all active components in the assembly can be replaced quickly and easily.
The assembly is supplied ready for use with the "Forward" command is prewired internally.



Altivar 58 ENERGY (ready-assembled drives with power ratings from 3 to 75 kW)

The ready-assembled drives are housed inside a dust and damp proof enclosure 1 which contains:
- an ATV 58 drive,
- a line choke,
- a Vario switch disconnector with padlockable front external control 3,
- a "frequency" reference potentiometer,
- a 3-position switch for selecting the direction of operation,
- an operator terminal 4.

A slot is provided for installing an additional contactor.
The front panel has a hinged cover 2. For safety reasons, it can only be opened when the switch disconnector is in the "OFF" position. The underside of the enclosure should be fitted with cable glands 5 via which the cables can be routed. When a ready-assembled drive with a power rating ≥ 7.5 kW is delivered, the additional contactor must be wired as a "line" or "downstream" contactor according to the specifications provided.

References:
pages 2/182 and 2/183
Dimensions:
page 2/186
Schemes:
page 2/187
Functions:
pages 2/190 to 2/205

Description (continued), characteristics

Variable speed drives for asynchronous motors

Ready-assembled Altivar 58

Options

■ Common options: the ready-assembled Altivar 58 supports the same options as the drives in the ATV 58 range:

☐ extension cards (see pages 2/140 and 2/141),

☐ communication cards (see pages 2/142 and 2/143),

☐ advanced PowerSuite dialogue solutions (see pages 3/2 and 3/3),

☐ braking module and resistors to be mounted externally (see pages 2/144 to 2/147).

■ Specific options for the COMPACT range (power ratings between 0.37 and 5.5 kW):

☐ an IP 65 enclosure for the remote operator terminal,

☐ a prewired removable connector for the AS-Interface bus (to be mounted on 7), a prewired removable connector for connecting a sensor (to be mounted on 7),

☐ an additional internal removable connector for remote control,

☐ a line choke to be assembled externally.

■ Specific options for the ENERGY range (power ratings between 3 and 75 kW):

☐ an IP 65 enclosure for the remote operator terminal,

☐ a line or downstream contactor,

☐ a SUB-D cable gland.

Characteristics

The ready-assembled Altivar 58 has the same:

- environmental,
- drive,
- electrical.

parameters as the Altivar 58 with heatsink and on base plate, with the exception of those listed below.

Degree of protection			IP 55
Ambient air temperature around the device	Storage	**°C**	- 25…+ 65
	Operation	**°C**	- 10...+ 40
Shock resistance	Conforming to IEC 60068-2-27		10 gn for 11 ms

Variable speed drives for asynchronous motors

Ready-assembled Altivar 58 for asynchronous motors from 0.37 to 75 kW or 0.5 to 100 HP

ATV 58EU09M2

Altivar 58 COMPACT (ready-assembled drives with power ratings from 0.37 to 5.5 kW)

High torque applications (170 % Tn)

Motor		**Line supply**				**Ready-assembled Altivar 58**			
Power indicated on rating plate *(1)*		**Line current** *(2)*		**Prospective line Isc**		**Continuous output current**	**Max. transient current** *(3)*	**References to be completed** *(4)*	**Weight**
		at U min.	**at U max.**	**at U min.**	**at U max.**				
kW	***HP***	**A**	**A**	**kA**	**kA**	**A**	**A**		**kg**
Single phase supply voltage: 200…240 V *(5)* **50/60 Hz**									
0.37	*0.5*	5.6	4.7	2	2	2.3	3.1	**ATV 58EU09M2**	9.500
0.75	*1*	9.8	8.3	2	2	4.1	5.6	**ATV 58EU18M2**	9.500
1.5	*2*	18.5	15.6	5	5	7.8	10.6	**ATV 58EU29M2**	10.500
2.2	*3*	24.8	21.1	5	5	11	15	**ATV 58EU41M2**	19.500
3-phase supply voltage: 200…240 V *(5)* **50/60 Hz**									
1.5	*2*	9.7	8.3	5	5	7.8	10.6	**ATV 58EU29M2**	10.500
2.2	*3*	13.4	11.4	5	5	11	15	**ATV 58EU41M2**	19.500
3-phase supply voltage: 380…500 V *(5)* **50/60 Hz**									
0.75	*1*	3.4	2.6	5	5	2.3	3.1	**ATV 58EU18N4**	10.500
1.5	*2*	6	4.5	5	5	4.1	5.6	**ATV 58EU29N4**	10.500
2.2	*3*	7.8	6	5	5	5.8	7.9	**ATV 58EU41N4**	10.500
3	–	10.2	7.8	5	5	7.8	10.6	**ATV 58EU54N4**	19.500
4	*5*	13	10.1	5	5	10.5	14.3	**ATV 58EU72N4**	19.500
5.5	*7.5*	17	13.2	5	5	13	17.7	**ATV 58EU90N4**	19.500

ATV 58ED12N4

Altivar 58 ENERGY (ready-assembled drives with power ratings from 3 to 75 kW)

High torque applications (170 % Tn)

Motor		**Line supply**				**Ready-assembled Altivar 58**			
Power indicated on rating plate *(1)*		**Line current** *(2)*		**Prospective line Isc**		**Continuous output current**	**Max. transient current** *(3)*	**References to be completed** *(4)*	**Weight**
		at U min.	**at U max.**	**at U min.**	**at U max.**				
kW	***HP***	**A**	**A**	**kA**	**kA**	**A**	**A**		**kg**
3-phase supply voltage: 380…500 V *(5)* **50/60 Hz**									
3	–	10.2	7.8	5	5	7.8	10.6	**ATV 58ED05N4**	37.000
4	*5*	13	10.1	5	5	10.5	14.3	**ATV 58ED07N4**	37.000
5.5	*7.5*	17	13.2	5	5	13	17.7	**ATV 58ED09N4**	37.000
7.5	*10*	17.5	14	22	22	17.6	24	**ATV 58ED12N4**	43.000
11	*15*	24	20	22	22	24.2	32.9	**ATV 58ED16N4**	43.000
15	*20*	29.5	25.5	22	22	33	44.9	**ATV 58ED23N4**	46.000
18.5	*25*	43	35	22	65	41	55	**ATV 58ED28N4**	70.000
22	*30*	51	41	22	65	48	66	**ATV 58ED33N4**	70.000
30	*40*	68	55	22	65	66	90	**ATV 58ED46N4**	70.000
37	*50*	82	66	22	65	79	108	**ATV 58ED54N4**	110.000
45	*60*	101	82	22	65	94	127	**ATV 58ED64N4**	110.000
55	*75*	121	98	22	65	116	157	**ATV 58ED79N4**	110.000
Standard torque applications (120 % Tn)									
3-phase supply voltage: 380…500 V *(5)* **50/60 Hz**									
22	*30*	51	41	22	65	44	55	**ATV 58ED28N4**	70.000
30	*40*	67	53	22	65	60	66	**ATV 58ED33N4**	70.000
37	*50*	82	66	22	65	72	90	**ATV 58ED46N4**	70.000
45	*60*	99	79	22	65	85	108	**ATV 58ED54N4**	110.000
55	*75*	121	97	22	65	105	127	**ATV 58ED64N4**	110.000
75	*100*	160	130	22	65	138	157	**ATV 58ED79N4**	110.000

(1) These power ratings are given for a maximum permissible switching frequency of 4 kHz in continuous operation without derating. For higher switching frequencies, the drive must be in intermittent operation or it must be set one rating lower (see special uses on the page 2/131).

(2) Typical value without additional choke.

(3) For 60 seconds.

(4) Drive supplied with operator terminal.
*To obtain a drive without an operator terminal, add the letter **Z** at the end of the reference.*
*Example: **ATV 58EU09M2** without operator terminal becomes **ATV 58EU09M2Z**.*

(5) Nominal supply voltages, U min…U max.

***Note:** please refer to the table summarising the possible combinations for drives, options and accessories on pages 2/184 and 2/185.*

Variable speed drives for asynchronous motors

Ready-assembled Altivar 58

Special options

IP 65 enclosure for the remote operator terminal

The plug-in operator terminal can be used remotely, hand-held or fixed to the machine, using this IP 65 dust and damp proof kit.

Description	For drives	Reference	Weight kg
Kit comprising: - 1 cable fitted with connectors, length 3 m - IP 65 enclosure with flexible, transparent membrane - manual	ATV 58E all ratings	**VW3 A58864**	0.300

M12 prewired plug-in connectors for the COMPACT range

Description	For drives	Reference	Weight kg
4-way straight male M12 connector for AS-Interface bus	ATV 58EU power ratings between 0.37 and 5.5 kW	**VW3 A58862**	0.100
5-way female M12 connector for sensor	ATV 58EU power ratings between 0.37 and 5.5 kW	**VW3 A58863**	0.100

Additional plug-in control terminal block for remote control

Description	For drives	Reference	Weight kg
Internal terminal block, plug-in, 10 terminals, maximum cross-section 2.5 mm	ATV 58EU COMPACT range power ratings between 0.37 kW and 5.5 kW	**VW3 A58861**	0.100

Line choke

The line choke must be mounted externally for ready-assembled ATV 58E COMPACT range drives with power ratings between 0.37 and 5.5 kW.

It is built into ready-assembled ATV 58E ENERGY range drives with power ratings between 3 and 75 kW.

To select a line choke, see 2/149.

"Line" or "downstream" contactor

A slot is provided for mounting a contactor on ATV 58E ENERGY range drives with power ratings between 3 and 75 kW. The contactor is wired as a line or downstream contactor by the user, depending on requirements.

To select a contactor, see pages 2/172 to 2/175.

Potentiometer

Description	For drives	Reference	Weight kg
IP 65 potentiometer 2.2 kΩ	ATV 58E all ratings	**VW3 A58866**	0.100

SUB-D cable gland

Description	For drives	Reference	Weight kg
SUB-D cable gland, plug-in, 10 terminals	ATV 58E ENERGY range power ratings between 3 kW and 75 kW	**VW3 A58865**	0.300

Variable speed drives for asynchronous motors

Altivar 58 ready-assembled

Combinations (see pages 2/182 and 2/183)

Altivar 58 COMPACT

Supply	**Motor**		**ATV 58 drive for application**		**Options**				
Supply voltage 50/60 Hz	Power indicated on rating plate		With standard torque (120 % Tn)	With hight torque (170 % Tn)	**Line choke**	**1 extension or communication card**	**IP 65 enclosure or remote operator terminal**	**PowerSuite advanced dialogue solutions**	
	kW	***HP***						Software workshop and Pocket PC	Magelis display
200…240 V single-phase	0.37	*0.5*	–	**ATV 58EU09M2**	VZ1 L004M010	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	0.75	*1*	–	**ATV 58EU18M2**	VZ1 L007UM50	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	1.5	*2*	–	**ATV 58EU29M2**	VZ1 L018UM20	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	2.2	*3*	–	**ATV 58EU41M2**	VZ1 L018UM20	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
200…240 V 3-phase	1.5	*2*	–	**ATV 58EU29M2**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	2.2	*3*	–	**ATV 58EU41M2**	VW3 A66503	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
380…500 V 3-phase	0.75	*1*	–	**ATV 58EU18N4**	VW3 A66501	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	1.5	*2*	–	**ATV 58EU29N4**	VW3 A66501	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	2.2	*3*	–	**ATV 58EU41N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	3	–	–	**ATV 58EU54N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	4	*5*	–	**ATV 58EU72N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	5.5	*7.5*	–	**ATV 58EU90N4**	VW3 A66503	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8

Altivar 58 ENERGY

Supply	**Motor**		**ATV 58 drive for application**		**Options**				
Supply voltage 50/60 Hz	Power indicated on rating plate		With standard torque (120 % Tn)	With hight torque (170 % Tn)	**Line choke**	**1 extension or communication card**	**IP 65 enclosure or remote operator terminal**	**PowerSuite advanced dialogue solutions**	
	kW	***HP***						Software workshop and Pocket PC	Magelis display
380…500 V 3-phase	3	–	–	**ATV 58ED05N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	4	*5*	–	**ATV 58ED07N4**	VW3 A66502	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	5.5	*7.5*	–	**ATV 58ED09N4**	VW3 A66503	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	7.5	*10*	–	**ATV 58ED12N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	11	*15*	–	**ATV 58ED16N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	15	*20*	–	**ATV 58ED23N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	18.5	*25*	–	**ATV 58ED28N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	22	*30*	–	**ATV 58ED33N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
			ATV 58ED28N4	–	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	30	*40*	–	**ATV 58ED46N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
			ATV 58ED33N4	–	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	37	*50*	–	**ATV 58ED54N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
			ATV 58ED46N4	–	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	45	*60*	–	**ATV 58ED64N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
			ATV 58ED54N4	–	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	55	*75*	–	**ATV 58ED79N4**	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
			ATV 58ED64N4	–	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8
	75	*100*	**ATV 58ED79N4**	–	Integrated	VW3 A58●●●	VW3 A58864	VW3 A81●●	XBT HM017010A8

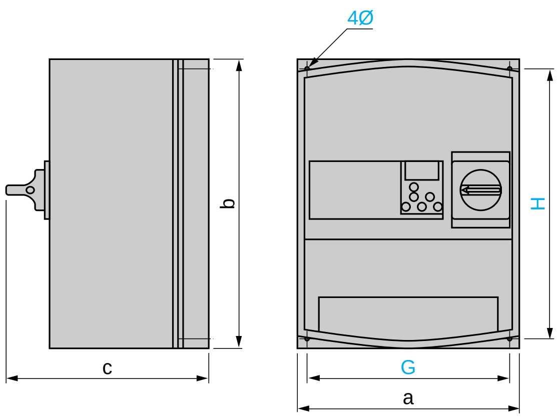
(1) In most cases this filter is of no advantage, as the ready-assembled drive can be placed very close to the motor.

Options *(continued)*								
RS 485 Interconnection	**Additional input filter** *(1)*	**Output filter** *(1)*	**Braking module**	**IP 00 braking resistor**	**IP 30 braking resistor**	**Plug-in connector for AS-Interface bus**	**Plug-in connector for sensor**	**Plug-in control terminal block for remote control**
VW3 A58306	VW3 A58401	–	VW3 A58701	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58401	VW3 A58451	VW3 A58701	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58452	Integrated	VW3 A58704	VW3 A58733	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58452	Integrated	VW3 A58704	VW3 A58733	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58402	VW3 A58451	Integrated	VW3 A58702	VW3 A58732	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58403	VW3 A58451	Intégré	VW3 A58703	VW3 A58734	VW3 A58862	VW3 A58863	VW3 A58861
VW3 A58306	VW3 A58403	VW3 A58452	Integrated	–	VW3 A58735	VW3 A58862	VW3 A58863	VW3 A58861

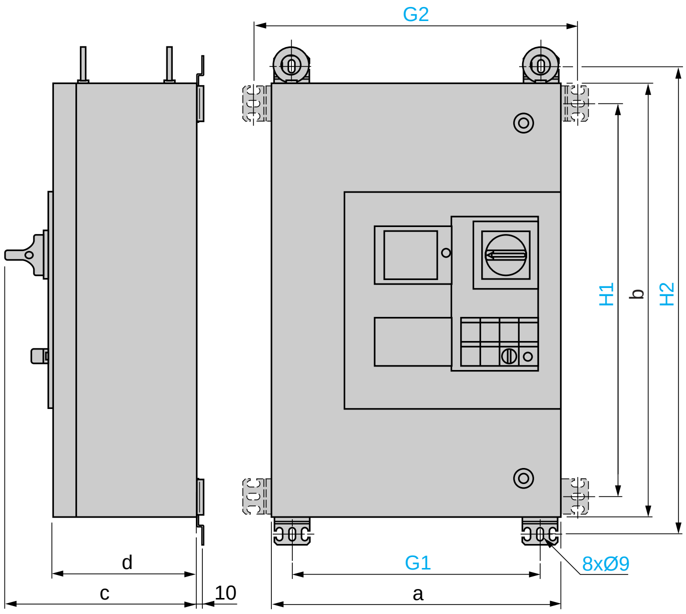
Options *(continued)*								
RS 485 Interconnection	**Additional input filter** *(1)*	**Output filter** *(1)*	**Braking module**	**IP 00 braking resistor**	**IP 30 braking resistor**	**Plug-in connector for AS-Interface bus**	**Plug-in connector for sensor**	**Plug-in control terminal block for remote control**
VW3 A58306	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734	–	–	–
VW3 A58306	VW3 A58403	VW3 A58451	Integrated	VW3 A58703	VW3 A58734	–	–	–
VW3 A58306	VW3 A58403	VW3 A58452	Integrated	–	VW3 A58735	–	–	–
VW3 A58306	VW3 A58404	VW3 A58453	Integrated	–	VW3 A58735	–	–	–
VW3 A58306	VW3 A58404	VW3 A58453	Integrated	–	VW3 A58736	–	–	–
VW3 A58306	VW3 A58405	VW3 A58453	Integrated	–	VW3 A58736	–	–	–
VW3 A58306	–	VW3 A66412	Integrated	–	VW3 A58737	–	–	–
VW3 A58306	–	VW3 A66412	Integrated	–	VW3 A58737	–	–	–
VW3 A58306	–	VW3 A66412	Integrated	–	VW3 A58737	–	–	–
VW3 A58306	–	VW3 A66412	Integrated	–	VW3 A58737	–	–	–
VW3 A58306	–	VW3 A66412	Integrated	–	VW3 A58737	–	–	–
VW3 A58306	–	VW3 A66413	Integrated	–	VW3 A66704	–	–	–
VW3 A58306	–	VW3 A66413	Integrated	–	VW3 A58737	–	–	–
VW3 A58306	–	VW3 A66413	Integrated	–	VW3 A66704	–	–	–
VW3 A58306	–	VW3 A66413	Integrated	–	VW3 A66704	–	–	–
VW3 A58306	–	VW3 A66413	Integrated	–	VW3 A66704	–	–	–
VW3 A58306	–	VW3 A66413	Integrated	–	VW3 A66704	–	–	–
VW3 A58306	–	–	Integrated	–	VW3 A66704	–	–	–

Dimensions

ATV 58EU●●●●



ATV 58ED●●●●

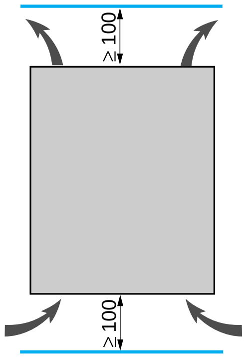


ATV 58E	a	b	c	G	H	Ø
U09M2, U18M2	230	316	215	210	300	5,5
U29M2, U18N4, U29N4, U41N4	270	337	250	250	322	5,5
U41M2, U54N4, U72N4, U90N4	300	406	281	280	391	5,5

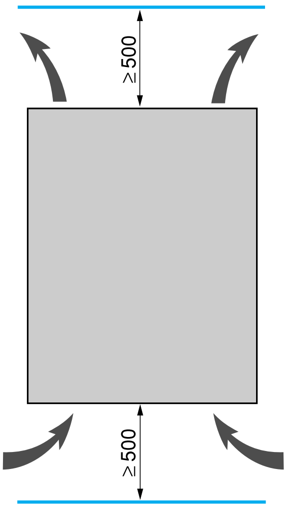
ATV 58E	a	b	c	d	G1	G2	H1	H2
D05N4, D07N4, D09N4, D12N4, D16N4, D23N4	500	700	300,5	250	437,5	550	637,5	750
D28N4, D33N4, D46N4	460	850	365,5	315	397,5	510	787,5	900
D54N4, D64N4, D79N4	570	1050	405,5	340	507,5	620	987,5	1100

Setup recommendations

ATV 58EU●●●●



ATV 58ED●●●●

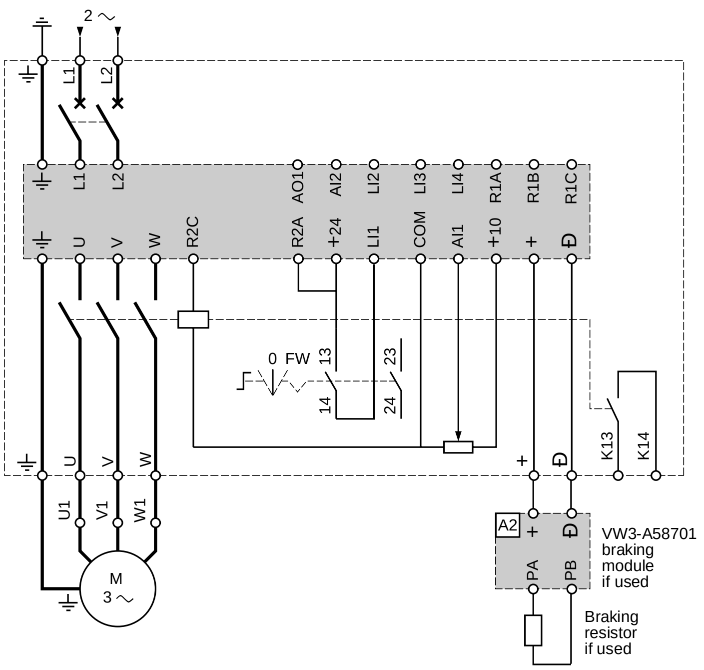


Do not place the device near heating elements.

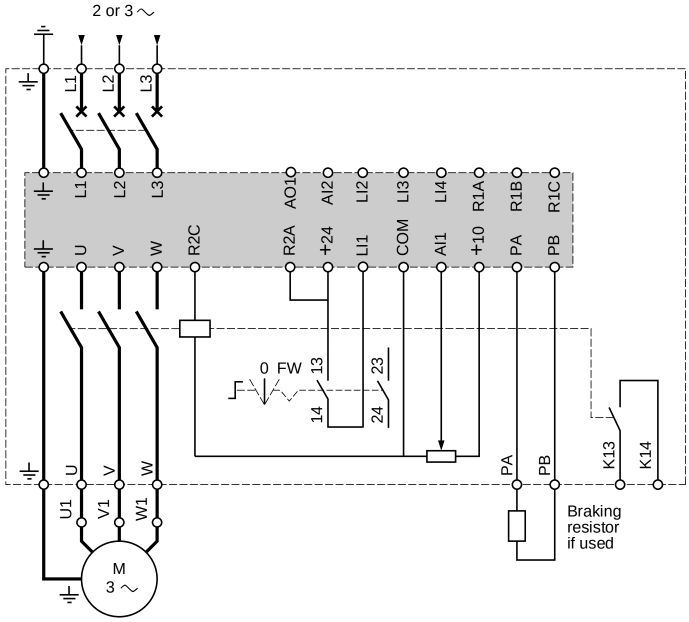
Leave sufficient clearance to allow air circulation. The speed drive is cooled by an air flow from the bottom to the top.

Schemes

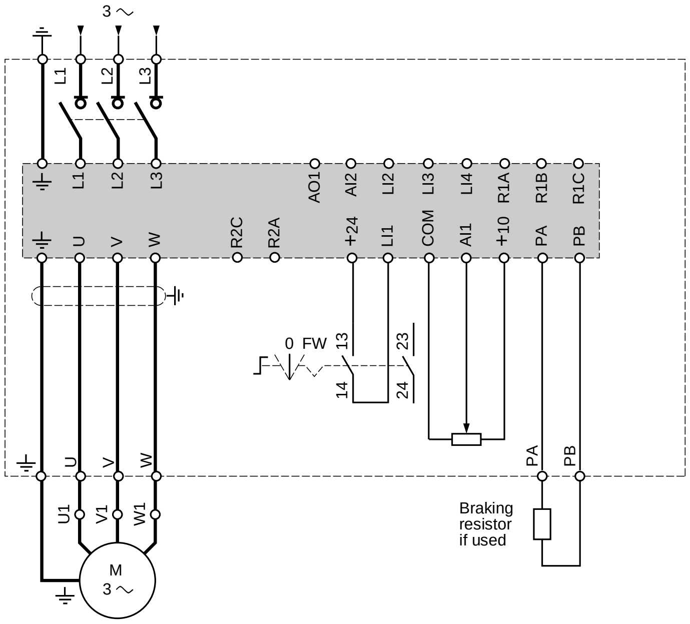
ATV 58EU09M2, EU18M2



**ATV 58EU29M2, EU41M2, EU18N4, EU29N4, EU41N4, EU54N4,
ATV 58EU72N4, EU90N4**

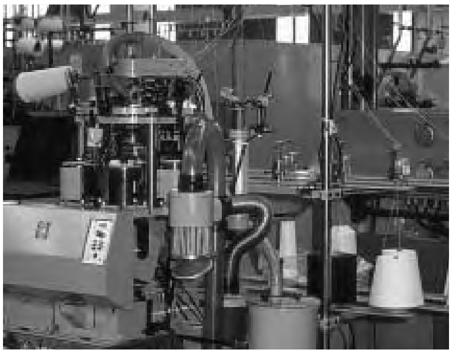


ATV 58ED05N4, ED07N4, ED09N4, ED12N4, ED16N4, ED23N4, ED28N4, ED33N4, ED46N4, ED54N4, ED64N4, ED79N4

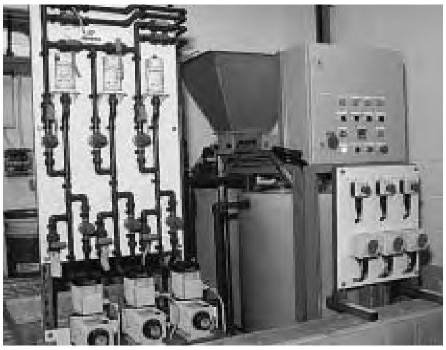


Variable speed drives for asynchronous motors

Altivar 58
Combination of functions and applications

Applications	**Special machines**			**Packing/packaging**	
	Timber machines Textile machines	Mixers Kneaders Centrifuges	Dosing (pumps, screws, dosing belts)	Hoop casing machines Bagging machines Labelling machines	Palletizers Depalletizers
					
“Drive” functions					
Maximum frequency 500 Hz (special motor)	■				
Switching frequency	2 to 16 kHz	2 to 16 kHz	2 to 16 kHz	2 kHz	2 kHz
Noise reduction (random freq.)		■	■	■	■
Skip frequency		■			
Energy saving					
Automatic injection on stop	■	■		■	■
Resistance braking	■	□		■	■
Application functions					
Automatic adaption of the deceleration ramp	■	■		■	
Automatic catching a spinning load (flying restart)	■	■	■	■	
Automatic restart					
Controlled stop on loss of AC supply	■	■	□		
Lim. of the operating time at low speed					
S-shaped ramps					■
U-shaped ramps			□		
Adaptation of current limit					
Analogue inputs					
- Summing	□		□	■	
- Torque limit	□				
- PI regulator			□		
- PTC probe	□	□		□	□
- Tachogenerator speed feedback	□	□	■		□
Encoder input (speed regulation)	□	□	□		□
Logic inputs					
- 2 operating directions	■	■	□	■	■
- d.c. injection		■			
- Fast stop		□			
- Freewheel stop	■				
- Step by step (JOG)	□	□	□	□	□
- Preset speeds	■	■	□	■	■
- Ramp switching	□				
- +/ - speed		□	■	□	
- Reference switching			□		
- Motor switching	□				■
- 2nd torque limit	□				
Logic outputs and relays					
- Brake sequence					■
- Downstream contactor control	□	□		□	
- Frequency threshold reached	□		■	□	□
- HSP reached		□			
- Reference reached	□	□	□	□	
- Current threshold reached		□	□		
- Thermal motor threshold reached					□
- Drive running	□		■	□	□
Analogue output (torque, speed, current, ramp)	□	□	□	□	□

■ Frequent or essential use □ Occasional use

Materials handling/hoisting			**Elevators**		**Pumping/ventilation**	
Continuous conveyors, belt conveyers, chain conveyors	Cycle conveyors transfer tables, manipulation arms, overhead cranes	Hoisting winches	Gates	Winches	Centrifugal pumps Screw compressors	Fans (driers, drying ovens, tunnels, extractor hoods, air conditioning)
						
					□	
2 kHz	2 kHz	2 kHz	16 kHz	2 to 16 kHz	2 to 16 kHz	2 to 16 kHz
■	■	■		□	■	■
□	□				□	□
					■	■
■	■					□
■	■	■		■		
■					■	■
■					■	■
□					■	■
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■	■	□		■		
					□	
						□
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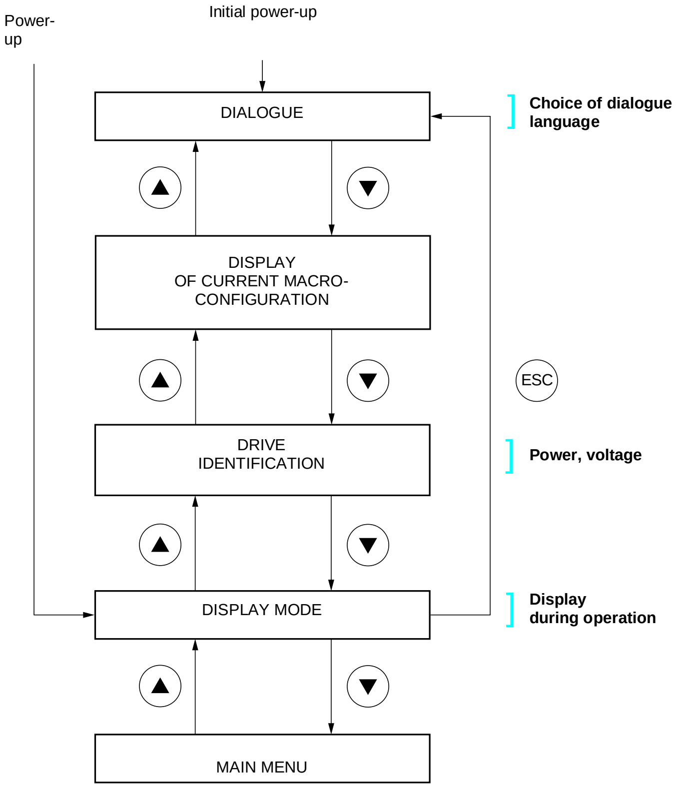
Variable speed drives for asynchronous motors

Altivar 58

Variable speed drives for asynchronous motors

Altivar 58

Description of functions



■ **Principle of access in the main menu with the operator terminal**

◻ With the terminal switch in position 0, the user can:
- select the dialogue language,
- display the macro-configuration,
- identify the drive,
- display the state of the drive, the electrical values and the fault register.

◻ With the terminal switch in position 1, it is possible to:
- perform operations possible in position 0,
- modify the settings.

◻ With the terminal switch in position 2, the user can:
- perform the operations possible in positions 0 and 1,
- change the macro-configuration,
- modify the motor power,
- modify all the configuration parameters,
- enable control of the drive via the terminal,
- store, load or protect the parameter files.

■ **Principle of access in the main menu with the PowerSuite Pocket PC or with the PowerSuite software workshop**

There are no access restrictions, unless an access code has already been created.

Variable speed drives for asynchronous motors

Altivar 58

■ Macro-configuration programming

A simplified menu can be used for preprogramming the drive to facilitate configuration and set-up.
There are 3 options available, which correspond to the various functions and applications:
- handling,
- general use,
- variable torque.

Selection of one of these macro-configurations will automatically assign the functions, parameters and I/O, even for any option cards which may be used. This menu also includes a guide to the most appropriate selection in each case. Preconfiguration carried out in this way can be modified at any time if necessary.

In the "factory" configuration, the selection is set to the "Handling" macro-configuration.

The preconfigured functions for each macro-configuration are:

Type of macro-configuration	Handling	General use	Variable torque
Basic I/O			
Logic input LI1	Forward	Forward	Forward
Logic input LI2	Reverse	Reverse	Reverse
Logic input LI3	2 preset speeds	Jog operation	Reference switching
Logic input LI4	4 preset speeds	Freewheel stop	Injection braking
Analogue input AI1	Summing speed reference	Summing speed reference	Speed reference 1
Analogue input AI2	Summing speed reference	Summing speed reference	Speed reference 2
Relay R1	Drive fault	Drive fault	Drive fault
Relay R2	Downstream contactor control	Motor thermal state reached	Frequency reference reached
Analogue output A01	Motor frequency	Motor frequency	Motor frequency
Extension card I/O			
Logic input LI5	8 preset speeds	Clearing faults	Freewheel stop
Logic input LI6	Clear fault	Current limit	Ramp switching
Analogue input AI3 or	Summing speed reference	Summing speed reference	PI regulator
Encoder inputs	Speed regulation	Speed regulation	Speed regulation
Logic output LO	Current threshold reached	Downstream contactor control	High speed reached
Analogue output AO	Motor frequency	Motor frequency	Motor frequency

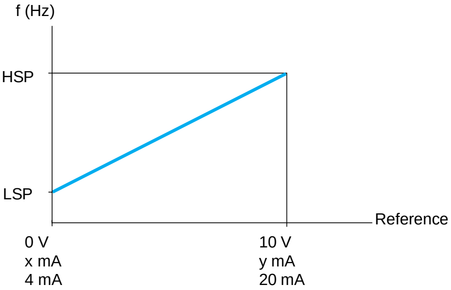
■ Operating power range

Enables use of the drive at optimum power, according to whether the application requires normal overtorque (standard torque applications, 1.2 Tn) or significant overtorque (high torque applications).
Function suitable for drives with power ratings above 7.5 kW at 208 to 240 V and 15 kW at 380 to 500 V, where this type of optimisation offers significant cost reductions.

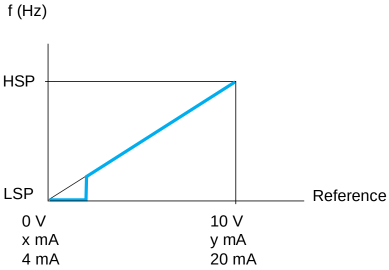
■ Operating speed range

Used to determine the 2 frequency limits which define the speed range permitted by the machine under actual operating conditions.
For all applications with or without overspeed.
Three operating modes are possible:

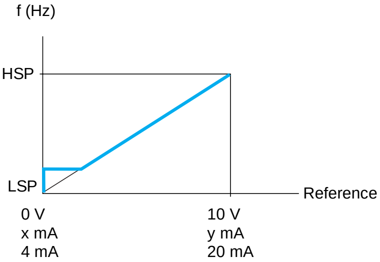
- Normal mode



- Pedestal mode



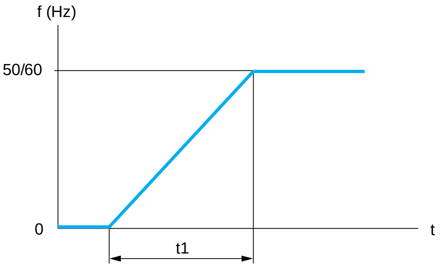
- Deadband mode



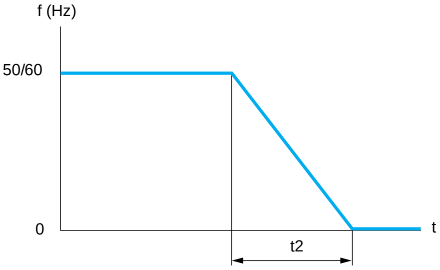
LSP: low speed, from 0 to HSP, factory setting 0
HSP: high speed, from LSP to f max., factory setting 50/60 Hz
x: configurable between 0 and 20 mA, factory setting 4 mA
y: configurable between 0 and 20 mA, factory setting 20 mA

■ Acceleration and deceleration ramp times

Used to define acceleration and deceleration ramp times according to the application and the machine dynamics.
For all applications.



Linear acceleration ramp



Linear deceleration ramp

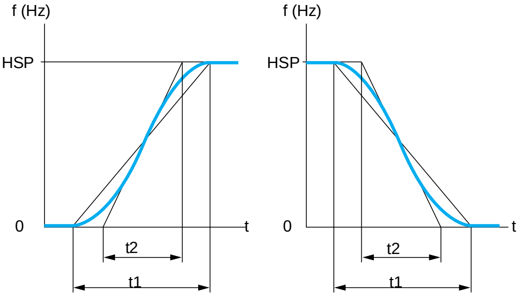
Setting for t1 and t2 between 0.05 and 999.9 s, factory setting 3 s.

■ Acceleration and deceleration ramp profile

Used to gradually increase the output frequency starting from a speed reference, following a linear ratio or a preset ratio which enables the ramp to be given an S or a U profile.
- for applications such as materials handling, packaging, transportation of people: the use of S ramps takes up mechanical play and eliminates jolts, and limits “non-following” of speed during rapid transient operation of high inertia machines,
- for pumping applications (installation with centrifugal pump and non-return valve) valve closing can be controlled more accurately if U ramps are used.

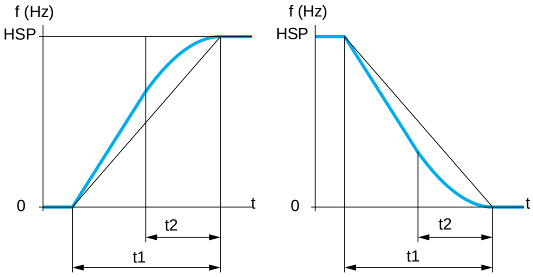
Selecting “linear” or “S”, or “U” profiles will affect both the deceleration and acceleration ramps.

- S-shape ramps



HSP: high speed
The curve coefficient is fixed, with t2 = 0.6 x t1.
where t1 = set ramp time

- U-shape ramps



HSP: high speed
The curve coefficient is fixed, with t2 = 0.5 x t1.
where t1 = set ramp time

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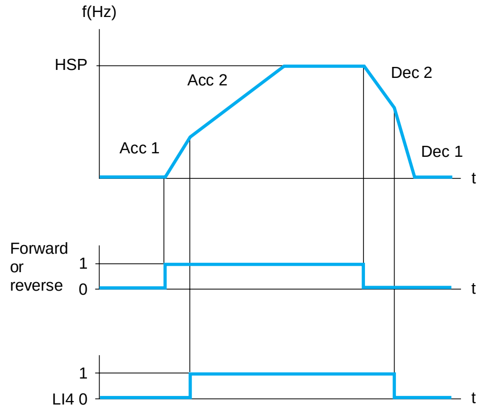


Acceleration 1 (Acc 1) and deceleration 1 (Dec 1):
- adjustment 0.05 to 999.9 s
- factory setting 3 s

Acceleration 2 (Acc 2) and deceleration 2 (Dec 2):
- adjustment 0.05 to 999.9 s
- factory setting 5 s

HSP: high speed

Acceleration and deceleration
Example of switching using logic input LI4

■ Alternate ramp switching

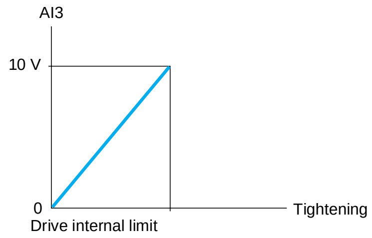
Used to switch 2 acceleration or deceleration ramp times, which can be adjusted separately.
The function is enabled by reassigning 1 logic input or by defining 1 frequency threshold.
Function suitable for:
- materials handling with smooth starting and approach,
- machines with fast steady state speed correction,
- high speed lathes with limitation of acceleration and deceleration times above certain speeds.

■ Automatic adaptation of deceleration ramp

Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function avoids the drive locking in the event of an **excessive braking** fault.
Function suitable for all applications not requiring precise stopping and not using braking resistors.
Adjustment: yes or no.
The factory setting depends on the macro-configuration.
Automatic adaptation must be cancelled if the machine has position control with stopping on a ramp and a braking resistor installed. This function is automatically disabled if the brake sequence is configured.

■ Reduction of torque limit by logic input

Used to reduce the maximum motor torque, via a logic input LI to be assigned to this function.
Adjustment: 0 to 200 % of the nominal motor torque for high torque applications.
Function suitable for machines at risk of frequent jamming: transporters, grinders, extruders. Cutting to length with stopping and maintaining motor torque over a mechanical travel limit. Use with motor with lower power rating than the drive rating (switching motors).



Torque limiting by analogue input

■ Reduction of torque limit by analogue input

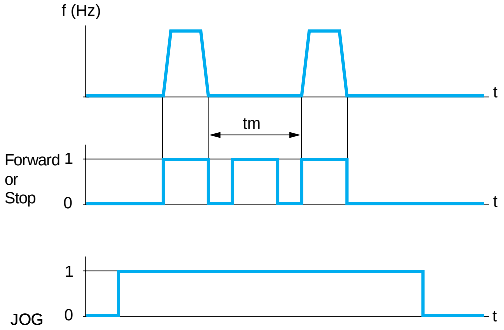
Used to reduce the maximum motor torque via analogue input AI2 or AI3 to be assigned to this function.
The I/O extension card with analogue input must be used.
Function suitable for correction of torque or traction.

■ Reverse operation

Used to reverse the direction of operation via logic input LI2, which is assigned to this function in the factory set-up.
This function can be suppressed in non-reversing motor applications by reassigning input LI2 to a different function.
This function is suitable for all non-reversing and reversing applications.

■ Disabling reverse direction

Used to:
☐ inhibit operation in the opposite direction to that controlled by the logic inputs, even if this reversal is required by a summing or feedback control function,
☐ inhibit reverse operation if it is requested using the REV key on the terminal.
To be used if the direction of operation should not be reversed
(example: fan).



Speed reference:
- adjustment 0 to 10 Hz
- factory setting 10 Hz

Minimum time tm between 2 pulses
- adjustment 0 to 2 s
- factory setting 0.5 s

Jog function

■ Step by step (JOG)

Used for pulse operation at minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
Enabled by means of an adjustable logic input LI, assigned to this function, and pulses given by the operating direction command.
This function is suitable for machines with product insertion in manual mode
(example: gradual movement of the mechanism during maintenance operations).

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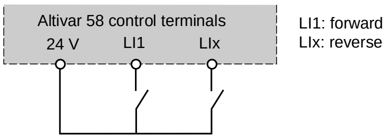
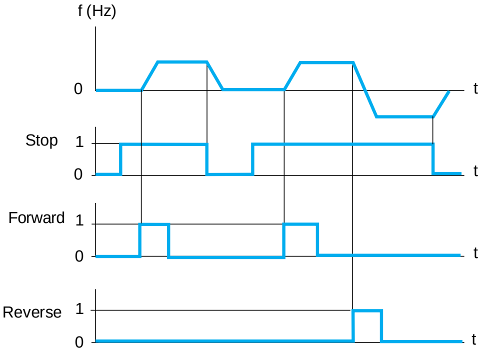
■ 2-wire control

Used to control the direction of operation by means of a maintained contact.
Enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:

- ☐ detection of the state of the logic inputs,
- ☐ detection of a change in state of the logic inputs,
- ☐ detection of the state of the logic inputs with forward operation always having priority over reverse.



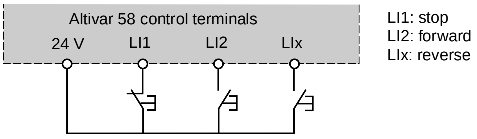
Wiring diagram for 2-wire control



3-wire control

■ 3-wire control

Used to control the operating direction and stopping by means of pulsed contacts.
Enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.

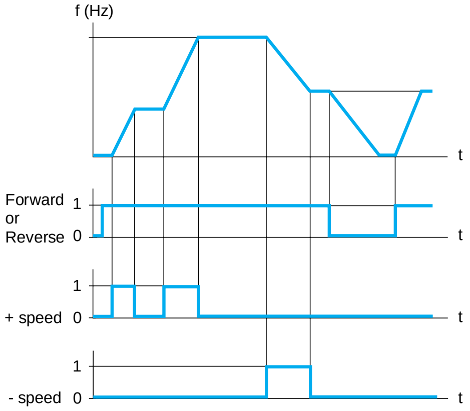


Wiring diagram for 3-wire control

■ +/- speed

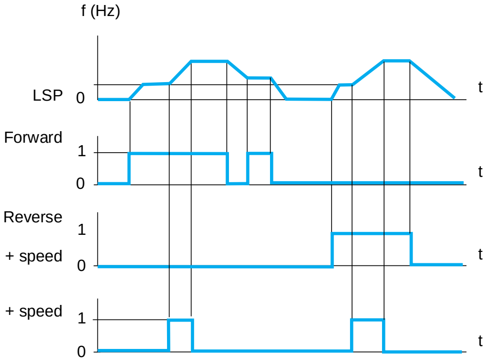
Used to increase or decrease a speed reference by means of 1 or 2 logic commands, with or without the last reference being saved (motorised potentiometer function). The maximum speed is given by the reference applied to the analogue inputs. For example, connect AI1 to the +10V. Enabled by assigning 1 or 2 logic inputs.
This function is suitable for centralised control of a machine with several sections operating in one direction or for control by a pendant control station of a handling crane in two operating directions.

☐ With saving of the last reference and 2 logic inputs



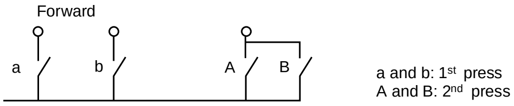
Example of "+/- speed" with 2 logic inputs

☐ Without saving of the last reference and a single logic input ("+ speed")



LSP: low speed

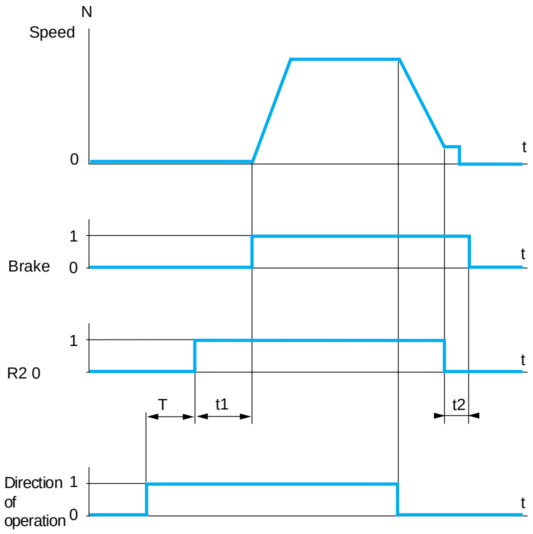
Example with double action buttons



***Note:** this type of "+/- speed" control is incompatible with 3-wire control.*

■ Save reference

This function is associated with “+/- speed” control. Select yes or no.
Enables the new speed reference to be applied if the run command or line supply is lost. The save is applied the next time a run command is received.



t1: adjustable time delay on brake release time.
t2: adjustable time delay depending on the brake engage time.
T: non-adjustable time delay.

Brake sequence operation

■ **Brake sequence**

Used to manage control of a safety brakes in synchronisation with the starting and stopping of the motor to avoid jolts and load veering.
Brake control sequence managed by the drive.
Values that can be adjusted for brake release: frequency and current threshold, time delay.
Values that can be adjusted for brake engage: frequency, time delay.
Validation: R2 relay logic output must be assigned to brake control.
Function suitable for materials handling applications with movements equipped with safety brakes (hoisting) and machines requiring a parking brake (unbalanced machines).

Note:
to ensure the safety of the machine and personnel, it is advisable to use the speed feedback function with the addition of an option card, or an external safety device. Make sure that the braking resistor is sized for the maximum load conditions of the machine. Make sure that the drive/motor connections cannot be interrupted by accident.

■ **Motor switching**

Allows two motors with different powers to be supplied successively by the same drive. Switching must take place with the drive stopped and locked, using an appropriate sequence at the drive output.
The function can be used to adapt the motor parameters. The following parameters are switched automatically:
☐ nominal motor current,
☐ injection current,
☐ brake release current threshold.
Motor thermal protection is disabled by this function.
Enabled by assigning logic input LI to this function.
The associated parameter is the coefficient giving the relationship between the power of the smallest motor and the power of the drive: 0.2 to 1.
With hoisting applications, this function enables a single drive to be used for vertical and horizontal movements.

■ **Downstream contactor control**

Allows the drive to control a contactor located between the drive and the motor.
The request to close the contactor is made when a run command appears.
The request to open the contactor is made when there is neither a run command nor a current present in the motor (freewheel stop, drive locked or braking terminated).
Enabled by means of logic output LO or relay R2.

☐ This function avoids the need for frequency switching on the power circuit upstream of the drive (otherwise premature aging of the filtering capacitors will occur) and requires a specific connection diagram (see page 2/166).
☐ **This function must be used for cycles < 60 s with motor isolation on stopping.**
Otherwise, the excessive frequency of operation of the line contactor may destroy the load resistor in the drive.
☐ On machines where operation requires power to the motor to be removed when there is a stop, this function prevents any possibility of an untimely restart (example: materials handling carousel where items are put down and picked up manually).

This function can also be used to implement backup operation by direct supply of the motor via the mains supply (for machines requiring an emergency release function). The output can then be used both to control a downstream contactor and to authorise emergency operation (“bypass” function).

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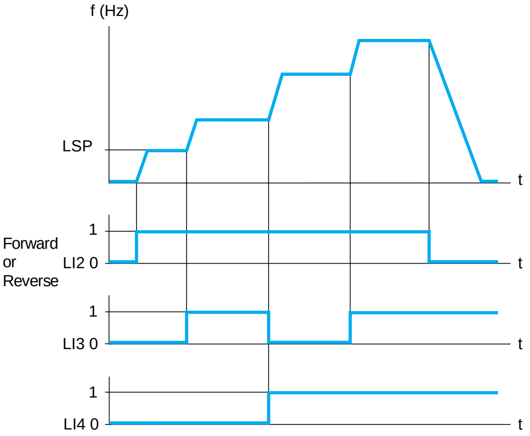
■ Preset speeds

Used to switch preset speed references.
2, 4, or 8 preset speeds can be selected.
Enabled by means of 1, 2 or 3 logic inputs.
The preset speeds can be adjusted in increments of 0.1 Hz to 0 Hz up to the maximum speed.
Function suitable for materials handling and machines with several operating speeds.



The speed obtained with inputs LI3 and LI4 at state 0 is LSP or the speed reference, depending on the level of analogue inputs AI1 and AI2.

Factory settings:

1st speed: LSP (low speed or reference)

2th speed: 5Hz

3th speed: 10 Hz

4th speed: HSP (high speed)

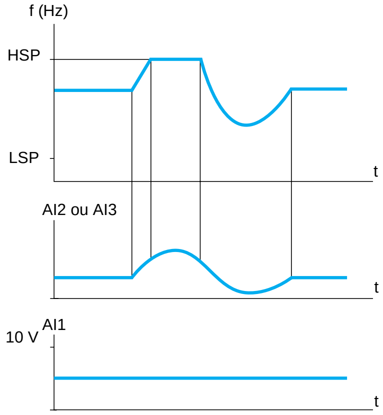
Example of operation with 4 preset speeds.

■ Setting analogue input AI2

It is possible to modify the specification of analogue current input AI2.
Factory setting: 4-20 mA.
Other values: 0-20 mA, 20-4 mA or X-Y mA by programming X and Y with a precision of 0.1 mA.

■ Summing inputs

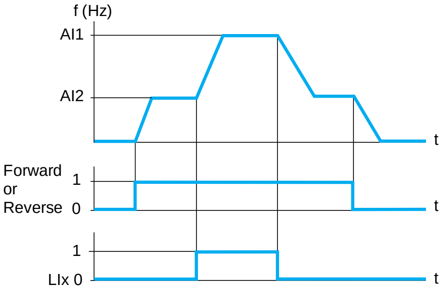
Analogue input AI2 (and/or analogue input AI3 with extension card) can be assigned as a summing input with AI1 corresponding to speed HSP.
This function is suitable for machines on which the speed is controlled by a process controller signal on input AI2.



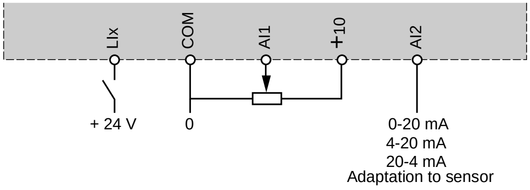
References summed

■ Reference switching

Allows 2 analogue references to be switched by means of a logic command. This function avoids having to switch low level signals and makes the 2 reference inputs AI1 and AI2 independent.
Enabled by means of 1 reassignable logic input LI.
This function is suitable for all machines with automatic/manual operation.
Automatic control via a sensor on input AI2, enabled by setting the logic input to 0.
Manual control by means of potentiometer on input AI1 (local control).



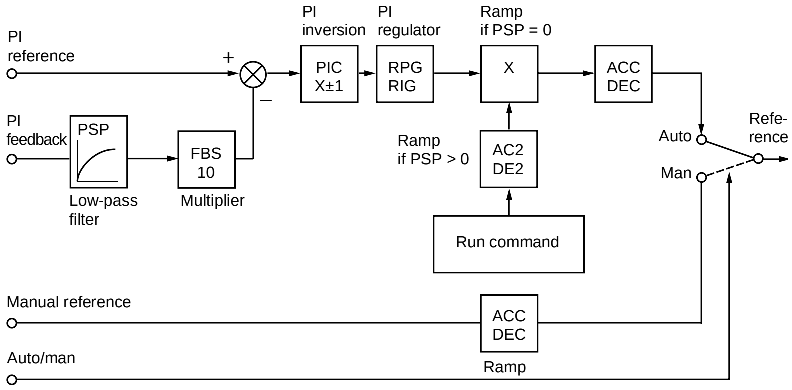
Example of reference switching



Connection diagram for reference switching

■ PI regulator

Used for simple control of a flow rate or a pressure with a sensor which supplies a feedback signal adapted to the drive.
This function is suitable for pumping and ventilation applications.



ACC: acceleration
AC2: acceleration 2
DEC: deceleration
DE2: deceleration 2
FBS: PI feedback multiplication coefficient
PIC: reversal of the direction of correction of the PI regulator
PSP: used to adjust the filter time constant on the PI feedback
RIG: PI regulator integral gain
RPG: proportional gain of the PI regulator

☐ **PI reference:**
- line reference (serial link),
- or 2 or 4 preset references by logic inputs,
- or analogue input AI1 (± AI2, ± AI3).

☐ **PI feedback:**
- analogue input AI2 or AI3.

☐ **Manual reference** (speed regulation operation)
- analogue input AI3.

☐ **Auto/man:**
- logic input LI for switching operation to speed regulation (man) or PI regulation (auto).

During automatic operation, it is possible to adapt the process feedback, to correct inverse PI, to adjust the proportional and integral gain and Ki, to allocate an analogue output for the PI reference, feedback and error, to apply a ramp (time = AC2 - DE2) to establish the PI action on starting and stopping.
The motor speed is limited to between LSP and HSP.

Preset PI references:
2 or 4 preset references require the use of 1 or 2 logic inputs respectively.

2 preset references **Assign: LIx to Pr2**		**4 preset references** **Assign: LIx to Pr2, LIy to Pr4**		
LIx	**Reference**	**LIy**	**LIx**	**Reference**
0	Analogue reference	0	0	Analogue reference
1	Process max (= 10 V)	0	1	PI2 (adjustable)
		1	0	PI3 (adjustable)
		1	1	Process max (= 10 V)

Note:
the PI function is incompatible with the "preset speeds" and "step-by-step" (JOG) functions,
the PI reference can also be transmitted on line via the RS 485 serial link or via one of the communication cards.

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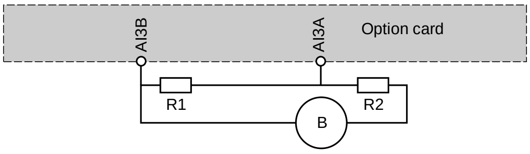


Connection diagram for speed feedback via tachogenerator

■ Speed feedback with tachogenerator

Used for precise speed control, irrespective of the state of the motor load.

Assigned to logic input AI3, with extension card/analogue input

The maximum tachogenerator voltage must be between 5 and 9 V. If necessary, use an external divider bridge to set this value *(1)*.

An accurate setting for adjusting this value can be found in the “adjust” menu. The coherence between motor frequency and speed feedback is monitored in the drive’s fault menu.

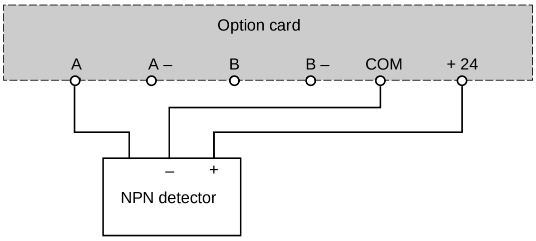
This function is suitable for all applications requiring exact speed irrespective of the load.

(1) Example: motor 1500 rpm at 50 Hz, tachogenerator 0.06 V/rpm, max. speed set to 75 Hz (speed 2250 rpm)
maximum voltage 0.06 x 2250 = 135 V
recommended tachogenerator current 10 mA, therefore R1 + R2 = 135/10 = 13.5 kΩ
average voltage on the input = 7 V, therefore R1 = 7/10 = 0.7 kΩ or 680 Ω, nearest standard value. R2 = 13.5 - R1, or 12 kΩ, nearest standard value
exact voltage on AI3 = 135 x R1/(R1 + R2) = 135 x 0.68/12.68 = 7.24 V
Use appropriate power resistors (min. 2 W).
The speed feedback should be scaled exactly by programming (when the device is set up).

■ Incremental speed feedback

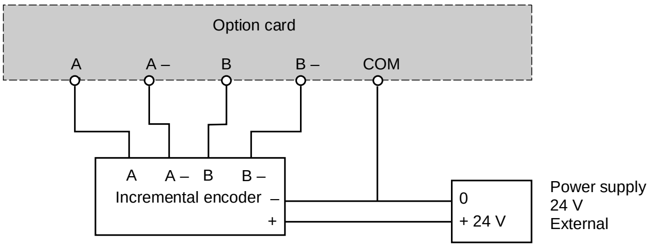
Used for precise speed control, irrespective of the state of the motor load.
Assigned to logic inputs A, A-, B, B- on the extension card/encoder inputs.
NPN type open collector output, nominal voltage 24 V ⎓
Max. reading frequency 33 kHz at max. speed HSP
For use in 1 operating direction with an inductive sensor or photoelectric detector: simple regulation (less accurate at low speed).

☐ Use in 1 operating direction



Connection diagram with inductive sensor or photoelectric detector: simple regulation (less accurate at low speed)

☐ Use in 1 or 2 operating directions



Connection diagram with incremental encoder for accurate regulation at low speed

Consistency between the motor frequency and the speed feedback is monitored in the drive fault management system.

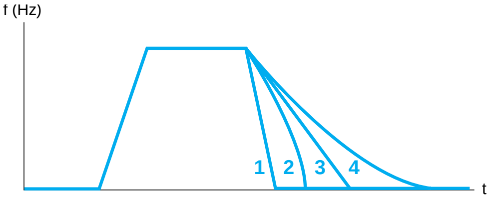
This function is suitable for applications requiring accurate speed control irrespective of the load and a high level of immunity to interference.

■ Incremental speed reference

Enables validation by assigning the logic inputs on the above extension card/encoder inputs to the “summing inputs” function.
Synchronization of the speed of a number of drives.
Nominal voltage 24 V ⎓
Max. reading frequency 33 kHz at max. speed HSP

■ Controlled stop

Used to define stop modes in addition to the standard drive stops. These stop requests always have priority.



1 Fast stop
2 d.c. injection stop
3 Normal stop on deceleration ramp
4 “Freewheel” stop

Examples of controlled stops

Choice of three stopping methods:
☐ freewheel stop: the drive locks and the motor stops in accordance with the inertia and the resistive torque,
☐ fast stop: the motor brakes to a stop with the deceleration ramp time divided by a coefficient which can be set between 1 and 10,
☐ d.c. injection braking: adjustment of the time (0 to 30 s, factory setting 0.5 s) and current (10% to 136 % of the nominal drive current in high torque applications, factory setting 70%). Continuous braking is possible but is limited automatically to another adjustable value (10% to 100% of the nominal motor current, factory setting 50%) after 30 s.

Enable modes:
☐ by means of 1 reassignable logic input LI: active at 0 for freewheel stop and fast stop, active at 1 for injection stop,
☐ automatic when stopping (frequency less than 0.1 Hz) for injection braking, as this function can be combined with the others. In this case, only the current after 30 s of injection can be adjusted.
Applications:
- “freewheel” stop for applications with locking using electrical safety devices,
- fast stop for materials handling applications with emergency stop electrical braking,
- d.c. injection braking for fans, for which this stopping mode does not generally require the addition of a braking resistor.

■ **Controlled stop on mains power break**
Used to control motor stopping on a mains power break, following a ramp which is self-adapting according to the restored kinetic energy.
Function suitable for materials handling, machines with high inertia, continuous product processing machines.
Factory setting: inactive

■ **Automatic catching a spinning load with speed detection** ("catch on the fly")
Used to restart the motor smoothly after one of the following events:

- ☐ mains power break or simple switch off,
- ☐ fault reset or automatic restart,
- ☐ freewheel stop or injection stop with logic input,
- ☐ uncontrolled loss of power downstream of the drive.

On restarting, the effective speed of the motor is detected in order to restart on the ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
Factory setting: active
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines for which the loss of motor speed is negligible during the supply loss time (machines with high inertia), fans and pumps driven by a residual flux, etc.

■ **Automatic restart**
Enables the drive to be restarted automatically after locking following a fault if this fault has disappeared and if the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts at 30 s intervals.
If the drive has not restarted after 6 attempts, it will lock and the procedure is abandoned until it has been switched off and on again.
Factory setting: inactive.

The faults permitting this restart are:

- ☐ excessive braking,
- ☐ mains overvoltage,
- ☐ motor thermal overload,
- ☐ drive thermal overload,
- ☐ loss of 4-20 mA reference,
- ☐ d.c. bus overvoltage,
- ☐ external fault,
- ☐ motor phase loss,
- ☐ serial link fault,
- ☐ mains voltage too low. For this fault, the function is always active, even if it is not configured.

For this type of fault, the drive fault relay remains activated if the function is configured. The speed reference and the direction of operation must be maintained for this function.
This function is suitable for machines or installations operating continuously or without supervision, which, when restarted, pose no danger to either equipment or personnel (pumps, fans, etc).

■ **Maintaining the speed following loss of the 4-20 mA reference**
Enables the motor speed to be maintained following loss of the 4-20 mA reference.
This function is suitable for applications which must not be interrupted.

■ **Limiting low speed operating time** (LSP)
The motor is stopped automatically after an operating period at low speed (LSP) with zero reference and run command present.
This time can be set between 0.1 and 999.9 s or no limit. Factory setting 5 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is broken and then re-established.
This function is suitable for automatic stopping/starting on pressure-regulated pumps.

Fault reset

Enables faults to be reset by means of a logic input LI which can be reassigned to this function.
The restart conditions after a reset to zero are the same as those of a normal power-up.
Fault reset: overvoltage, overspeed, external fault, drive overheating, loss of motor phase, d.c. bus overvoltage, loss of 4-20 mA reference, load veering, motor overload if the thermal state is less than 100 %, serial link fault.
"Mains undervoltage" and "mains phase loss" faults are reset automatically when the mains supply is restored.
Function suitable for applications where the drives are difficult to access, for example on moving parts in materials handling systems.

General reset (inhibits all faults)

This function can be used to inhibit all faults, including thermal protection (forced operation) except short-circuit faults, to ensure operation unless irreparable damage has been caused in extreme operating conditions.
Function suitable for applications where a restart can be vital (conveyor in a furnace, smoke extraction station, machine with hardening products which need to be removed).

Forced local mode

Forced local mode switches the drive from serial link control to terminal control. A logic input LI can be reassigned to this function.

External fault

When the input assigned to this function changes to 1, the motor stops in accordance with the parameter configuration and the drive locks in an "EPF external fault" fault.

Fault relay, unlocking

The fault relay is energised when the drive is powered up and is not faulty.
It contains a “C/O” common point contact.
The drive can be unlocked after a fault in one of the following ways:

- by powering down until the “ON” LED extinguishes then switching the power back on,
- by assigning a logic input to the "reset faults” function,
- by the “automatic restart” function, if it has been configured.

Motor thermal protection

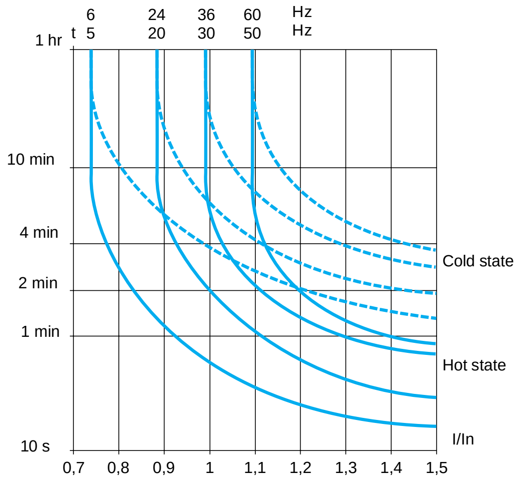
Indirect motor thermal protection is implemented via continuous calculation of its theoretical temperature rise.
The drive is locked on a fault if this temperature rise exceeds 118% of the nominal temperature rise.

- This function is suitable for applications with self-cooled or force-cooled motors.

The microprocessor calculates the theoretical temperature rise of the motor based on various elements:

- the operating frequency,
- the current taken by the motor,
- the operating time,
- the maximum ambient temperature around the motor (40 °C).

Adjustment:
0.25 to 1.36 times the nominal current of the drive in high torque applications, factory setting 0.9 times the nominal current indicated on the motor rating plate.



Thermal protection characteristics (warm and cold)

- Special applications

Adaptation of thermal protection in the fault configuration menu:

- applications with force-cooled motor: in this case, the tripping curves are those shown opposite for the nominal frequency 50/60 Hz,
- suppression of thermal protection in harsh environments: temperature greater than 40°C around the motor, which may cause the cooling fins to become clogged (provide direct thermal protection via thermistor probes integrated into the motor),
- motor thermal protection using PTC probes: see "PTC probe protection" function with option card,
- if several motors are connected in parallel on the same drive, fit each motor starter with a thermal relay to reduce the risk of the load being distributed unevenly.

***Note:** when the drive is switched off, calculation I2t is saved and the amount by which it has decreased is calculated.*

Variable speed drives for asynchronous motors

Altivar 58

■ **PTC probe protection**
Used for motor thermal protection (if the motor is fitted with PTC probes).
Assigned to logic input AI3, with extension card/analogue input
Maximum resistance of probe circuit at 20 °C: 750 Ω (3 x 250 Ω probes connected in series)
Probe break and short-circuit faults are monitored.

■ **Thermal protection of drive**
Enables the drive to be protected directly via a thermistor fitted on the heatsink, ensuring that components are protected in the event of poor ventilation or excessive ambient temperatures.
Locks the drive in the event of a fault.

■ **Switching frequency, noise reduction**
High frequency switching of the intermediate d.c. voltage can be used to supply the motor with a current wave with low harmonic distortion.
The switching frequency can be adjusted to reduce the noise generated by the motor.
In addition, the switching frequency is random in order to avoid resonance. This function can be disabled if it causes instability.
This function is suitable for all applications which require low motor noise.

☐ Without derating, for continuous or intermittent duty (0.5 and 1 kHz frequencies should be used for long cable lengths).

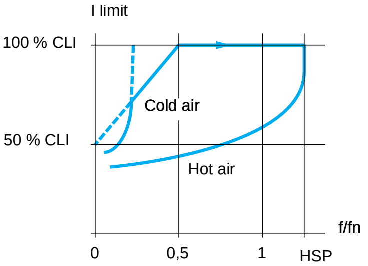
Drives	Configurable switching frequencies kHz
ATV-58●U09M2 to ●D12M2 ATV-58HD16M2X and HD23M2X ATV-58●U18N4 to ●D46N4 ATV-58HD28N4X to HD46N4X	0.5-1-2-4
ATV-58HD28M2X to HD46M2X ATV-58●D54N4 to ●D79N4 ATV-58HD54N4X to HD79N4X	0.5-1-2

☐ Without derating, with intermittent operating cycle or with derating by one rating in continuous duty *(1)*.

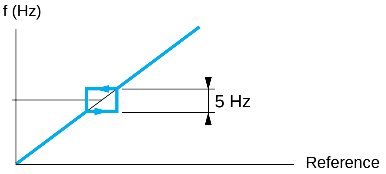
Drives	Configurable switching frequencies kHz
ATV-58●U09M2 to ●D12M2 ATV-58●U18N4 to ●D23N4	8-12-16
ATV-58HD16M2X and HD23M2X ATV-58●D28N4 to ●D46N4 ATV-58HD28N4X to HD46N4X	8-12
ATV-58HD28M2X to HD46M2X ATV-58●D54N4 to ●D79N4 ATV-58HD54N4X to HD79N4X	4-8

(1) In intermittent duty, automatic frequency reduction in the case of overheating.

■ **Energy saving**
Enables the power consumption to be adapted according to the load, improving efficiency.
Function suitable for variable or reduced torque applications.



Adaptation of the current limit



Motor speed change depending on the reference with a skip frequency

■ **Adaptation of the current limit**

The current limit can be adapted automatically according to the speed in order to avoid a motor overload fault.
This function is suitable for ventilation applications in which the load curve changes according to the air density.

■ **Auto-tuning**

Auto-tuning can only be performed by user intervention via the dialogue tools and by an assignable logic input. It is used to optimise performance.
This function is suitable for use in all applications.

■ **Skip frequencies**

Skip frequencies can be used to suppress up to three critical speeds which may be the cause of mechanical resonance.
It is possible to prohibit the prolonged operation of the motor within a frequency band of 5 Hz over 1 to 3 frequency bands adjustable over the speed range.
Function suitable for lightweight machines, bulk product conveyors with unbalanced motor, fans and centrifugal pumps.

■ **Reassignable logic outputs**

Relay R2 (or LO solid state output with I/O extension card):

☐ Remote signalling of the following information as required:
- drive operating (running or braking),
- frequency threshold reached (higher than or equal to an adjustable threshold),
- 2nd frequency threshold reached,
- frequency reference reached (motor frequency equal to the reference),
- current threshold reached (higher than or equal to an adjustable threshold),
- motor thermal threshold reached (higher than or equal to an adjustable threshold),
- drive thermal threshold reached (higher than or equal to an adjustable threshold),
- high speed reached,
- loss of 4-20 mA reference.

☐ Remote control of a downstream contactor.
☐ Brake sequence (R2 relay only).

■ **Analogue outputs AO1 (or AO with I/O extension card)**

Analogue outputs AO1 and AO (x-y mA) can be assigned to the following parameters:

- motor current (y mA = twice the nominal current of the drive),
- motor frequency (y mA = maximum frequency),
- ramp output (y mA = maximum frequency),
- motor torque (y mA = twice the nominal motor torque),
- signed motor torque (x mA = - twice the nominal motor torque, ie. braking operation,
- signed ramp (x mA = maximum reversing frequency, y mA = maximum forward frequency),
- PI reference (x mA = minimum reference, y mA = maximum reference),
- PI feedback (x mA = minimum feedback, y mA = maximum feedback),
- PI error (x mA = maximum error < 0, y mA = minimum error >0),
- PI integral (y mA = integral saturated),
- motor power (x mA = 0% of the nominal motor power , y mA = 200% of the nominal motor power),
- motor thermal state calculated: (x mA = 0%, y mA = 200%),
- drive thermal state: (x mA = 0%, y mA = 200%).

Note: *x and y can be set between 0 and 20 mA*

■ **Adjustment of analogue outputs AO1 (or AO with I/O extension card)**

Used to modify the characteristics of analogue current outputs AO1 and AO.
Factory setting: 0 -20 mA
Other values: 4-20 mA, 20-4 mA or x-y mA by programming x and y with a definition of 0.1 mA.
This function is suitable for use in applications with a signal other than 0-20 mA.

Variable speed drives for asynchronous motors
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Compatibility table for configurable I/O functions

■ **Configurable I/O**

Functions which are not listed in this table are fully compatible.

- ☐ Stop functions have priority over run commands.
- ☐ Speed references via logic command have priority over analogue references.

The choice of functions is limited:

- by the number of drive I/O which can be reassigned: if necessary, add an I/O extension card,
- by the incompatibility of certain functions with one another.

Functions	d.c. injection braking	Summing inputs	PI regulator	+/- speed	Reference switching	Free-wheel stop	Fast stop	Run Jog operation	Preset speeds	Speed regulation with tacho-generator or encoder	Torque limitation by AI3	Torque limitation by LI
d.c. injection braking	▨					↑	↑					
Summing inputs		▨			⊖							
PI regulator			▨					⊖	⊖	⊖		
+/- speed				▨	⊖			↑	⊖			
Reference switching		⊖		⊖	▨				⊖			
Freewheel stop	←					▨	←					
Fast stop	←					↑	▨					
Jog operation			⊖	←				▨	←			
Preset speeds			⊖	⊖	⊖			↑	▨			
Speed regulation with tachogenerator or encoder			⊖							▨		
Torque limitation by AI3											▨	⊖
Torque limiting via LI											⊖	▨

⊖ Incompatible functions
🟦 Compatible functions
▨ Not applicable

Priority functions (functions which cannot be active at the same time)

← ↑ The arrow indicates which function has priority.

Example: the "fast stop" function has priority over the "d.c. injection braking" function.

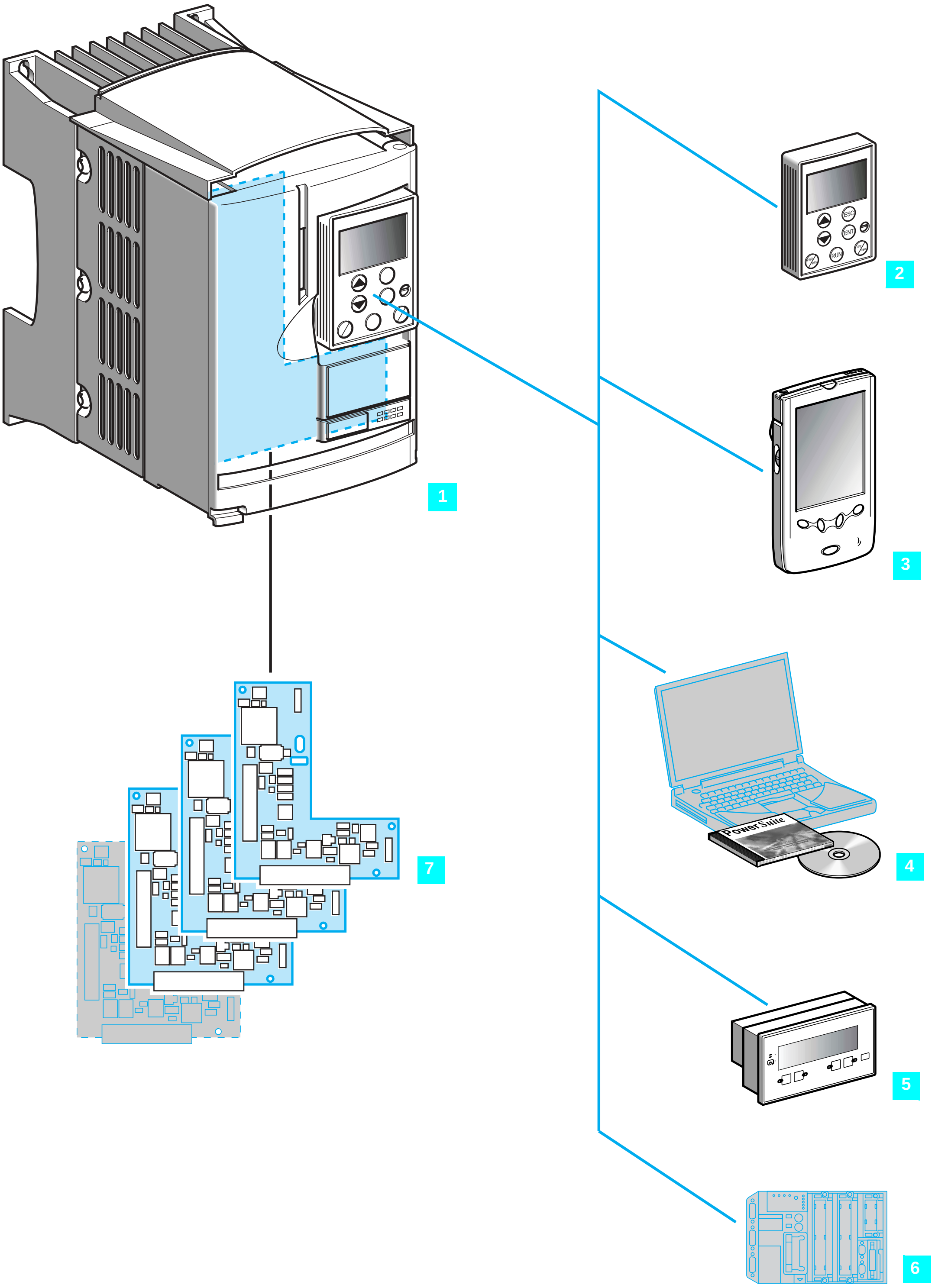
Summary table of the configurable I/O assignments

	Drive I/O								
	Without option card				With I/O extension cards				
	Relay R2	Analogue input AI2	Analogue output AO1	3 logic inputs LI2-LI3-LI4	2 logic inputs LI5-LI6	Analogue input AI3	Logic output LO	Analogue output AO	Encoder inputs A-, A+, B-, B+
Functions									
Auto-tuning				■	■				
Reverse operation				■	■				
Alternate ramp switching				■	■				
Step by step (JOG)				■	■				
+/- speed				■	■				
Preset speeds				■	■				
Reference switching				■	■				
External fault				■	■				
Freewheel stop				■	■				
d.c. injection stop				■	■				
Fast stop				■	■				
Motor switching				■	■				
Forced local mode				■	■				
PI auto/man				■	■				
Fault reset				■	■				
General reset (inhibits all faults)				■	■				
Summing reference		■				■			■
PI regulator		■		■	■	■			
2^{nd} speed reference		■							
Speed feedback						■			■
PTC probes						■			
Torque limit reduction		■		■	■	■			
Downstream contactor control	■						■		
Frequency threshold reached	■						■		
High speed reached	■						■		
Frequency reference reached	■						■		
Current threshold reached	■						■		
Motor thermal threshold reached	■						■		
Drive thermal threshold reached	■						■		
Drive running	■						■		
Loss of 4-20 mA reference	■						■		
Brake sequence	■								
Motor current			■					■	
Motor frequency			■					■	
Ramp output (signed)			■					■	
Motor torque			■					■	
PI function outputs			■					■	
Motor power			■					■	
Motor thermal state			■					■	
Drive thermal state			■					■	

■ Possible assignments

Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor



Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

Applications

Frequency converter for 3-phase squirrel cage asynchronous motors, the Altivar 58F flux vector control (FVC) with sensor complements the standard Altivar 58 range without sensor. It comprises functions which respond to applications requiring torque and accuracy at very low speed and increased dynamics, such as:
- horizontal and vertical materials handling,
- modular machines.

Functions

The main functions are as follows:
- starting, closed loop speed control, dynamic braking and braking to a standstill,
- possible open loop operation,
- possibility of holding motor torque at a standstill,
- energy saving, PID control,
- brake logic,
- +/- speed, S ramps, U ramps, preset speeds, jog operation (JOG),
- automatic catching a spinning load with speed search (catch on the fly),
- automatic limiting of low speed operating time, motor and drive protection, etc.

Manufacturing variations

The Altivar 58F is presented in the form of a drive (item 1) with heatsink for normal environments and ventilated enclosures. The offer is also available with the drive mounted on a baseplate for ratings 0.75 to 15 kW.

Fast programming using macro-configurations

The Altivar 58F offers simple, fast programming using macro-configurations which correspond to various applications: materials handling, general use.
Each of these configurations is fully adjustable.

Dialogue functions

The Altivar 58F has an RS 485 multidrop serial link with simplified Modbus protocol as part of the standard product. This serial link is used to connect PLCs (item 6), a PC or one of the available dialogue tools. There are 3 advanced dialogue solutions, with plain text display in 5 languages (English, French, German, Spanish, Italian) and storage of configurations:

- **Operator terminal**, on the drive or enclosure door (item 2)
- **PowerSuite Pocket PC** (item 3):
the Pocket PC is a tool which can be used during preparation, programming, setup and maintenance. **The kit comprises a Pocket PC** and connection accessories.
- **PowerSuite software workshop** for PC (item 4):
the PowerSuite software workshop is used to set up an Altivar drive from a PC in a Microsoft Windows 95, 98, NT4 or 2000 environment.
- **Magelis display unit with matrix screen** (item 5):
this display unit can be used to monitor, diagnose and adjust up to 8 Altivar 58F drives.

Customising the application

It is possible to extend the functions by adding an extension card **or** communication bus (item 7).

- **I/O extension cards**:
-I/O and speed loop with analogue input or speed reference from encoder input.
- **Communication bus**:
-Fipio, Uni-Telway/Modbus, INTERBUS-S, Modbus Plus, AS-Interface, Profibus DP, Ethernet, CANopen, DeviceNet communication bus.

Electromagnetic compatibility

- **Integrated EMC filters**:
ATV-58F drives are available with integrated EMC filters. Incorporating filters into the drives simplifies installation and provides an economical means of ensuring machine conformity for CE marking purposes.
They are sized to conform to the following standards: IEC/EN 61800-3 for domestic and industrial environments.
- **Line chokes**:
ATV-58F drives with power rating ≥ 18.5 kW at 380…500 V are available with integrated line chokes which limit the line current to the motor nominal current value.
Separate line chokes are available as an option for the other power ratings.

Characteristics:
pages 2/208 to 2/213

References:
pages 2/214 and 2/215

Dimensions, schemes:
pages 2/218 to 2/221

Functions:
pages 2/224 to 2/233

Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

Environment characteristics

Conforming to standards			Altivar 58F drives have been developed to conform to National and International standards and the recommendations for electrical industrial control devices (IEC, EN, NFC, VDE), notably: ● Low Voltage EN 50178 ● EMC immunity: - IEC/EN 61000-4-2 level 3 - IEC/EN 61000-4-3 level 3 - IEC/EN 61000-4-4 level 4 - IEC/EN 61000-4-5 level 3 - IEC/EN 61800-3, environments 1 and 2 ● EMC, conducted and radiated emissions: - IEC/EN 61800-3, environments 2 (industrial sector) and 1 (public sector) with restricted distribution - EN 55011 class A (drives with radio interference filters included) - EN 55022 class B, with additional filters.
CE marking			The drives have been developed according to the European low voltage (73/23/EECand 93/68/EEC) and EMC (89/336/EEC) directives. For this reason, Altivar 58F drives are marked with the CE European Community mark.
Product certifications			UL and CSA
Degree of protection			IP 21 and IP 41 on upper part (conforming to EN 50178)
Vibration resistance			Conforming to IEC 60068-2-6: ● 1.5 mm peak from 2 to 13 Hz ● 1 gn from 13 to 200 Hz
Shock resistance			Conforming to IEC 60068-2-27: 15 gn for 11 ms
Maximum ambient pollution			Degree 2 conforming to IEC 60664-1 and EN 50178
Maximum relative humidity			93 % with no condensation or dripping water, conforming to IEC 60068-2-3
Ambient air temperature around the device	Storage	**°C**	- 25…+ 65
	Operation	**°C**	**ATV-58FHU18N4** to **HU90N4** drives**:** ● - 10…+ 50 with no derating ● Up to + 60 derating the current by 2.2 % per °C over 50 °C **ATV-58FHD12N4** to **HD23N4** drives**:** ● - 10…+ 40 with no derating ● Up to + 50 derating the current by 2.2 % per °C over 40 °C **ATV-58FHD28N4** to **HD79N4** drives**:** ● - 10…+ 40 with no derating ● Up to + 60 with fan kit derating the current by 2.2 % per °C over 40 °C
Maximum operating altitude		**m**	1000 with no derating (above this, derate the current by 1 % per additional 100 m)
Operating position			Vertical

Drive characteristics

Output frequency range	**Hz**	0…450
Configurable switching frequency	**kHz**	No derating, in continuous operation: ● 0.5-1-2-4 for **ATV-58FHU18N4** to **HD46N4** drives ● 0.5-1-2 for **ATV-58FHD54N4** to **HD79N4** drives No derating with intermittent operating cycle or with derating by one power rating in continuous operation: ● 8-12-16 for **ATV-58FHU18N4** to **HD23N4** drives ● 8-12 for **ATV-58FHD28N4** to **HD46N4** drives ● 4-8 for **ATV-58FHD54N4** to **HD79N4** drives
Speed range		1…1000 closed loop with encoder feedback 1…100 open loop or with tachogenerator speed feedback
Speed precision For a torque variation from 0.2 Tn to Tn		± 1 % of the nominal speed, without speed feedback ± 0.1 % of the nominal speed, with tachogenerator speed feedback (option card) ± 0.01 % of the nominal speed, with encoder feedback (closed loop)
Transient overtorque		200 % of the nominal motor torque (typical value at ± 10 %) for 2 s 170 % of the nominal motor torque (typical value at ± 10 %) for 60 s
Braking torque		30 % of the nominal motor torque with no braking resistor (typical value). Up to 150 % with braking resistor as option
Voltage/frequency ratio		Flux vector control with or without sensor

Electrical characteristics

Power supply	a.c. voltage	**V**	ATV-58F●●●●N4 drives: 380 - 10 % to 500 + 10 %
	Frequency	**Hz**	50 ± 5 % or 60 ± 5 %
	d.c. voltage	**V**	ATV-58F●●●●N4290 drives: 540 - 10 % to 700 + 10 %
Output voltage			Maximum voltage equal to mains voltage
Electrical isolation			Electrical isolation between power and control (inputs, outputs, supplies)
Available internal supplies			Protected against short-circuits and overloads 1 + 10 V supply - 0 + 10 % for the reference potentiometer (1…10 kΩ), maximum current 10 mA 1 + 24 V supply (min 18 V, max 30 V) for control inputs, maximum current 120 mA
AI analogue inputs			AI1A, AI1B: differential bipolar voltage analogue input: ● ± 10 V, impedance 40 kΩ in differential mode, 20 kΩ in common mode ● max permissible voltage ± 30 V ● 11 bit resolution + sign ● accuracy ± 0.5 % of maximum value ● linearity ± 0.2 % of maximum value ● sampling time 2 ms AI2: analogue current input: ● 0-20 mA input, reassignable to X-YmA by programming X and Y (0 to 20) ● max permissible current 50 mA ● resolution 0.02 mA ● precision ± 1 % of maximum value ● linearity ± 0.5 % of maximum value ● sampling time 2 ms ● impedance 100 Ω
Logic inputs LI1 to LI4			4 assignable logic inputs with impedance 3.5 kΩ, compatible with PLC level 1, standard IEC 60065A-68 Maximum length of shielded cable: 100 m Power supply + 24 V (min 11 V, max 30 V) State 0 if < 5 V, state 1 if ≥ 11 V Sampling time: 2 ms max
Other inputs			See option cards

Presentation:
pages 2/206 and 2/207

References:
pages 2/214 and 2/215

Dimensions, schemes
pages 2/218 to 2/221

Functions:
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Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

Electrical characteristics (continued)

A01 current analogue output		0-20 mA output reassignable to X-Y mA, with X and Y configuration (0 to 20), load impedance 500 Ω maximum Resolution 0.02 mA Precision ± 1 % of maximum value Linearity ± 0.5 % of maximum value Sampling time 2 ms maximum
Logic outputs		2 relay logic outputs: R1 (fault relay) and R2 (assignable) 1 C/O contact protected against overvoltages (relay R1) 1 N/O contact protected against overvoltages (relay R2) Minimum switching capacity: 10 mA for ⎓ 24 V Maximum switching capacity: ● on a resistive load (cos φ = 1): 5 A for ∼ 250 V or ⎓ 30 V ● on an inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for ∼ 250 V or ⎓ 30 V
Other outputs		See option cards
Communication		RS 485 multidrop serial link with simplified Modbus protocol as part of the standard product. Transmission speed: 19,200 bps no parity. Use: ● connecting a terminal (option) or ● connecting a microprocessor card or ● connecting a PC (option) or ● connecting one or more PLCs
Acceleration and deceleration ramps		Shape of ramps can be selected: linear or S or U or totally customizable. Factory-preset to 3 s. Possibility of 2 ranges of ramps which can be switched by frequency threshold or logic input Can be adjusted separately from 0.01 to 999.9 s (definition 0.1 s or 0.01 s) Automatic adaptation of the deceleration times if the braking capacity is exceeded (configurable option)
Braking to standstill		By d.c. injection: ● by a signal on an assignable logic input ● automatically on stopping as soon as the frequency drops below 0.1 Hz, for a time adjustable from 0 to 30 s or continuous
Main protection and safety features of the drive		Short-circuit protection: ● between output phases ● between output phases and earth ● on the outputs of internal supplies Thermal protection against excessive overheating and overcurrents Mains undervoltage and overvoltage Mains supply phase loss of phase (prevents single phase operation of 3-phase drives)
Motor protection		Thermal protection integrated in the drive by continuous calculation of I^2 t taking the speed into account: ● saving of motor thermal state when drive is powered down ● function can be modified using the terminal depending on type of motor cooling, force-cooled or self-cooled Protection against motor loss of phase Protection via PTC probes with option card
Insulation resistance to earth	**MΩ**	> 500 (electrical insulation)

Encoder feedback characteristics

Power supply		Voltage 5 V (maximum 5.5 V) Protected against short-circuits and overloads Maximum current 200 mA
Incremental logic inputs A, $\overline{A}$, B, $\overline{B}$		For incremental optical encoder with RS422 compatible differential outputs Maximum 5000 points/rev Minimum 100 points/rev Maximum frequency 200 kHz with high-speed HSP Impedance 330 Ω
Connection		Via shielded cable comprising 3 twisted pairs with a step of between 25 and 50 mm Connect the shielding to the ground at both ends

Minimum conductor cross-section for limiting line voltage drops

Maximum length of cable	Maximum encoder current draw	Minimum conductor cross-section
10 m	100 mA	0.2 mm² or AWG24
	200 mA	0.2 mm² or AWG24
50 m	100 mA	0.5 mm² or AWG20
	200 mA	0.75 mm² or AWG18
100 m	100 mA	0.75 mm² or AWG18
	200 mA	1.5 mm² or AWG16

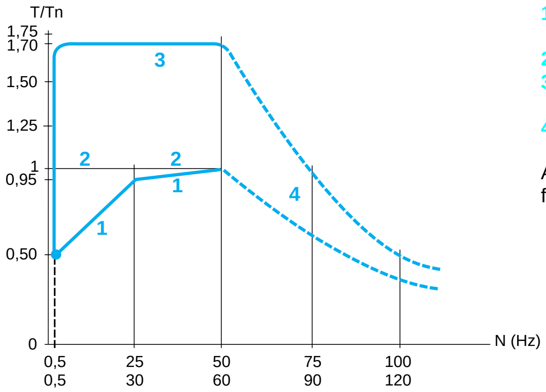
Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

Torque characteristics (typical curves)

The curves below show the permanent torque and the transient overtorque available on a self-cooled motor or force-cooled motor. The only difference lies in the ability of the motor to provide high permanent torque at less than half nominal speed.

Open loop applications



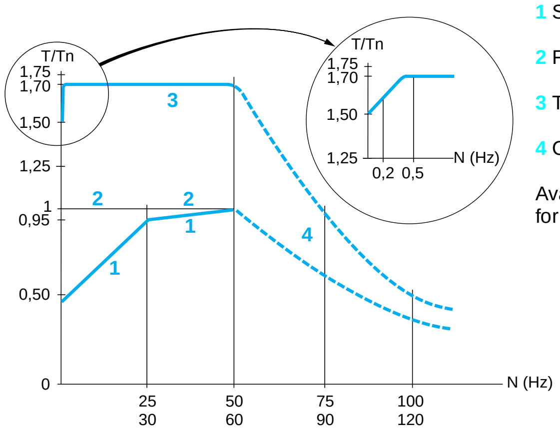
1 Self-cooled motor: permanent useful torque

2 Force-cooled motor: permanent useful torque
3 ransient overtorque for 60 s max.

4 Overspeed torque at constant power

Available overtorque: 200 % of the nominal motor torque for 2 s and 170 % for 60 s.

Closed loop applications



1 Self-cooled motor: permanent useful torque

2 Force-cooled motor: permanent useful torque

3 Transient overtorque for 60 s max.

4 Overspeed torque at constant power

Available overtorque: 200 % of the nominal motor torque for 2 s and 170 % for 60 s.

Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

Special uses

Power of the motor lower than the power of the drive

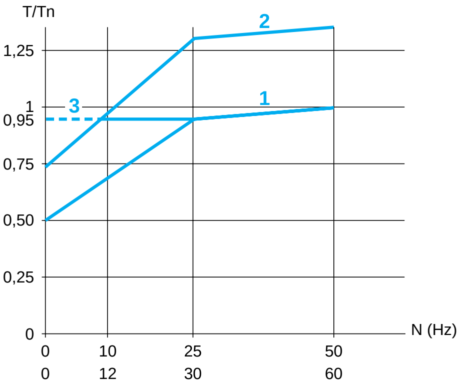
The Altivar 58F drive can supply any motor with a power level lower than that for which it is designed. This solves the problem of applications requiring intermittent high overtorque.
Examples: machine with very high starting torque.

Note: in this case we recommend oversizing the drive to one size above that of the motor. Example: connecting an 11 kW motor to a 15 kW drive.

Power of the motor higher than the power of the drive

A motor with a power level higher than that of the drive can be used as long as the current drawn by the motor is lower than or equal to the nominal current of the drive. This gives a self-cooled motor a greater speed range in continuous operation.

Note: limit the power of the motor to one size above that of the drive.



Example: connecting a 2.2 kW drive to a 3 kW motor (the 3 kW motor is to be used as a 2.2 kW motor with a speed range of 10 to 50 Hz).

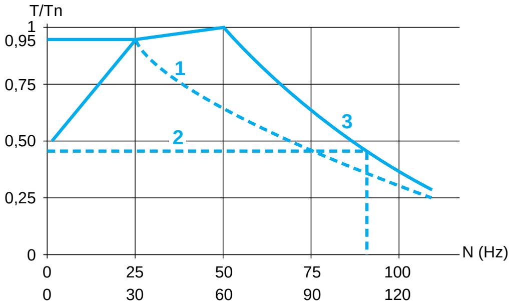
1 Continuous motor torque
Example: 2.2 kW
Motor power = drive power

2 Continuous motor torque
Example: 3 kW
Motor power > drive power

3 2.2 kW drive: nominal current

Using a motor at overspeed

The maximum output frequency of the drive can be adjusted from 40 to 450 Hz. Before using a standard asynchronous motor at overspeed, ask the manufacturer for the mechanical overspeed capabilities of the selected motor.



Above its nominal speed corresponding to a frequency of 50/60 Hz, the motor runs with decreasing flux and its torque decreases considerably (see curve opposite).
The application must allow reduced torque operation at very high speed.

1 Machine torque (decreasing torque)

2 Machine torque (low motor torque)

3 Continuous motor torque

Typical applications: woodworking machines, increasing the operational speed range of lightly loaded motors.

Variable speed drives for asynchronous motors

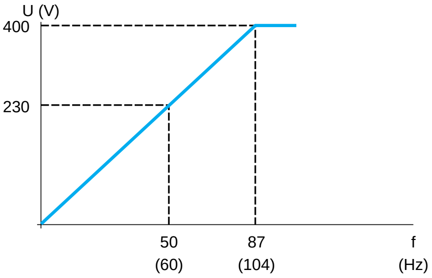
Altivar 58F Flux Vector Control with sensor

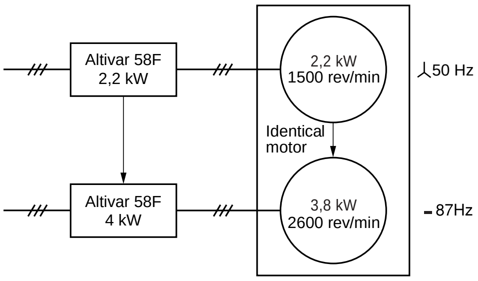
Special uses (continued)

Using a motor at constant torque up to 87/104 Hz

A 230/400 V motor can be used at constant torque up to 87 Hz with a Δ connection with 400 V supply.
In this special case, the initial power of the motor and the power of the connected drive are multiplied by $\sqrt{3}$ (a drive of suitable power must therefore be selected).

Example: a 2.2 kW, 50 Hz motor with a ⅄ connection supplies a power of 3.8 kW at 87 Hz with a Δ connection (establish the overspeed capabilities of the motor).





Operation with intermittent cycle and high switching frequency

It is possible to operate with a high switching frequency (1) with no derating of power if the operating conditions are intermittent and within the following limits:
Cumulative running time 36 s max per 60 s cycle (load factor 60 %).

---

(1) Possible frequencies (in kHz):
- 8-12-16 for ATV-58FHU18N4 to HD16N4 drives,
- 8-12 for ATV-58FHD28N4 to HD46N4 drives,
- 4-8 for ATV-58FHD54N4 to HD79N4 drives.

Variable speed drives for asynchronous motors

Altivar 58F Flux vector control with sensor

ATV 58FHU18N4

3-phase supply voltage: 380...500 V *(1)* 50/60 Hz

Motor		Line supply *(3)*				Altivar 58F				
Power indicated on rating plate *(2)*		Line current		Max. prospective line Isc		Max. drive nominal current	Max. transient current *(4)*	Power dissipated at nominal load *(5)*	Reference	Weight
		at U min.	at U max.	at U min.	at U max.					
kW	*HP*	A	A	kA	kA	A	A	W		kg
Drive with heatsink										
0.75	*1*	3.4	2.6	5	5	2.	3.1	55	**ATV 58FHU18N4** *(6)*	3.800
1.5	*2*	6	4.5	5	5	4.1	5.6	65	**ATV 58FHU29N4** *(6)*	3.800
2.2	*3*	7.8	6	5	5	5.8	7.9	105	**ATV 58FHU41N4** *(6)*	3.800
3		10.2	7.8	5	5	7.8	10.6	145	**ATV 58FHU54N4** *(6)*	6.900
4	*5*	13	10.1	5	5	10.5	14.3	180	**ATV 58FHU72N4** *(6)*	6.900
5.5	*7.5*	17	13.2	5	5	13	17.7	220	**ATV 58FHU90N4** *(6)*	6.900
7.5	*10*	26.5	21	22	22	17.6	24	230	**ATV 58FHD12N4** *(6)*	13.000
11	*15*	35.4	28	22	22	24.2	32.9	340	**ATV 58FHD16N4** *(6)*	13.000
15	*20*	44.7	35.6	22	22	33	44.9	410	**ATV 58FHD23N4** *(6)*	15.000
18.5	*25*	43	35	22	65	41	55	670	**ATV 58FHD28N4**	34.000
22	*30*	51	41	22	65	48	66	780	**ATV 58FHD33N4**	34.000
30	*40*	68	55	22	65	66	90	940	**ATV 58FHD46N4**	57.000
37	*50*	82	66	22	65	79	108	940	**ATV 58FHD54N4**	57.000
45	*60*	101	82	22	65	94	127	1100	**ATV 58FHD64N4**	57.000
55	*75*	121	98	22	65	116	157	1475	**ATV 58FHD79N4**	57.000
Drive on base plate										
0.75	*1*	3.4	2.6	5	5	2.3	3.1	55	**ATV 58FPU18N4** *(6)*	2.900
1.5	*2*	6	4.5	5	5	4.1	5.6	65	**ATV 58FPU29N4** *(6)*	2.900
2.2	*3*	7.8	6	5	5	5.8	7.9	105	**ATV 58FPU41N4** *(6)*	2.900
3		10.2	7.8	5	5	7.8	10.6	145	**ATV 58FPU54N4** *(6)*	4.800
4	*5*	13	10.1	5	5	10.5	14.3	180	**ATV 58FPU72N4** *(6)*	4.800
5.5	*7.5*	17	13.2	5	5	13	17.7	220	**ATV 58FPU90N4** *(6)*	4.800
7.5	*10*	26.5	21	22	22	17.6	24	230	**ATV 58FPD12N4** *(6)*	11.500
11	*15*	35.4	28	22	22	24.2	32.9	340	**ATV 58FPD16N4** *(6)*	11.500
15	*20*	44.7	35.6	22	22	33	44.9	410	**ATV 58FPD23N4** *(6)*	13.500

(1) Nominal supply voltage, U min…U max.

(2) These power levels are given for the maximum switching frequency permitted by the drive in continuous operation without derating (2 or 4 kHz depending on the rating).
For higher switching frequencies:
- derate the power by one rating in continuous operation, for example ATV-58FHD12N4 for 5.5 kW,
- if no power derating is applied, do not exceed the following operating conditions:
Cumulative running time 36 s maximum per 60 s cycle (load factor 60 %).

(3) Typical value for a 4-pole motor with no additional choke.

(4) For 60 seconds.

(5) These power levels are given for the maximum switching frequency permitted by the drive in continuous operation (2 or 4 kHz depending on the rating).

(6) These drives are available with power supplied via the d.c. bus. To order these drives, add 290 at the end of the reference.
Example: ***ATV-58FHU18N4*** *becomes* ***ATV-58FHU18N4290*** *with power supply via the d.c. bus.*

Nota : *please refer to the table summarising the possible combinations for drives, options and accessories on pages 2/216 and 2/217.*

Variable speed drives for asynchronous motors

Altivar 58F Flux vector control with sensor
Options

Presentation

The Altivar 58F Flux Vector Control with sensor supports the same options as the drives in the ATV 58 range:

- I/O extension card.
- Communication cards:
  - Fipio,
  - Uni-Telway, Modbus ASCII, Modbus RTU/Jbus,
  - INTERBUS-S,
  - Modbus Plus,
  - AS-Interface,
  - Profibus DP,
  - Ethernet TCP/IP,
  - CANopen,
  - DeviceNet.

- Kit for remote operator terminal.
- Advanced PowerSuite dialogue solutions (see pages 3/2 and 3/3).
- RS 485 connection kit.
- Chokes.
- Input filters.
- Output filters.
- Braking resistors.
- Kit for mounting IP 23 air exchanger.
- Control card fan kit.
- Separate control circuit supply kit .
- Removable power terminals.

For more information about all of these options, see pages 2/135 to 2/153.

Nota : *the communication cards are fitted with terminals or connectors which are compatible with the corresponding communication buses or networks. Connect them using the appropriate PLC accessories.*

Variable speed drives for asynchronous motors

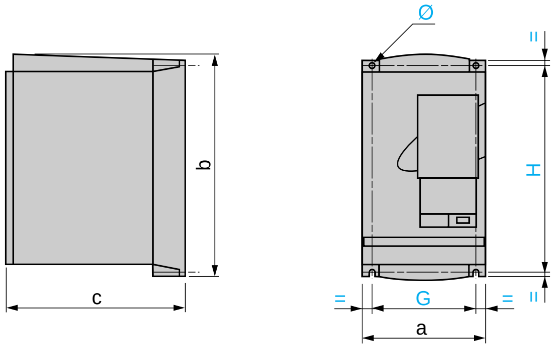
Altivar 58F Flux Vector Control with sensor

Supply	Motor		ATV-58F drive	Options			
Supply voltage 50/60 Hz	Power indicated on rating plate			1 extension or communication card (1) See p. 2/141 See p. 2/143	Remote operator terminal See p. 2/138	PowerSuite advanced dialogue solutions	
	kW	HP				Software workshop and Pocket PC See p. 3/2	Magelis display
380…500 V 3-phase	0,75	1	**ATV-58F●U18N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	1,5	2	**ATV-58F●U29N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	2,2	3	**ATV-58F●U41N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	3	–	**ATV-58F●U54N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	4	5	**ATV-58F●U72N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	5,5	7,5	**ATV-58F●U90N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	7,5	10	**ATV-58F●D12N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	11	15	**ATV-58F●D16N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	15	20	**ATV-58F●D23N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	18,5	25	**ATV-58FHD28N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	22	30	**ATV-58FHD33N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	30	40	**ATV-58FHD46N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	37	50	**ATV-58FHD54N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	45	60	**ATV-58FHD64N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8
	55	75	**ATV-58FHD79N4**	VW3-A58●●●	VW3-A58103	VW3-A81●●	XBT-HM017010A8

(1) Except for specific customer cards **VW3-A5821●**.

RS 485 Interconnection	Line choke	Additional input filter	Output filter	IP 00 braking resistor	IP 30 braking resistor	Kit for mounting IP 23 air exchanger	Control card fan kit	Separate control circuit supply kit	Plug-in power terminal block
See p. 2/139	**See p. 2/149**	**See p. 2/151**	**See p. 2/153**	**See p. 2/146**	**See p. 2/147**	**See p. 2/135**	**See p. 2/136**	**See p. 2/136**	**See p. 2/137**
VW3-A58306	VW3-A66501	VW3-A58402	VW3-A58451	VW3-A58702	VW3-A58732	–	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A66501	VW3-A58402	VW3-A58451	VW3-A58702	VW3-A58732	–	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A66502	VW3-A58402	VW3-A58451	VW3-A58702	VW3-A58732	–	VW3-A58822	VW3-A58602	VW3-A58812
VW3-A58306	VW3-A66502	VW3-A58403	VW3-A58451	VW3-A58703	VW3-A58734	–	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A66502	VW3-A58403	VW3-A58451	VW3-A58703	VW3-A58734	–	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A66503	VW3-A58403	VW3-A58452	–	VW3-A58735	–	VW3-A58823	VW3-A58603	VW3-A58813
VW3-A58306	VW3-A66503	VW3-A58404	VW3-A58453	–	VW3-A58735	–	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A66504	VW3-A58404	VW3-A58453	–	VW3-A58736	–	VW3-A58824	VW3-A58604	–
VW3-A58306	VW3-A66504	VW3-A58405	VW3-A58453	–	VW3-A58736	–	VW3-A58824	VW3-A58604	–
VW3-A58306	Integrated	VW3-A58406	VW3-A66412	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	Integrated	VW3-A58407	VW3-A66412	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	Integrated	VW3-A58407	VW3-A66412	–	VW3-A58737	VW3-A58806	VW3-A58825	–	–
VW3-A58306	Integrated	VW3-A58408	VW3-A66413	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	Integrated	VW3-A58408	VW3-A66413	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–
VW3-A58306	Integrated	VW3-A58408	VW3-A66413	–	VW3-A66704	VW3-A58807	VW3-A58826	–	–

ATV-58FH●●●●●



ATV-58FH	a mm	b mm	c mm	G mm	H mm	Ø mm
U18N4, U29N4, U41N4	150	230	184	133	210	5
U54N4, U72N4, U90N4	175	286	184	155	270	5,5
D12N4, D16N4	230	325	210	200	310	5,5
D23N4	230	415	210	200	400	5,5
D28N4, D33N4, D46N4	240	550	283	205	530	7
D54N4, D64N4, D79N4	350	650	304	300	619	9

Options: see pages 2/161 and 2/163

Mounting recommendations

Same as **ATV-58H●●●N4**: see pages 2/176 and 2/177.

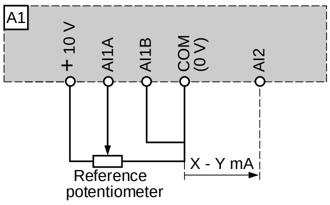
ATV-58FH	Ventilation rate
U18N4	not cooled
U29N4, U41N4, U54N4	36 m^3/hour
U72N4, U90N4, D12N4, D16N4, D23N4	72 m^3/hour
D28N4, D33N4, D46N4	292 m^3/hour
D54N4, D64N4, D79N4	492 m^3/hour

Variable speed drives for asynchronous motors

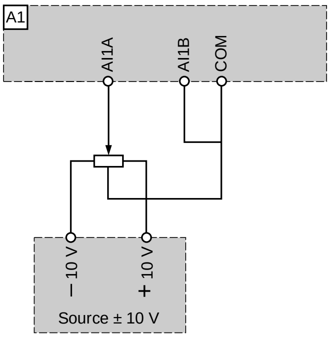
Altivar 58F Flux Vector Control with sensor

The connection diagrams for Altivar 58F Flux Vector Control drives with sensor and for their options are the same as those for the **ATV-58H●●●N4** drives (see pages 2/164 to 2/170) except for speed setpoints and encoder feedback if fitted.

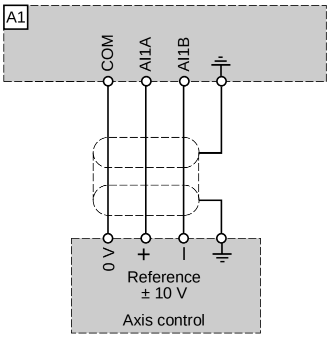
Single pole speed setpoint



2-pole speed setpoint

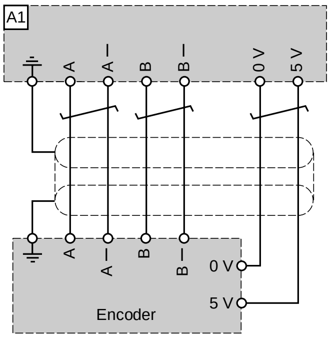


Speed setpoint using axis control



Closed loop control

Encoder wiring

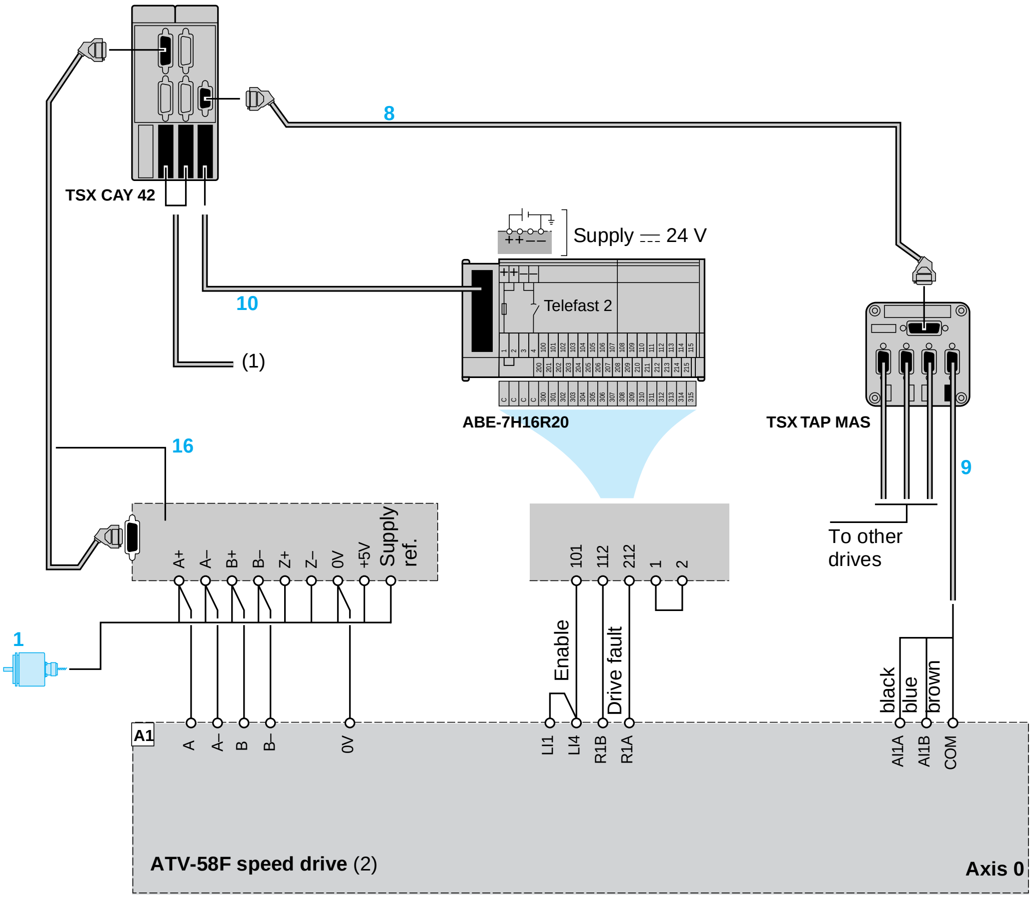


Motor starter combinations for customer assembly: see pages 2/174 and 2/175, high torque applications.

Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

Example of connection with TSX CAY●● axis control module



1 Incremental encoder (3)
8 TSX CXP 213/613 cable equipped with connectors
9 TSX CDP 611 rolled ribbon cable equipped with connectors
10 TSX CDP ●●3 cable equipped with connectors
16 Cable equipped with connectors and VY1-X411CA15 adaptor

---

(1) To connect auxiliary I/O (for example: Emergency stop, reference point, etc), please refer to the axis control module catalogue.
(2) The drive should be programmed as “General Use Macro Configuration”.
(3) For more detailed information on Telemecanique encoders, please contact your Regional Sales Office.

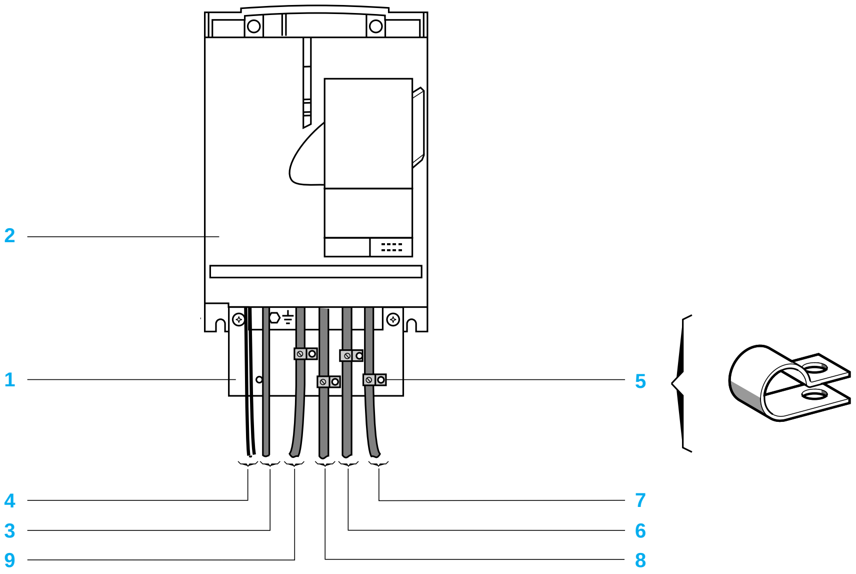
Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor
Electromagnetic compatibility

Principle

- Earth connections between drive, motor and cable shielding must have "high frequency" equipotentiality.
- Use shielded cables with shielding connected to earth for a complete 360° at both ends of the motor cable, braking resistor cable (if used) and control-command cables. Conduit or metal ducting can be used for part of the shielding provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Mounting: installation diagram



1 Sheet steel plate (supplied) to be fitted to the drive (earthed casing).

2 Altivar 58F.

3 Non-shielded power supply wires or cables.

4 Non-shielded wires for the output of the fault relay contacts.

5 Attachment and connection to earth of the shielding of cables 6, 7, 8 and 9 as close as possible to the drive:
-strip the shielding,
-use cable clamps of an appropriate size to clamp the shielding to the mounting plate 1, tight enough to ensure good contact,
-type of clamp: stainless steel.

6 Shielded cable for connecting the motor, shielding connected to earth at both ends. This shielding must be unbroken and, if there are intermediate terminals, they must be in EMC shielded metal boxes.

7 Shielded cable for connecting the encoder.
The shielding must be connected to earth at both ends. This shielding must be unbroken and, if there are intermediate terminals, they must be in EMC shielded metal boxes.

8 Shielded cable for connecting the braking resistor, if used. The shielding must be connected to earth at both ends. This shielding must be unbroken and, if there are intermediate terminals, they must be in EMC shielded metal boxes.

9 Shielded cable for connecting the control/command.
For applications which require a large number of conductors, small cross-sections must be used (0.5 mm^2). The shielding must be connected to earth at both ends. This shielding must be unbroken and, if there are intermediate terminals, they must be in EMC shielded metal boxes.

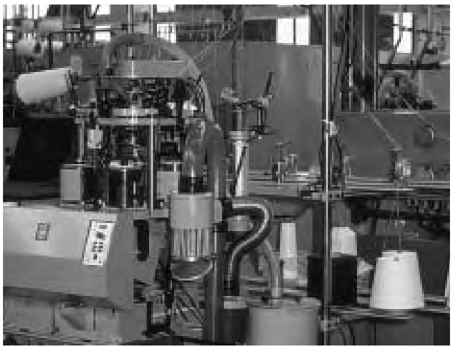
Notes:
1 Although there is a high frequency equipotential earth connection between the drive, the motor and the cable shielding, it is still necessary to connect the PE protective conductors (green-yellow) to the appropriate terminals on each of the devices.

2 If an additional input filter is used, it should be mounted behind the drive and connected directly to the line supply by an unshielded cable. Connection 3 is then made using the filter cable.

Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor
Combination of functions and applications

Applications	**Special machines**		**Packaging/packing**	
Machines which require torque and precision at very low speed as well as a raised dynamic	Timber Textile	Modular	Bagging machines Labelling machines	Palletizers Depalletizers



"Drive" functions				
Maximum frequency 450 Hz (special motor)	■			
Switching frequency	2 to 16 kHz	2 to 8 kHz	2 to 8 kHz	2 to 8 kHz
Noise reduction (random frequency)		□	□	□
FVC closed loop	□	■	□	■
Resistance braking	■	□	■	■
Application functions				
Automatic adaptation of the deceleration ramp	■			
Automatic catching a spinning load (flying restart)	■			
Controlled stop on loss of line supply	■	■	■	
Ramps can be customized as S or U		□	□	■
Analogue inputs - Summing	□	□		
- Torque limiting		□		
- PID regulator		■		
- PTC probes	□	□	□	□
Logic inputs - 2 operating directions	■	□	□	■
- Fast stop	□			
- Freewheel stop	■		□	
- Step by step (JOG)	■	■	■	□
- Preset speeds	■			■
- Ramp switching	□	□		
- +/- speed	□	■		
- Reference switching		□		
- 2nd torque limit	□			
Logic outputs - Braking sequence				■
- Downstream contactor control	□	□		□
- Motor thermal state reached				□
- Motor current threshold reached	□	□		
- Drive running	□	□		
Analogue outputs (torque, speed, current, ramp, etc.)	□	□	□	□

■ Necessary or frequent use　□ Occasional use

Functions:
pages 2/224 to 2/233

Handling/lifting		**Elevators**
Horizontal	Vertical	Winches

2 to 8 kHz	2 to 8 kHz	2 to 16 kHz
		■
☐	■	■
■	■	■

☐		☐
■	☐	■
	☐	
☐		
☐	☐	☐
■	■	■
☐		
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■	■	■
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	☐	☐
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☐	☐	☐

Variable speed drives for asynchronous motors

Altivar 58F Flux Vector Control with sensor

The majority of functions for the Altivar 58F Flux Vector Control with sensor (FVC) are common to those of the Altivar 58.

However, certain Altivar 58 functions are not available in the Altivar 58F, namely:
- operating power range (use in high torque only),
- motor switching,
- incremental speed feedback with option card,
- energy saving,
- current limit adaptation.

Other functions are specific to the Altivar 58F. These are described on the following pages.
All the assignable I/O functions are listed on pages 2/232 and 2/233.

Common functions of the Altivar 58 and the Altivar 58F

Principle of access to menus	page 2/191
Operating speed range	page 2/193
Alternate ramp switching	page 2/194
Automatic adaptation of deceleration ramp	page 2/194
Reduction of torque limit by logic input	page 2/194
Reduction of torque limit by analogue input	page 2/194
Reverse operation	page 2/194
Disabling reverse direction	page 2/194
Step by step (JOG)	page 2/194
2-wire control	page 2/195
3-wire control	page 2/195
Downstream contactor control	page 2/196
Preset speeds	page 2/197
Adjusting analogue input AI2	page 2/197
Reference switching	page 2/197
Speed feedback with tachogenerator	page 2/199
Incremental speed reference	page 2/199
Controlled stop	page 2/199
Controlled stop on mains power break	page 2/200
Automatic catching a spinning load with speed detection	page 2/200
Automatic restart	page 2/200
Limiting low speed operating time	page 2/200
Fault reset	page 2/201
Forced local mode	page 2/201
Fault relay, unlocking	page 2/201
Motor thermal protection	page 2/201
PTC probe protection	page 2/202
Thermal protection of drive	page 2/202
Switching frequency, noise reduction	page 2/202
Auto tune	page 2/203
Skip frequencies	page 2/203

Specific functions of the Altivar 58F

Macro-configuration programming	page 2/225
Acceleration and deceleration ramp times	page 2/226
Acceleration and deceleration ramp profile	page 2/226
+/- speed	pages 2/227 and 2/228
Save reference	page 2/228
Motor fluxing	page 2/228
Open/closed loop switching	page 2/228
Summing inputs	page 2/228
PID regulator	page 2/229
Speed reference summing by encoder input	page 2/229
Closed loop	page 2/230
Brake sequence	page 2/230
Reassignable logic outputs	page 2/231
Analogue outputs AO and AO1	page 2/231
Adjustment of analogue outputs AO and AO1	page 2/231
Configurable I/O	pages 2/232 and 2/233

■ Macro-configuration programming

A simplified menu can be used for preprogramming the drive to facilitate configuration and set-up. There are 2 options available, which correspond to the various functions and applications:
- ☐ handling,
- ☐ general use.

Selection of one of these macro-configurations will automatically assign the functions, parameters and I/O, even for any option cards which may be used. This menu also includes a guide to the most appropriate selection in each case. Preconfiguration carried out in this way can be modified at any time if necessary.

In the “factory” configuration, the selection is set to the “Handling” macro-configuration.

The preconfigured functions for each macro-configuration are:

Type of macro-configuration	**Handling**	**General use**
Basic I/O		
Logic input LI1	Forward	Forward
Logic input LI2	Reverse	Reverse
Logic input LI3	2 preset speeds	Jog operation
Logic input LI4	4 preset speeds	Freewheel stop
Analogue input AI1	Summing speed reference	Summing speed reference
Analogue input AI2	Summing speed reference	Summing speed reference
Relay R1	Drive fault	Drive fault
Relay R2	Not assigned	Not assigned
Analogue output AO1	Motor frequency	Motor frequency
Extension card I/O		
Logic input LI5	8 preset speeds	Clearing faults
Logic input LI6	Clearing faults	Current limit
Analogue input AI3 or Encoder inputs	Summing speed reference	Summing speed reference
Logic output LO	Current threshold reached	Downstream contactor control
Analogue output AO	Motor current	Motor current

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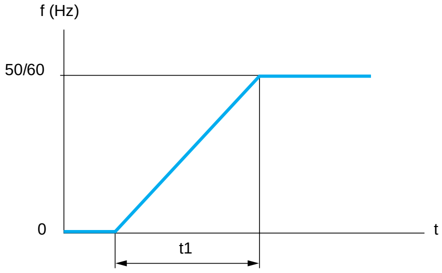
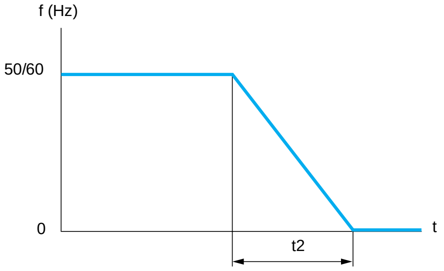
■ Acceleration and deceleration ramp times

Used to determine acceleration and deceleration ramp times according to the application and the machine dynamics, with intervals of 0.1 s or 0.01 s.
For all applications.



Acceleration ramp



t1: acceleration ramp time.
t2: deceleration ramp time.
t1 and t2 can be adjusted separately from 0.1 to 999.9 s or 0.01 to 99.99 s.
Factory setting 3 s.

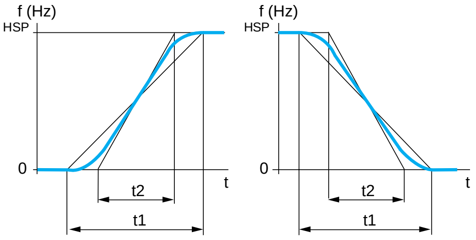
Deceleration ramp

■ Acceleration and deceleration ramp profile

Used to gradually increase the output frequency starting from a speed reference, following a linear ratio or a preset ratio which enables the ramp to be given an S or a U profile or to be customized.
For applications such as materials handling, packaging, transportation of people, the use of S or U ramps takes up mechanical play and eliminates jolts, and limits “non-following” of the speed during rapid transient operation of high inertia machines.

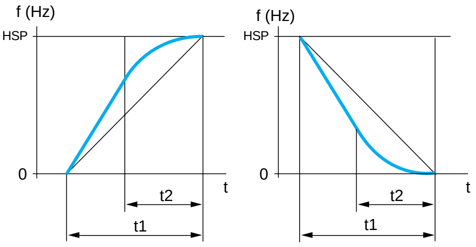
Selecting “linear” or “S”, or “U” profiles will affect both the deceleration and acceleration ramps.

☐ S-shape ramps



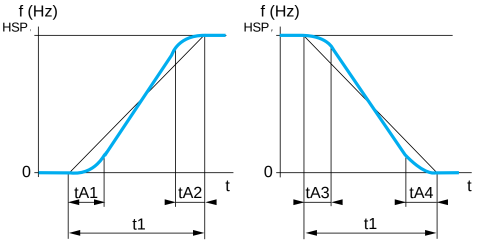
HSP: high speed.
The curve coefficient is fixed, with t2 = 0.6 x t1 and
t1: set ramp time.

☐ U-shape ramps



HSP: high speed.
The curve coefficient is fixed, with t2 = 0.5 x t1 and
t1: set ramp time.

☐ Customized ramps



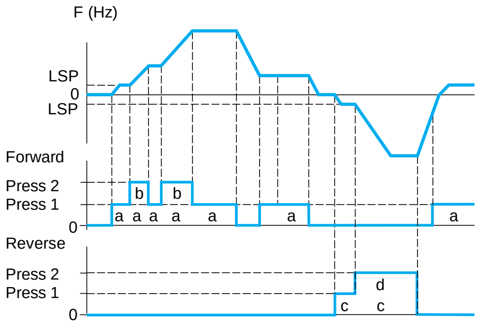
t1: set ramp time.
tA1: adjustment from 0 to 100 % (of t1).
tA2: adjustment from 0 to (100 % - tA1) (of t1).
tA3: adjustment from 0 to 100 % (of t1).
tA4: adjustment from 0 to (100 % - tA3) (of t1).

■ **+/- speed**
Used to increase or decrease a speed reference by means of 1 or 2 logic commands, with or without the last reference being saved (motorised potentiometer function).
Enabled by assigning 1 or 2 logic inputs.
Function dedicated to:

- centralized control of a non-reversing machine which has several sections,
- control, from a pendant control station, of a materials handling crane, in two operating directions.

☐ Use of double action pushbuttons.

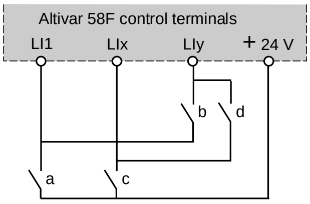
Only one logic input assigned to + speed is required.
Description: 1 button pressed twice for each direction of rotation. Each action closes a contact.



Example of operation using double action pushbuttons

	Released (- speed)	Press 1 (speed maintained)	Press 2 (+ speed)
Forward button	–	Contact a	Contacts a and b
Reverse button	–	Contact c	Contacts c and d

Wiring example:



LI1: forward
LIx: reverse
LIy : + speed

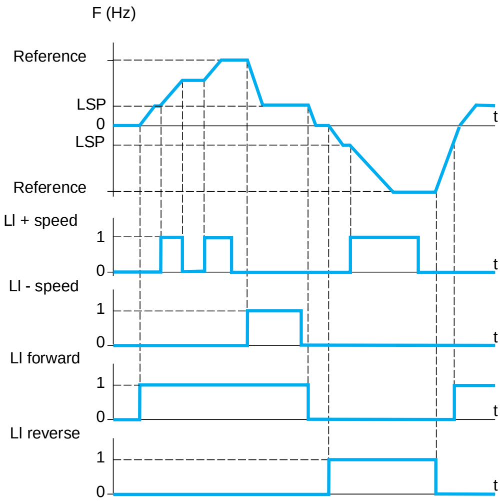
This type of +/- speed is incompatible with 3-wire control. In this case, the - speed function is automatically assigned to the logic input with a higher index (for example: LI3 = + speed, LI4 = - speed).

In this case, the maximum speed is given by the references applied to the analogue inputs: for example, connect AI1 to the + 10 V.

☐ Use of single action pushbuttons.

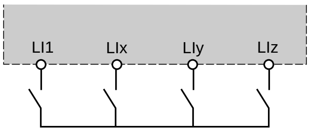
Two logic inputs are required in addition to the operating direction(s).
The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.
This function accesses the "STr" save reference parameter in the Control menu.

- The minimum rotation speed is limited to low speed (LSP).
- - speed has priority over + speed.
- If Str = No, RAM or EEP, the maximum rotation speed is fixed by the analogue references (for example, connect AI1 to the + 10 V). If the reference decreases and drops below the rotation speed, the rotation speed follows the reference. The rate of increase is given by the valid acceleration parameter (acceleration, deceleration, acceleration 2 or deceleration 2).



Example of operation using single action pushbuttons without reference saving (Str = No).

Wiring examples:



LI1: forward
LIx: reverse
LIy : + speed
LIz : - speed

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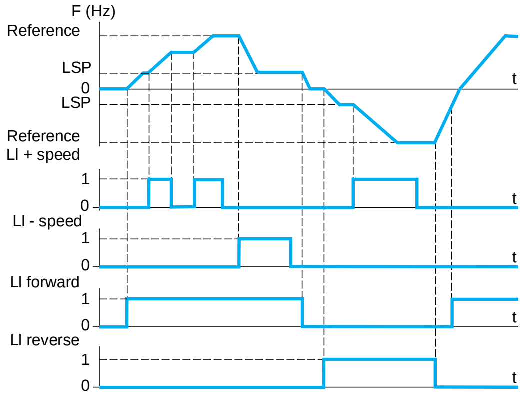
■ **+speed/- speed** (continued)

☐ Use of single action pushbuttons (continued).

Example using single action pushbuttons with reference saving:

Str = RAM (saved in RAM): the reference is saved on each + speed / - speed falling edge. Thus, after a stop **without** the drive being powered down, when a run command appears, the frequency increases to the saved value if the + speed/- speed commands are not active.
+ speed / - speed still have priority.

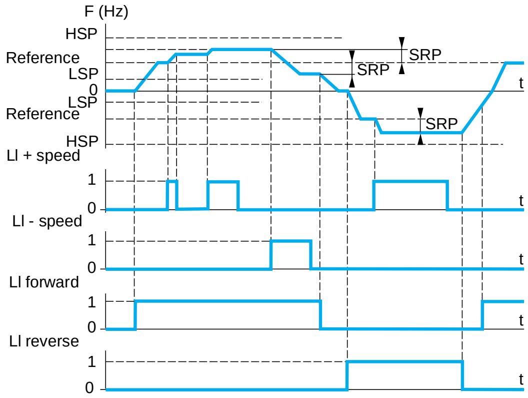
Str = EEP (saved in EEPROM): the reference is saved on each + speed / - speed falling edge. Thus, after a stop **with or without** the drive being powered down, when a run command appears, the frequency increases to the saved value if the + speed/- speed commands are not active. The + speed / - speed commands still have priority.



Example of operation using single action pushbuttons with reference saving.

Example using single action pushbuttons without reference saving:

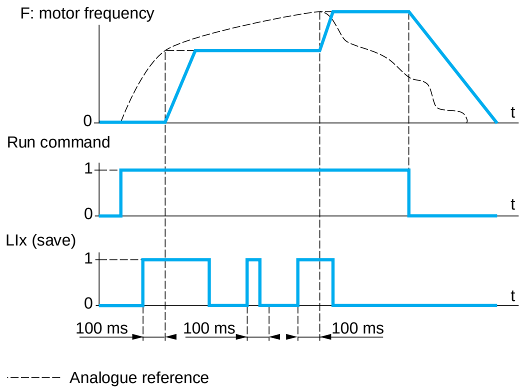
Str = SRE: the maximum rotation speed is fixed by the high speed (HSP). When the run command is issued, the drive changes to the setpoint reference following the acceleration and deceleration ramps. Pressing + speed/- speed varies the speed around this setpoint following the acceleration 2 and deceleration 2 ramps.
+ or - speed adjustment around the setpoint is limited by parameter SRP, which is a percentage of HSP.
If the reference changes, the ratio between the reference and the setpoint resulting from the + speed/- speed correction is fixed.



Example of operation using single action pushbuttons without reference saving.

■ **Save reference**

☐ Used to take into account and save the speed reference value of the analogue input using a logic input when the command lasts longer than 0.1 s.
☐ Used to control the speed of several drives alternately via a single analogue setpoint and a logic input for each drive.
☐ It is also used to confirm a line reference (serial link) via a logic input on several drives. This allows movements to be synchronized by getting rid of variations when the reference is sent.
☐ The setpoint is acquired 100 ms after the rising edge of the request. A new reference is not then acquired until a new request is made.



Example of operation using reference saving.

■ **Motor fluxing**

Used to obtain rapid high torque on start-up, the magnetic flux needs to be already established in the motor.
☐ This function can be selected in open loop or closed loop operation.
☐ In continuous mode, the drive automatically builds up flux when it is powered up.
☐ In non-continuous mode:
- if an LI is assigned to the motor fluxing command, flux is built up when the command is confirmed.
- if no LI has been assigned or if it is not active when a run command is given, the motor is fluxed when it starts up.

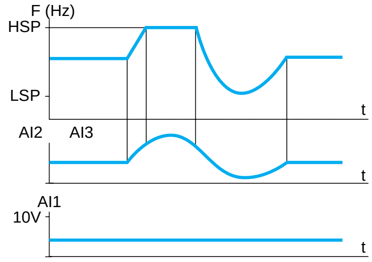
☐ The flux current is equal to the drive limit current (I lim) when the flux is established and is then adjusted to the motor no-load current.

■ **Open/closed loop switching**

Used to switch between open loop and closed loop mode. Switching must be carried out when the motor is stopped, and the drive locked.

■ **Summing inputs**

Analogue input AI2 (and/or analogue input AI3 with extension card) can be assigned as a summing input of AI1 with deadband corresponding to speed HSP.
The frequency setpoints given by AI2 and/or AI3 can be summed and/or subtracted with AI1: AI1 ± AI2 ± AI3.
This function is dedicated to machines on which the speed is governed by a corrector signal on input AI2.



Example of operation using summing inputs.

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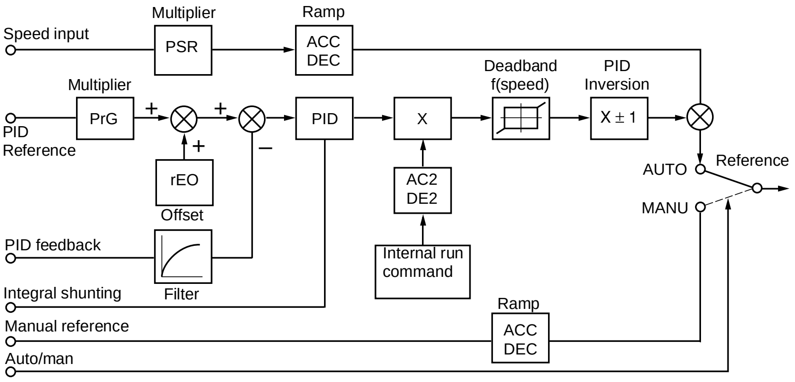
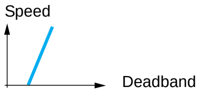
■ PID regulator

Used to regulate a process with a reference and a feedback given by a sensor. A speed input gives an initial (or predictive) setpoint for start-up.
Function dedicated to traction regulation on a winder.



ACC: acceleration, **AC2**: acceleration 2, **DEC**: deceleration, **DE2**: deceleration 2

- ☐ **Speed input:** line reference (serial link).
- ☐ **PID reference:** reference via the line (serial link), 2 or 4 references preset via logic inputs or analogue input AI1 (± AI2, ± AI3).
- ☐ **PI feedback:** analogue input AI2 or AI3.
- ☐ **Integral shunting:** logic input LI.
- ☐ **Manual reference** (speed regulation mode): analogue input AI3.
- ☐ **Auto/man:** logic input LI for switching operation to speed regulation (man) or PI regulation (auto).
  In automatic mode, it is possible to:
  - adapt the reference input to the process feedback: GAIN (PrG) and OFFSET (rEO),
  - correct PID inversion,
  - adjust the proportional, integral and derivative gain (Kp, Ki and Kd),
  - use the “alarm” on the logic output if a threshold is exceeded (Max. feedback, Min. feedback and PID error),
  - allocate an analogue output for the PID reference, PID feedback and PID error, limit the PID action in relation to the speed, with an adjustable base and ratio (see drawing below).



- apply a ramp (time = AC2 - DE2) to establish the PID action when starting and stopping.
The motor speed is limited to between LSP and HSP.
It is displayed as a percentage.

☐ Preset PI references:

2 or 4 PID preset references require the use of 1 or 2 logic inputs respectively.

2 preset references		**4 preset references**		
Assign: LIx to Pr2		**Assign: LIx to Pr2, LIy to Pr4**		
LIx	**Reference**	**LIy**	**LIx**	**Reference**
0	Analogue reference	0	0	Analogue reference
1	Process max	0	1	PI2 (adjustable)
		1	0	PI3 (adjustable)
		1	1	Process max

■ Speed reference summing by encoder input (I/O extension card encoder input)

The reference provided by the encoder input is summed with analogue input AI1.
Function dedicated to synchronization of the speed of several drives. Parameter PLS in the “drive” menu is used to adjust the speed ratio of one motor relative to another.
Reference by pulse generator.

- **FVC closed loop** (control card encoder input)

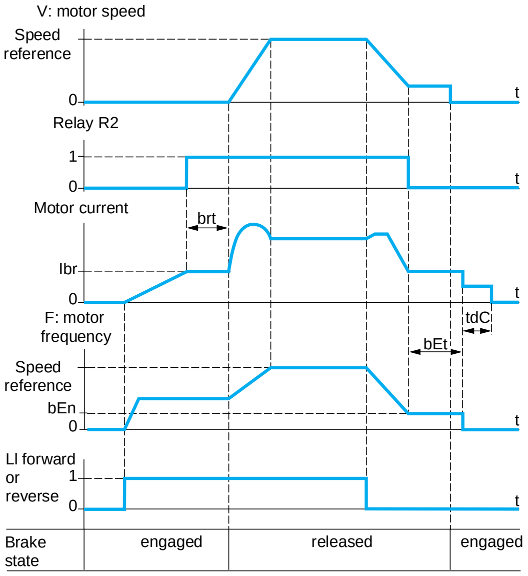
Operation using flux vector control with sensor (inputs A, A-, B, B-).
This concerns the control card encoder. The encoder is used for precise speed regulation, independent of the load state, as well as optimized control (flux vector control mode in closed loop: FVC).

- ☐ Consistency between the motor frequency and the speed feedback is monitored in the drive fault management system.
- ☐ In the event of a missing encoder feedback signal (FVC mode) or inconsistency, the drive locks with a speed loss fault.
- ☐ During operation, if the difference between the motor frequency and the speed feedback is greater than 5 Hz, the drive locks in speed loss fault mode.
- ☐ If the brake sequence is active, the speed loss fault can only occur when the brake is released.

If the speed feedback is greater than 1.2 x "max. frequency", the drive locks with an overspeed fault.

- **Brake sequence**: can only be assigned to relay R2

Used to control an electromagnetic brake by the drive, for horizontal and vertical lifting applications, and for unbalanced machines (parking brake).
Principle of the function dedicated to vertical hoisting movement:
maintains motor torque in the upward direction during brake opening and closing, in order to hold the load, and start smoothly when the brake is released.
Principle of the function dedicated to horizontal hoisting movement:
synchronizes brake opening with the build-up torque on starting and brake closing at zero speed on stopping, in order to prevent jerking.

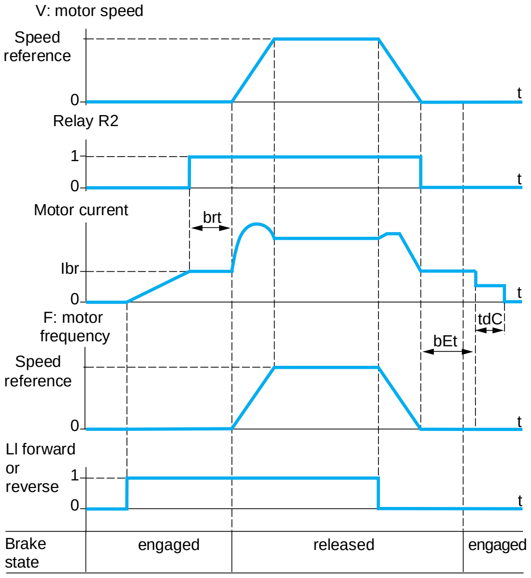


Example of brake sequence in open loop mode (see diagram opposite)

Settings which can be accessed in the adjust menu:

- ☐ brake release delay (brt),
- ☐ brake release current (Ibr),
- ☐ brake engage frequency (bEn),
- ☐ brake engage delay (bEt),
- ☐ d.c. injection braking time on stopping (tdC),
- ☐ brake pulse (bIP):

- when set to "YES", it always gives a motor torque in the "up" direction (vertical lifting),
- when set to "NO" the torque direction corresponds to the requested operating direction (horizontal lifting).



Example of brake sequence in closed loop mode (see diagram opposite)

Settings which can be accessed in the adjust menu:

- ☐ brake release delay (brt),
- ☐ brake release current (Ibr),
- ☐ zero speed maintenance time in stop mode (tdC),
- ☐ brake engage delay (bEt),
- ☐ brake pulse (bIP):

- when set to "YES", it always gives a motor torque in the "up" direction (vertical lifting),
- when set to "NO" the torque direction corresponds to the requested operating direction (horizontal lifting).

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■ Reassignable logic outputs

Relay R2 or output LO are used for:

☐ Remote indication of the following information as required:
- drive operating (running or braking),
- frequency threshold reached (higher than or equal to an adjustable threshold),
- 2nd frequency threshold reached,
- frequency reference reached (motor frequency equal to the reference),
- current threshold reached (higher than or equal to an adjustable threshold),
- thermal threshold reached (higher than or equal to an adjustable threshold),
- high speed reached,
- PID error,
- PID feedback alarm,
- loss of 4-20 mA reference,

☐ Remote control of a downstream contactor:
- brake sequence (relay R2 only).

■ Analogue outputs AO and AO1

Output AO1 on the control card and output AO on one of the I/O extension cards are used to assign the analogue outputs x-y mA to the following parameters, as required:
- motor current (y mA = twice the nominal current of the drive),
- motor frequency (y mA = maximum frequency),
- ramp output (y mA = maximum frequency),
- signed ramp output (x mA = negative maximum frequency, y mA = positive maximum frequency),
- motor torque (y mA = twice the nominal motor torque),
- signed motor torque (x mA = - twice the nominal motor torque, ie. braking operation, y mA = + twice the nominal motor torque,
- PID reference (x mA = min. reference, y mA = max. reference),
- PID feedback (x mA = min. feedback, y mA = max. feedback),
- PID error (x mA = - 5 %, y mA = + 5 %),
- PID integral,
- motor power: (x mA = 0 % of the nominal motor power, y mA = 200 % of the nominal motor power),
- motor thermal state: (x mA = 0 %, y mA = 200 %),
- drive thermal state: (x mA = 0 %, y mA = 200 %).

Note:
x adjustable from 0 to 20.
y adjustable from 0 to 20.

■ Adjustment of the analogue outputs AO and AO1

The characteristics of analogue current outputs AO and AO1 can be modified.
Factory setting: 0-20 mA
Other values: 4-20 mA, 20-4 mA or x-y mA by programming x and y with a definition of 0.1 mA
This function is dedicated to all applications with a signal other than 0-20 mA.

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Compatibility table for configurable I/O functions

- **Configurable I/O**

Functions which are not listed in this table are fully compatible.

- ☐ Stop functions have priority over run commands.
- ☐ Speed references via logic command have priority over analogue references.

The selection of functions is limited by the incompatibility of certain functions with one another

Functions	d.c. injection braking	Summing inputs	PID regulator	+/- speed	Reference switching	Freewheel stop	Fast stop	Run Step by step	Preset speeds	Speed regulation with tachogenerator	AI3 torque limiting	LI torque limiting	Reference saving	Closed loop FVC	Open/closed loop switching
d.c. injection braking	⬜	🟩	🟩	🟩	🟩	↑	🟩	🟩	🟩	🟩	🟩	🟩	🟩	⊖	🟩
Summing inputs	🟩	⬜	🟩	🟩	⊖	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
PID regulator	🟩	🟩	⬜	⊖	⊖	🟩	🟩	⊖	⊖	⊖	🟩	🟩	⊖	🟩	⊖
+/- speed	🟩	🟩	⊖	⬜	⊖	🟩	🟩	↑	⊖	🟩	🟩	🟩	⊖	🟩	🟩
Reference switching	🟩	⊖	⊖	⊖	⬜	🟩	🟩	🟩	⊖	🟩	🟩	🟩	🟩	🟩	🟩
Freewheel stop	←	🟩	🟩	🟩	🟩	⬜	←	🟩	🟩	🟩	🟩	🟩	🟩	←	🟩
Fast stop	🟩	🟩	🟩	🟩	🟩	↑	⬜	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Jog operation	🟩	🟩	⊖	←	🟩	🟩	🟩	⬜	←	🟩	🟩	🟩	⊖	🟩	🟩
Preset speeds	🟩	🟩	⊖	⊖	⊖	🟩	🟩	↑	⬜	🟩	🟩	🟩	⊖	🟩	🟩
Speed regulation with tachogenerator	🟩	🟩	⊖	🟩	🟩	🟩	🟩	🟩	🟩	⬜	🟩	🟩	🟩	⊖	🟩
AI3 torque limiting	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	⬜	⊖	🟩	🟩	🟩
LI torque limiting	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	⊖	⬜	🟩	🟩	🟩
Save reference	🟩	🟩	⊖	⊖	🟩	🟩	🟩	⊖	⊖	🟩	🟩	🟩	⬜	🟩	⊖
Closed loop FVC	⊖	🟩	🟩	🟩	🟩	↑	🟩	🟩	🟩	⊖	🟩	🟩	🟩	⬜	🟩
Open/closed loop switching	🟩	🟩	⊖	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	⊖	🟩	⬜

⊖	Incompatible functions
🟩	Compatible functions
⬜	Not applicable

Priority functions (functions which cannot be active at the same time)

← The arrow indicates which function has priority.

↑

Example: the "Freewheel stop" function has priority over the "d.c. injection braking" function.

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Summary table of the configurable I/O assignments

	Drive I/O									
	Without option card					With I/O extension cards				
	Relay R2	Analogue input AI2	Analogue output AO1	3 logic inputs LI2-LI3-LI4	Encoder inputs A-, A+, B-, B+	2 logic inputs LI5-LI6	Analogue input AI3	Logic output LO	Analogue output AO	Encoder inputs A-, A+, B-, B+
Functions										
Auto-tuning				▨		▨				
Reverse operation				▨		▨				
Alternate ramp switching				▨		▨				
Step by step (JOG)				▨		▨				
+/- speed				▨		▨				
Save reference				▨		▨				
Motor fluxing				▨		▨				
Preset speeds				▨		▨				
Reference switching				▨		▨				
Freewheel stop				▨		▨				
d.c. injection stop				▨		▨				
Fast stop				▨		▨				
Open/closed loop switching				▨		▨				
Second torque limit				▨		▨				
Forced local mode				▨		▨				
Auto/man PID				▨		▨				
PID integral shunting				▨		▨				
Preset PID references:				▨		▨				
Fault reset				▨		▨				
2nd speed reference		▨								
Summing reference		▨					▨			▨
PID regulator feedback		▨					▨			
Subtracting reference		▨					▨			
Manual PID reference							▨			
PID speed reference							▨			
Torque limit reduction		▨					▨			
PTC probes							▨			
Speed feedback					▨		▨			
Downstream contactor control	▨							▨		
Frequency threshold reached	▨							▨		
High speed reached	▨							▨		
Frequency reference reached	▨							▨		
Current threshold reached	▨							▨		
Thermal threshold reached	▨							▨		
Drive running	▨							▨		
Brake sequence	▨									
PID error	▨							▨		
PID feedback alarm	▨							▨		
Loss of 4-20 mA reference	▨							▨		
Motor current			▨						▨	
Motor speed			▨						▨	
Ramp output			▨						▨	
Motor torque			▨						▨	
Signed motor torque			▨						▨	
Signed ramp output			▨						▨	
PID reference output			▨						▨	
PID feedback output			▨						▨	
PID error output			▨						▨	
PID integral output			▨						▨	
Motor power			▨						▨	
Motor thermal state			▨						▨	
Drive thermal state			▨						▨	

▨ Possible assignments

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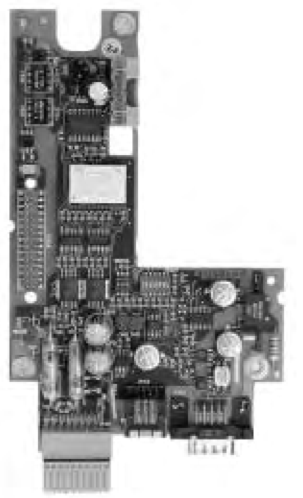
Altivar 38, 58, 58F

Option: "Controller Inside" - programmable card



VW3 A581131

Presentation

The "Controller Inside" programmable card is used to adapt variable speed drives to specific customer applications, quickly and in an open-ended manner, by decentralizing the control system functions.
It fits into Altivar 38, 58 and 58F variable speed drives.

The programmable card contains:
- ■ 8 I/O to be defined according to the application, including:
  - ☐ 2 inputs which can be used as counter inputs
  - ☐ 2 inputs which can be used as incremental encoder inputs
- ■ a communication interface for the CANopen bus which can be Master or Slave
- ■ a serial link to a PC

The card must have a separate power supply.

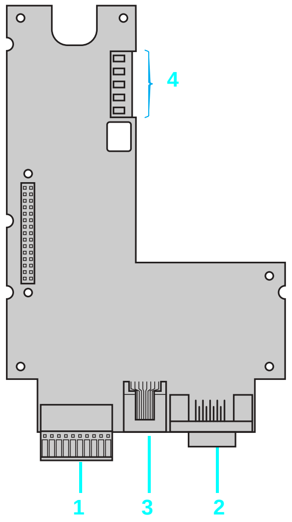
The PS 1131 software workshop (see pages 2/236 to 2/239) is used for card programming and setup.
The CANopen bus configurator is integrated in the software workshop.

This software workshop is already used for other Schneider Electric products (LEXIUM, TWINline). It conforms to international standard IEC 61131-3.
- ■ 6 programming languages are available:
  - ☐ Ladder language (LD)
  - ☐ Structured Text language (ST)
  - ☐ Grafcet language (SFC)
  - ☐ Instruction List language (IL)
  - ☐ Function blocks (DFB)
  - ☐ Continuous Flow Chart (CFC)
- ■ To assist programming, there are:
  - ☐ logic functions (AND, OR, etc)
  - ☐ mathematical functions (Cos, Sin, Exp, etc)
  - ☐ function blocks dedicated to drives, thus simplifying data exchanges between the drive and the programmable card (example: sending the speed reference).

The application program is rebuilt and loaded into the "Flash" memory.
The non-volatile memory (NVRAM) is used to save the application data when the card is not supplied with power.

The various functions, such as displaying changes in variables, forced writing of variables, the possibility of placing breakpoints and executing the program step by step, are used to debug the application program.

Description



The programmable card has 3 external connectors and 5 signalling LEDs.

1 Connector with 10-way removable spring terminals, including:
- 8 contacts which can be used as either inputs or outputs, 2 of which can be used as counter or incremental encoder inputs.
- Choices of input, output, or type of logic input are made by the program loaded in the card.
- 2 contacts are reserved for the 24 V ⎓ (min 20 V ⎓, max 28 V ⎓), 2 A external power supply. The external power supply must be ordered separately *(1)*.

2 9-way male SUB-D connector for connection to the CANopen bus.

3 8-way RJ45 type connector for connection to the RS485 serial link.
Connection to the PC is via a cable and an RS485/RS232 adaptor included in the PowerSuite for PC connection kit.

4 5 LEDs, including:
- 3 reserved for the application program
- 2 for the CANopen bus communication status

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(1) Recommended power supply reference: ABL 7RE2402.
Please consult our "Phaseo power supplies and transformers" specialist catalogue.

Variable speed drives for asynchronous motors

Altivar 38, 58, 58F

Option: "Controller Inside" - programmable card

Environment characteristics *(1)*

Conforming to standards			Low voltage: EN 50178, EMC immunity: IEC/EN 61800-2, IEC/EN 61800-3 EMC, radiated and conducted emissions: IEC/EN 61800-3, UL 508C
CE marking			The drives have been designed to meet the requirements of the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives.
Product certifications			UL, CSA
Max. ambient pollution	Conforming to UL 508C		Level 3
Maximum relative humidity	Conforming to IEC 60068-2-3		93% without condensation or dripping water
Ambient air temperature			See the respective drive characteristics.

Electrical characteristics of the programmable card

Supply voltage (provided by external power supply)	Nominal	**V**	⎓ 24
	Maximum	**V**	⎓ 28
	Minimum	**V**	⎓ 20
External power supply current *(2)*		**A**	2 (to be adapted according to the number of I/O used)
Power consumption	No-load	**mA**	80
	Using logic output	**mA**	200
Logic inputs	Maximum voltage	**V**	⎓ 28
	Switching thresholds	**V**	⩾ 11 for change from state 0 to state 1 < 5 for change from state 1 to state 0
Input resistance		**kΩ**	3.1 ± 500Ω
Counter or incremental encoder inputs			5 kHz limit frequency
Outputs	Maximum switching voltage	**V**	28
	Maximum residual voltage	**mV**	200
	Maximum current	**mA**	200
Connection of I/O	Maximum capacity		0.5 mm^2 (rigid cable ⩾ 0.2 mm^2 or flexible cable with ferrule)
	Length of cable	**m**	⩽ 100 for cross-section 0.25 mm^2
	Type of contact		spring
Rebuilt program	Maximum size	**Kb**	320
	Memory size of the variables	**Kb**	128
NVRAM memory	Memory size	**Kb**	8
Lithium battery	Life		8 years approx.

References

Description	Use for drive/software version *(3)*	Reference	Weight kg
Programmable card "Controller Inside"	ATV 38 / ⩾ 1.0 ATV 58 / ⩾ 4.2 ATV 58F / ⩾ 3.1	**VW3 A581131**	0.320
PowerSuite for PC connection kit	ATV 38 ATV 58 ATV 58F	**VW3 A8106**	0.100
PS 1131 software workshop *(4) (5)* supplied on CD-ROM	ATV 38 / ⩾ 1.0 ATV 58 / ⩾ 4.2 ATV 58F / ⩾ 3.1	*(5)*	0.100
Application programs *(5)* supplied on CD-ROM	ATV 38 / ⩾ 1.0 ATV 58 / ⩾ 4.2 ATV 58F / ⩾ 3.1	*(5)*	0.100

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(1) These characteristics are in addition to those of the ATV 38, ATV 58, ATV 58F drives. Check the corresponding drive characteristics.

(2) Recommended power supply reference: ABL 7RE2402. Please consult our "Phaseo power supplies and transformers" specialist catalogue.

(3) After disconnecting the operator terminal, check the software version indicated on the label attached to the drive control card.

(4) The "PS 1131 software workshop" CD-ROM includes:
- *the programming software workshop and associated manual*
- *the function libraries for communicating with the drive and managing the CANopen bus*
- *the online help file*
- *program examples*
- *the user and programming manuals for the ATV 38, ATV 58 and ATV 58F drives*
- *the internal variables manual*

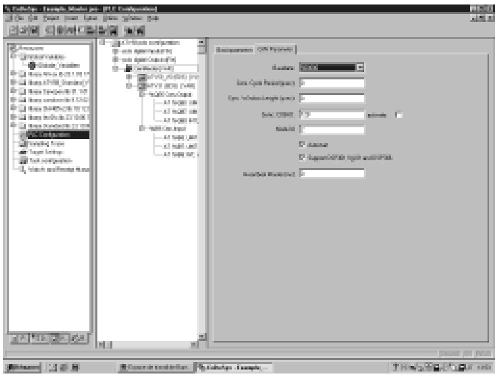
(5) The "PS 1131 software workshop" and "Application programs" CD-ROMs are provided during training. Please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 38, 58, 58F

Option: "Controller Inside" - CANopen

CANopen



CANopen bus configurator

The communication interface contained in the programmable card is used to connect the drive/programmable card device to the CANopen bus.

The drive/programmable card device can be either Master or Slave on this bus.
The CANopen configurator is included in the software workshop described on pages 2/237 to 2/239.
It uses EDS description files for each of the Slaves.

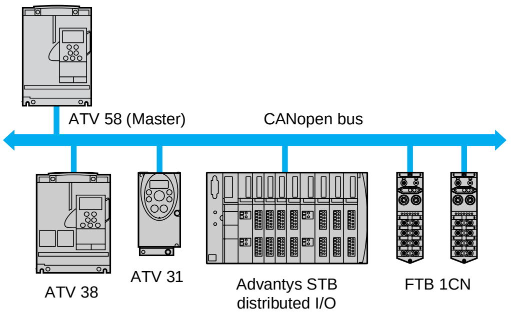
The drive address and communication speed on the bus are defined either by the program or by switches.

The line termination resistor is integrated on the card.

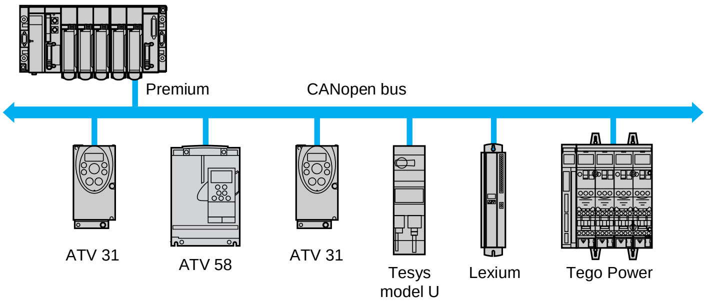
The signalling LEDs indicate the states of the CANopen bus in accordance with standard CIA DR 303, version 1.0.

Architecture

Example of Master architecture



Example of Slave architecture



Characteristics

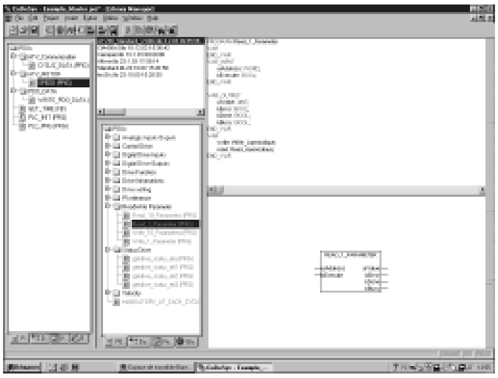
CANopen

Structure	Physical interface	ISO 11898							
	Access method	CSMA/CA, multimaster, producer/consumer principle							
Transmission	Data rate	10 Kbps to 1 Mbps							
	Medium	Double shielded twisted pair							
Physical configuration selection via program	Length of a segment according to the data rate	1 Mbps	800 Kbps	500 Kbps	250 Kbps	125 Kbps	50 Kbps	20 Kbps	10 Kbps
		15 m	50 m	100 m	250 m	500 m	1,000 m	2,500 m	5,000 m
Physical configuration selection via switches	Length of a segment according to the data rate	1 Mbps		500 Kbps		250 Kbps		125 Kbps	
		15 m		100 m		250 m		500 m	
Number of addresses	Master CANopen	The address can be configured from 0 to 32 via the CANopen configurator							
	Slave CANopen	The address can be configured from 1 to 63 via switches or via the program							
Number of Slaves		32 with a maximum of 9 PDOs per Slave							
Services supported (in accordance with DSP 405, DS 301)	Master CANopen	Services supported: ■ NetWork Management Master ■ Boot-up messages ■ Emergency messages ■ Sync ■ Node guarding, consumer and producer Heartbeat ■ Status and error ■ Implicit exchange of Process Data Objects (PDO) on the network (this exchange is pre-programmed and does not require any special action) ■ Explicit exchange for each Slave of 2 Service Data Objects (SDO), 1 in read mode and 1 in write mode ■ Compatibility with the standard device and communication profiles on CANopen. Services not supported: ■ Time stamp message ■ Transfer of SDO blocks ■ Event timer on PDO							
	Slave CANopen	Services supported: ■ Boot-up messages ■ Emergency messages ■ Node guarding ■ Implicit exchange of Process Data Objects (PDO) on the network. Only asynchronous exchanges are supported. PDOs can be exchanged between Slaves. ■ Explicit exchange of Service Data Objects (SDO). Transfer of SDO blocks is not supported.							

Variable speed drives for asynchronous motors

Altivar 38, 58, 58F

Option: "Controller Inside" - PS1131 software workshop



Application components

PS 1131 software workshop

The PS 1131 software workshop conforms to international standard IEC 61131-3, and includes all the functions used to program and set up the "Controller Inside" programmable card.
It incorporates the configurator for the CANopen communication interface.
The software workshop is already used for other Schneider Electric products (LEXIUM, TWINline).
It is designed for Windows 98, Windows NT 4.0, Windows Millennium, Windows 2000 Professional and Windows XP operating systems.

It benefits from the user-friendly interface associated with these operating systems:
- pop-up menus
- function blocks
- online help

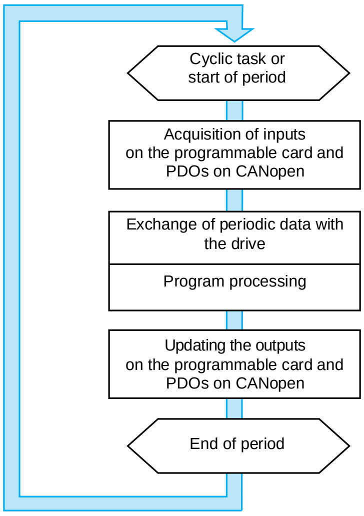
The software workshop exists in English and German.

The programming and debugging tools can be accessed via the application browser. This provides the user with an overview of the program and quick access to all the application components:
- program editor
- function blocks editor
- variables editor
- animation tables editor
- runtime screens editor

Modular structured programming

The software workshop is used to structure an application into functional modules consisting of sections (program code), animation tables and runtime screens. Each program section has a name and is programmed in one of the six available languages. To protect know-how or prevent any accidental modification, each section can be write-protected or read/write-protected.

Exporting/importing functional modules:
It is possible to export all or part of the tree structure in functional modules.
In this case, all program sections at the various module levels are exported.



Example of cycle execution for a drive connected on a CANopen bus

Program structure and execution of an application

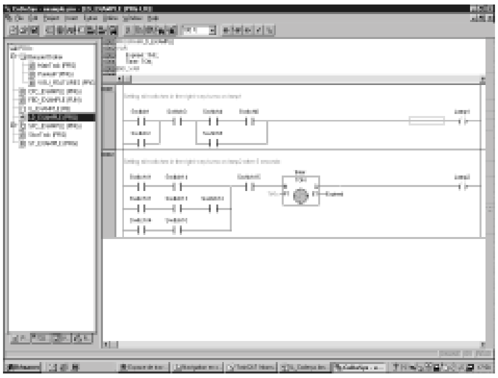
The program structure is single-task. A single Master task is executed. It consists of several subroutines.
Exchanges with the drive are performed by a function block available in the standard library.
The cycle execution can be either cyclic, or periodic. A software "watchdog", which can be configured between 5 ms and 800 ms by the user, monitors the cycle time.

- **Cyclic execution:**

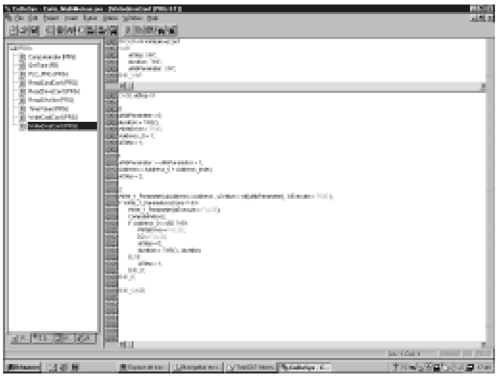
Once each cycle ends, execution of a new cycle begins. The cycle execution must last for at least 5 ms.

- **Periodic execution:**

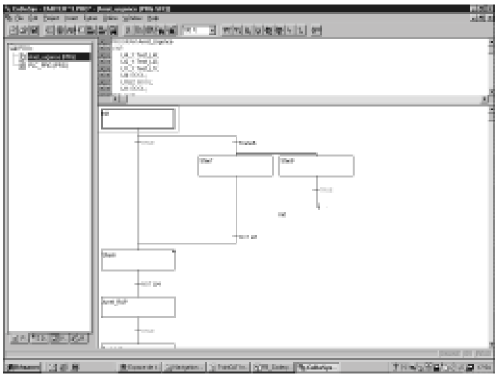
The program is executed periodically, and the period can be set by the user to between 5 and 100 ms. Cycle execution must be shorter than the defined period. Drive response in the event of the cycle time being exceeded can be managed by the program.



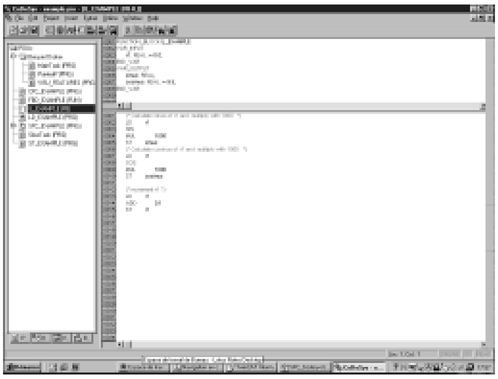
Example of Ladder language programming



Example of Structured Text language programming



Example of Grafcet language programming



Example of Instruction List programming

Programming languages

- 6 programming languages are available:
  - Ladder language (LD)
  - Structured Text language (ST)
  - Grafcet language (SFC)
  - Instruction List language (IL)
  - Function blocks (DFB)
  - Continuous Flow Chart (CFC)

Ladder language (LD)

A Ladder language program consists of a set of rungs executed sequentially.
A rung consists of several lines.
A line consists of several contacts and a coil.
The language objects can be entered and displayed as symbols or tags as required.
The Ladder language editor enables the immediate call of entry help functions such as access to function libraries and access to the variables editor.

Structured Text language (ST)

Structured Text language is a sophisticated algorithmic type language which is particularly well-suited to programming complex arithmetical functions, manipulating tables, message handling etc.
Structured Text language enables direct transcription of an analysis based on a flow chart, and is organised in statements.

Grafcet language (SFC)

Grafcet language is used to describe the sequential part of control systems in a simple, graphic way. It corresponds to the SFC "Sequential Function Chart" language described in standard IEC 61131-3.
Programs written in Grafcet (SFC) language consist of:

- macro-steps which are the single representation of a set of steps and transitions
- steps with which the actions to be performed are associated
- transitions with which the conditions are associated
- directed links connecting the steps and transitions

Instruction List language (IL)

Instruction List language is a language which represents, in text form, the equivalent of a Ladder diagram. It can be used to write Boolean equations and use all the functions available in the language.
Each instruction consists of an instruction code and a bit or word type operand.
As in Ladder language, instructions are organised in sequences of instructions (equivalent to a rung).

Function blocks (DFB)

Function block programming is a graphic language. It consists of function blocks connected by a rung. The program is executed sequentially.
Each block can be a logical or an arithmetical expression, a call to another function block, a jump or a go-back instruction.

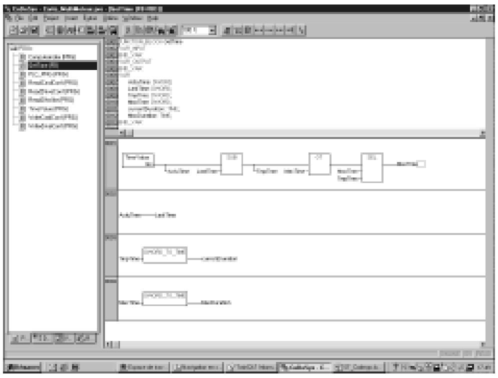
Continuous Flow Chart (CFC)

"Continuous Flow Chart" programming is a graphic language. The rung connecting the various function blocks on the page is not necessarily sequential. The output of a function block may be looped back on its input or on the input of a block already inserted in the rung.

Variable speed drives for asynchronous motors

Altivar 38, 58, 58F

Option: "Controller Inside" - PS1131 software workshop



Example of function block programming

Functions

User function blocks

The PS 1131 software workshop has pre-programmed function blocks and offers customers the option of creating their own function blocks. Once created in the library, these function blocks can be used by the program.
User function blocks can be used to structure an application. They can be used once a program sequence has been repeated several times in the application.

- **Standard library**

In addition to the basic functions (comparator, OR, AND function, etc), function blocks are used to simplify writing the program. They are used to make exchanges between the drive and the programmable card as transparent as possible.
Online help can be accessed for any library function.
Example of a function block used to send the speed reference to the drive.

- **Library created by the user**

The user has the option of creating his own function blocks in order to structure an application. It is possible to create an instance of the function block which can be used in different subroutines.

Debugging and running the application

Debugging is performed by means of the debug functions in the full program:

- use of breakpoints
- step-by-step program execution
- execution of the cycle only
- direct access to the subroutines to be executed (call stack).

Debugging is simplified:
- by writing the variable values in the application program, even during operation
- by designing display screens consisting of a set of data.

The list of data (explanatory texts, realtime values, block diagrams, bitmaps) for debugging and monitoring the application is created using the tools described below.

Variables editor

All defined variables are automatically available to perform supervision. It is possible to track the change in a variable after a particular event.

Animation table

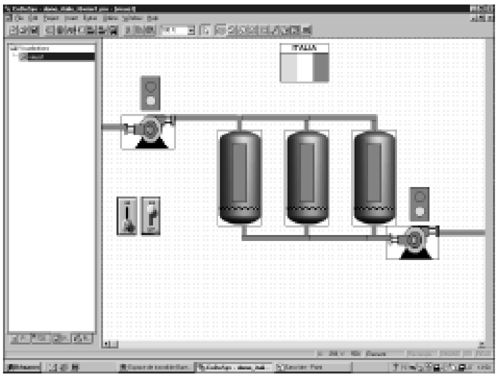
The animation table is used for modification and realtime monitoring of variables according to the state of the process.

Runtime screen

A runtime screen is incorporated in the software workshop. It is used to debug the program and to improve diagnostics of faults or malfunctions.

Simulation

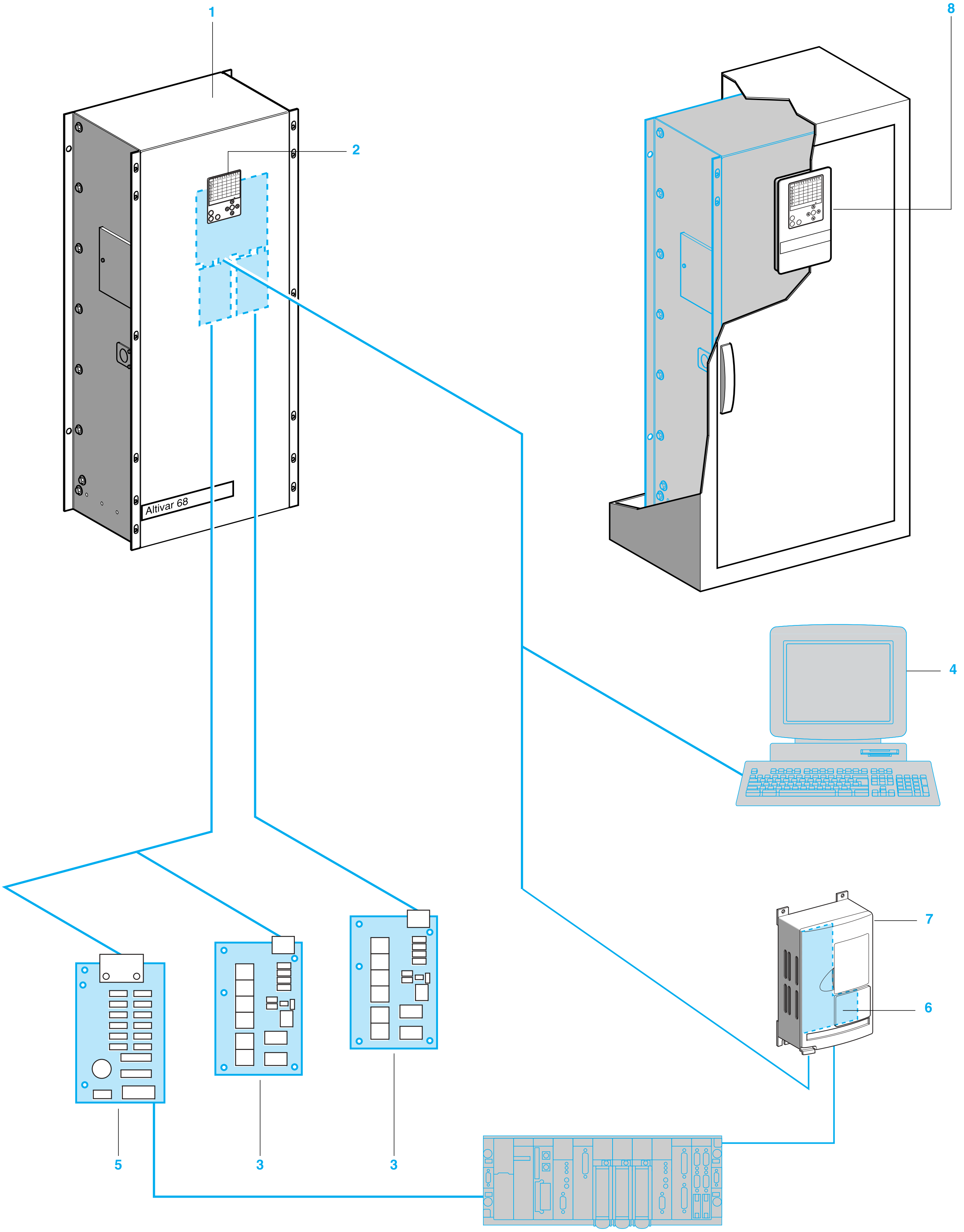
A "simulation" operating mode is available in the software workshop.
It is used to simulate the application program without being connected to the card.



Example of runtime screen

Variable speed drives for asynchronous motors

Altivar 68



Applications

A compact and robust speed drive for all types of high-power 3-phase asynchronous motors, the Altivar 68 1 incorporates the latest technological developments and its innovative functions meet the requirements of the most common applications, notably:
- ventilation, air-conditioning,
- pumping,
- conveying,
- grinding,
- handling and lifting.

The Altivar 68 has several application-specific preset configurations with few basic parameters, which can be modified using the programming terminal 2 to create additional functions.

It covers a range from 75 to 500 kW for high torque applications and from 90 to 630 kW for standard torque applications for a single voltage range from 400 to 500 V.
In spite of its high performance, it is easy to adjust. The introduction of elements on the motor rating plate and autotuning on stopping make it possible to obtain high torque together with remarkable drive quality, even at very low rotation speeds (< 0.5 Hz).
For applications which require exceptional speed precision even at very low speed, the speed drive can be supplied with an optional encoder feedback card.

Functions

The main functions are:
- dual configuration (2 motors),
- integrated PID drive (flow rate, pressure, speed correction),
- 7 possible preset speeds,
- JOG operation,
- brake release sequences for translational movement and hoisting,
- user-definable analogue and logic inputs,
- +/- speed,
- skip frequencies,
- comparator functions,
- logic functions,
- starting and speed regulation via flux vector control,
- 4 energy saving levels for variable torque applications,
- protection of motor and speed drive,
- automatic catching of spinning load with speed search (catch on the fly),
- high overtorque on start-up,
- separate 24 V⎓ supply for control circuit.

Programming terminal

The Altivar 68 is supplied with a programming graphic terminal which is used to:
- drive the speed drive in local mode,
- configure the various parameters,
- provide a remote display and indication of the speed drive status.

Options

Possible options:
- additional I/O card 3, 2 available, if there is no communication card,
- PC-based setup software 4,
- Profibus 5 and FipIo or Modbus Plus 6 communication cards via the optional module 7,
- braking unit and resistors,
- line chokes for protection against supply overvoltage and reduction of harmonic distortion,
- radio interference input filters to comply with electromagnetic compatibility,
- additional motor chokes to limit voltage surges on the motor terminals and when motor cables are very long,
- remote mounting kit for programming terminal 8 which enables installation of the terminal on the door of the enclosure or operator panel,
- DC bus connection in the form of a mechanical kit for connecting the braking module, several speed drives connected in parallel, or the optional external load circuit to the DC bus,
- external load circuit to connect several speed drives in parallel,
- earth fault detection kit in IT connection to protect the speed drive in the event of a short-circuit between phase and earth,
- air ducting kit and fan for mounting in an enclosure.

Characteristics:
pages 2/242 to 2/245

References:
pages 2/246 to 2/261

Dimensions, installation:
pages 2/264 to 2/269

Schemes:
pages 2/270 to 2/277

Variable speed drives for asynchronous motors

Altivar 68

Environment characteristics

Conforming to standards		Altivar 68 electronic variable speed drives have been designed to conform with national and international standards and to meet recommendations relating to industrial electrical control equipment (IEC, EN, NFC, VDE), notably: - low voltage: EN 50178, - electrical isolation: conforming to EN 50178, PELV, - EMC immunity: conforming to IEC 61800-3, (IEC 1000-4-2, IEC 1000-4-3, IEC 1000-4-4), - EMC emission: conforming to IEC 61800-3, - EMC radiated and conducted radio-electric frequency emission: optional suppression filters for industrial environments.
Product certifications		UL "OPEN DEVICE" To ensure UL conditions, the short-circuit current of the speed drives should not exceed the values listed below: - **ATV-68●10N4 to ●19N4** speed drives: 10 000 A, - **ATV-68●23N4 to ●33N4** speed drives: 18 000 A, - **ATV-68●43N4 to ●63N4** speed drives: 30 000 A.
CE marking		These speed drives have been designed to comply with the essential recommendations of the following European directives: - Low Voltage Directive 73/23 EC, - EMC Directive 89/336 EC for industrial environments. To indicate this, Altivar 68 products are marked with the European community CE marking.
Degree of protection		IP 00 (with front panel protection) Requires the addition of a protective device to prevent direct contact by persons
Maximum ambient pollution		Level 2 conforming to IEC 664-1 and EN 50178
Maximum relative humidity and **Environmental class**		95 % without condensation or dripping water, conforming to IEC 68-2-3 3K3, according to IEC 721-3-3
Ambient air temperature around the device		
Storage	**°C**	- 25…+ 70
Operation (with a switching frequency of 2.5 kHz, for a higher frequency, see below)	**°C**	Without derating: 0…+ 40: **ATV-68●10N4, ●19N4, ●33N4** and **●63N4** speed drives 0…+ 45: **ATV-68●13N4, ●15N4, ●23N4, ●28N4, ●43N4,** and **●53N4** speed drives With current derating of 2 % per °C: + 40…+ 50: **ATV-68●10N4, ●19N4, ●33N4** and **●63N4** speed drives + 45…+ 55: **ATV-68●13N4, ●15N4, ●23N4, ●28N4, ●43N4,** and **●53N4** speed drives
Switching frequency	**kHz**	2.5 - 5 - 10 To operate at a fixed frequency of 5 or 10 kHz, select the motor rating according to the derating values given in the table below Automatic adaptation of the switching frequency if the motor overheats

Inv = max. nominal current of the speed drive

Speed drive	**Max. ambient temperature**	**Switching frequency**		
		2.5 kHz	**5 kHz**	**10 kHz**
ATV-68●10N4	40 °C	Inv	0.80 Inv	0.45 Inv
ATV-68●13N4	45 °C	Inv	0.95 Inv	0.78 Inv
ATV-68●15N4	45 °C	Inv	0.85 Inv	0.58 Inv
ATV-68●19N4	40 °C	Inv	0.80 Inv	0.52 Inv
ATV-68●23N4	45 °C	Inv	Inv	0.80 Inv
ATV-68●28N4	45 °C	Inv	0.86 Inv	0.64 Inv
ATV-68●33N4	40 °C	Inv	0.82 Inv	0.60 Inv
ATV-68●43N4	45 °C	Inv	Inv	0.80 Inv
ATV-68●53N4	45 °C	Inv	0.86 Inv	0.64 Inv
ATV-68●63N4	40 °C	Inv	0.82 Inv	0.60 Inv

Maximum operating altitude	**m**	1000 without derating (above this, derate the current by 1 % per additional 100 m up to 2000 m)
Operating position		Vertical

Variable speed drives for asynchronous motors

Altivar 68

Drive characteristics

Output frequency range		**Hz**	0…300 Frequency stability: ± 0.01 % at 50 Hz Resolution: 0.01 Hz
Speed range			1…100 (in high torque configuration)
Speed precision			Without encoder feedback card: - 30 % of nominal slip, speed > 10 % of nominal motor speed, - 50 % of nominal slip, speed < 5 % of nominal motor speed. With encoder feedback in control mode: ± 0.01 % of high speed
Transient overtorque on start-up			180 % of nominal motor torque (typical value ± 10 %) in high torque configuration
Maximum transient current			**400, 440 and 500 V:** 150 % of nominal current in high torque operation for 60 s then 120 % in continuous operation 120 % of nominal current in standard torque operation (variable torque) for 60 s then 100 % in continuous operation **460 V:** 150 % of nominal current for 60 s, then 100 % in continuous operation Current limitation depends on the heatsink temperature. If a speed drive is used outside its thermal capacity, the speed drive automatically lowers the switching frequency and if necessary the transient limitation current.
Braking torque			Up to 30 % of nominal motor torque without braking unit (typical value) Up to 150 % with one or more additional braking units
Voltage/frequency ratio			**ATV-68C●●N4:** flux vector control without sensor; constant torque or variable torque with configurable energy saving **ATV-68FC●●N4:** flux vector control with sensor for more accurate speed control

Electrical characteristics

3-phase power supply Voltage - frequency			400 V ± 15 %, 50/60 Hz ± 5 % 440 V ± 10 %, 60 Hz ± 5 % 460 V - 10 % to 480 V + 10 %, 60 Hz ± 5 % 500 V - 15 % + 10 %, 50 Hz ± 5 %
Maximum output voltage			Maximum voltage equal to line supply voltage
Speed drive noise level		**dBA**	**ATV-68●10N4** to **●19N4:** 65 **ATV-68●23N4** to **●33N4**: 72 **ATV-68●43N4** to **●63N4:** 74
Efficiency			97.5 % (including line choke losses), at 50 Hz at nominal load.
Available internal supplies			1 + 10 V output + 2% - 0 %, 10 mA maximum, with short-circuit protection 1 + 24 V output + 25 % -15 % programmable as power supply voltage for logic inputs, 150 mA maximum or as logic output, with short-circuit protection.
Analogue inputs AI	**AIV**		1 analogue voltage input 0…10 V Impedance 100 kΩ Precision ± 0.6 % of full scale (10 V) Linearity error < - 0.15 % with a 1 kΩ reference potentiometer 10-bit resolution (∼ 10 mV) Limit of operation is programmable Acquisition time 5 ms
	AIC		1 analogue current input: 0(4)…20 mA Maximum load: 250 Ω Precision ± 0.9 % of full scale 20 mA 10-bit resolution (∼ 20 µA) Stability ± 0.2 % for a variation of 10 °C Zero current monitoring Limit of operation is programmable Acquisition time 5 ms
Electrical zero volts for control			The electronic zero can be isolated from earth but its potential with respect to earth must not exceed 35 V
Analogue output	**AO1**		1 analogue current output 0(4)…20 mA with programmable operations Maximum external load 600 Ω 10-bit resolution Precision: - frequency, current, voltage: ± 1.5 %, - torque, apparent or actual power: ± 5 %. Acquisition time 5 ms

Electrical characteristics (continued)

PTC input		For a maximum of 6 PTC thermistors in series (wiring must be shielded and separated from the motor cabling) Nominal value < 1.5 kΩ De-energisation resistance: 3 kΩ, reinitialisation value: 1.8 kΩ Short-circuit protection < 50 Ω Measured current approximately 1 mA
DI logic inputs		4 bipolar inputs: positive or negative logic Programmable operations Minimum duration for acceptance: 10 ms Consumption: approx. 8 mA at 24 V State 1 above 15 V, state 0 below 4 V
Common		Common for all logic inputs is situated on the base card. The level of voltage can float up to 35 V with respect to 0 V and earth contact.
Auxiliary power supply		Used to supply the control circuit and option cards via an external + 24 V if the power supply is cut. Power supply 24 V⎓. Consumption: approx. 0.5 A Separated from the internal power supply by a diode
Output relay		Programmable relay Switching voltage: ∿ 250 V, or ⎓ 30 V Switching power: 1250 VA max., 150 W Max. DC current: 3 A Min. switched current (new relay): ⎓ 24 V, 3 mA In PELV conditions, the external power supply must also be PELV (24 V) Electrical isolation between the line supply and the relay power supply
Signalling		Via 3 indicator lamps on the display module: - drive ready, - on, - faulty.

Characteristics of the coder feedback card

Power supply	Voltage	**V**	+ 12 ± 7 %
	Max. current	**mA**	200
Maximum operating frequency		**kHz**	≤ 300
Coder output configuration			RS 422 supplied at 5 V, min. period 3 µs for electric 360° and a cyclic ratio of electric 180° ± 10 %
Input signals			A, $\overline{A}$, B, $\overline{B}$ (I and $\overline{I}$)
Recommended type of coder			The selected incremental coder, for example XCC-14, XCC-15, XCC-19 (1) with type K output stage, must have an input voltage range of 8 to 30 V.
Recommended number of points/ revolution on the coder according to the type of motor			2-pole motor: 30 to 2048 points per revolution 4-pole motor: 60 to 4096 points per revolution 6-pole motor: 90 to 4096 points per revolution To obtain an accurate range, the encoder should have more than 200 points/revolution
Max. distance between coder and drive according to the frequency		**m**	200 at 50 kHz 100 at 100 kHz 50 at 300 kHz
Type of coder-drive cable			AWG 24 (0.22 mm^2), shielded twisted pair

(1) Please consult your Regional sales office

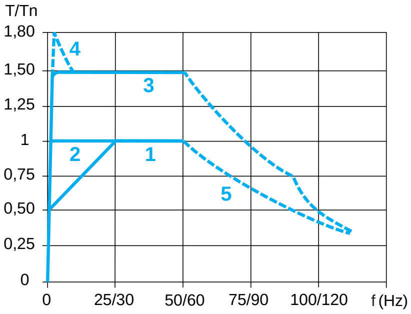
Variable speed drives for asynchronous motors

Altivar 68

Torque characteristics (typical curves)

The curves below define the available continuous torque and transient overtorque, either on a naturally-cooled or a force-cooled motor. The only difference is the ability of the motor to provide a high continuous torque at less than half nominal speed.

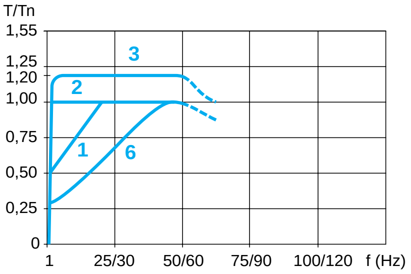
High torque applications



1 Naturally-cooled motor: continuous useful torque
2 Force-cooled motor: continuous useful torque (1)
3 Transient overtorque (1)
4 Possible overtorque at low speed (1)
5 Overspeed torque at constant power (2)

(1) Torque available at zero speed with encoder feedback card.
(2) **Warning:** check with the manufacturer regarding the mechanical overspeed possibilities of the selected motor.

Standard torque applications



1 Naturally-cooled motor: continuous useful torque (adjustable internal protection)
2 Force-cooled motor: continuous useful torque
3 Overtorque available for max. 60 seconds
6 Typical continuous useful torque in variable torque

Operation: special uses

Motor power rating different from that of speed drive

The speed drive can supply any motor which has a power rating between 20 and 120 % of that for which it is designed. Ensure that the current drawn does not exceed the continuous output current of the drive.

Motors connected in parallel

The speed drive rating must be greater than the sum of the motor currents to be connected to the speed drive. In this case, external thermal protection must be provided for each motor by probes (up to 6 motors) or a thermal overload relay.
If the total length of the motor cables is greater than 50 m (shielded cables) or 80 m (unshielded cables), the fitting of a choke between the speed drives and the motors is recommended.
Autotuning is necessary for applications which require a high start-up torque (conveyors, lifting). In this case, the motors should be mechanically coupled, should have the same power rating and the same cable length.
Autotuning is not necessary for applications which do not require a high start-up torque (pumps, fans). In this case, the motor power ratings and the cable lengths may be different.
Each motor can be isolated by a contactor during operation. On the other hand, the motor should be reconnected to the speed drive in accordance with the precautions described below: “Coupling a contactor downstream of the speed drive”.
The nominal current set for the speed drive should be equal to the sum of the motor currents.

Coupling a motor downstream of the speed drive

Coupling on the fly is possible if the current peak of the motor to be connected is less than the maximum transient current of the speed drive.
In all cases it is preferable to lock the speed drive before closing the contactor and unlock it after closing the main poles of the contactors.

Connection to an IT network

This type of connection is possible, but radio interference filters cannot be mounted. In addition, if the stray capacitance (or the filter capacitors) between the network and earth are excessive, there is a risk of premature wear on the speed drive in the event of a prolonged earth fault.
For this type of network, it is advisable to use earth fault detection via toroid sensor, kit **VW3-A68190**, see page 2/261, which will protect the speed drive in the event of an earth fault downstream of the speed drive.

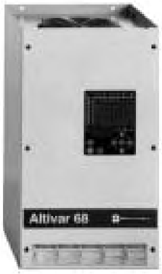
Mounting on DC bus

The Altivar 68 can be mounted on a DC bus or with a common bus. These special applications require the use of a load circuit in parallel, **VW3-A68180**, see page 2/261.

Presentation: pages 2/240 and 2/241
References: pages 2/246 to 2/261
Dimensions, installation: pages 2/264 to 2/269
Schemes: pages 2/270 to 2/277

Variable speed drives for asynchronous motors

Altivar 68
Standard


ATV-68C10N4


ATV-68C13N4


ATV-68C33N4

High torque applications (150 % Tn)

Motor Power rating on motor plate (1)		Supply Line current (2)				Altivar 68 Maximum drive nominal current				Max. transient current (3)	Power dissipated at nominal load (4)	Reference	Weight
		400 V	440 V	460 V	500 V	400 V	440 V	460 V	500 V				
kW	**HP**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**W**		**kg**
3-phase power supply 400 V - 15 %…500 V + 10 % 50/60 Hz													
75	100	133	121	116	106	142	129	124	113	213	2050	**ATV-68C10N4**	60.000
90	125	161	146	146	129	172	156	156	137	258	2400	**ATV-68C13N4**	95.000
110	150	194	177	169	157	208	189	180	167	312	2800	**ATV-68C15N4**	95.000
132	200	234	224	225	188	250	240	240	200	375	3250	**ATV-68C19N4**	95.000
160	250	304	282	283	244	325	302	302	260	488	4000	**ATV-68C23N4**	190.000
200	300	378	343	338	304	404	367	361	323	606	5000	**ATV-68C28N4**	190.000
250	350	444	403	388	357	475	431	414	380	713	6200	**ATV-68C33N4**	190.000
315	500	577	552	553	464	617	590	590	494	926	7800	**ATV-68C43N4**	500.000
400	600	717	673	675	577	767	720	720	614	1151	9700	**ATV-68C53N4**	500.000
500	800	845	785	787	680	904	840	840	723	1356	12 000	**ATV-68C63N4**	500.000

Standard torque applications (120 % Tn)

Motor Power rating on motor plate (1)		Supply Line current (2)				Altivar 68 Maximum drive nominal current				Max. transient current (5)	Power dissipated at nominal load (4)	Reference	Weight
		400 V	440 V	460 V	500 V	400 V	440 V	460 V	500 V				
kW	**HP**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**W**		**kg**
3-phase power supply 400 V - 15 %…500 V + 10 % 50/60 Hz													
90	(6)	159	145	(6)	128	170	155	(6)	136	213	2400	**ATV-68C10N4**	60.000
110	(6)	193	175	(6)	155	206	187	(6)	165	258	2800	**ATV-68C13N4**	95.000
132	(6)	234	212	(6)	188	250	227	(6)	200	312	3250	**ATV-68C15N4**	95.000
160	(6)	280	269	(6)	226	300	288	(6)	240	375	3800	**ATV-68C19N4**	95.000
200	(6)	365	338	(6)	293	390	362	(6)	312	488	4700	**ATV-68C23N4**	190.000
250	(6)	453	411	(6)	365	485	440	(6)	388	606	5800	**ATV-68C28N4**	190.000
315	(6)	533	483	(6)	429	570	517	(6)	456	713	7300	**ATV-68C33N4**	190.000
400	(6)	692	662	(6)	556	740	708	(6)	592	926	9100	**ATV-68C43N4**	500.000
500	(6)	860	808	(6)	692	920	864	(6)	736	1151	11 300	**ATV-68C53N4**	500.000
630	(6)	1015	942	(6)	816	1085	1008	(6)	868	1356	14 000	**ATV-68C63N4**	500.000

(1) Power values are given for a switching frequency of 2.5 kHz in steady state. For switching frequencies of 5 or 10 kHz the drive must be derated, see page 2/242.

(2) Typical value with additional choke for a 4-pole motor.
The presumed short-circuit current for a 3-phase power supply of 400 to 500 V is 22,000 A.

(3) For 60 seconds every 10 minutes for a voltage of 400 V (corresponding to 1.5 times the maximum drive nominal current).

(4) Power dissipated at maximum nominal current and switching frequency of 2.5 kHz.

(5) For 60 seconds every 10 minutes for a voltage of 400 V (corresponding to 1.2 times the maximum drive nominal current).

(6) At 460 V, only high torque is available.

Variable speed drives for asynchronous motors

Altivar 68F Flux Vector Control with sensor
With integrated encoder feedback card

ATV-68FC10N4

ATV-68FC13N4

ATV-68FC33N4

High torque applications (150 % Tn)

Motor Power rating on motor plate (1)		Supply Line current (2)				Altivar 68 Maximum drive nominal current				Max. transient current (3)	Power dissipated at nominal load (4)	Reference	Weight
		400 V	440 V	460 V	500 V	400 V	440 V	460 V	500 V				
kW	**HP**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**W**		kg
3-phase power supply 400 V - 15 %…500 V + 10 % 50/60 Hz													
75	100	133	121	116	106	142	129	124	113	213	2050	**ATV-68FC10N4**	60.000
90	125	161	146	146	129	172	156	156	137	258	2400	**ATV-68FC13N4**	95.000
110	150	194	177	169	157	208	189	180	167	312	2800	**ATV-68FC15N4**	95.000
132	200	234	224	225	188	250	240	240	200	375	3250	**ATV-68FC19N4**	95.000
160	250	304	282	283	244	325	302	302	260	488	4000	**ATV-68FC23N4**	190.000
200	300	378	343	338	304	404	367	361	323	606	5000	**ATV-68FC28N4**	190.000
250	350	444	403	388	357	475	431	414	380	713	6200	**ATV-68FC33N4**	190.000
315	500	577	552	553	464	617	590	590	494	926	7800	**ATV-68FC43N4**	500.000
400	600	717	673	675	577	767	720	720	614	1151	9700	**ATV-68FC53N4**	500.000
500	800	845	785	787	680	904	840	840	723	1356	12 000	**ATV-68FC63N4**	500.000

Standard torque applications (120 % Tn)

Motor Power rating on motor plate (1)		Supply Line current (2)				Altivar 68 Maximum drive nominal current				Max. transient current (5)	Power dissipated at nominal load (4)	Reference	Weight
		400 V	440 V	460 V	500 V	400 V	440 V	460 V	500 V				
kW	**HP**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**W**		kg
3-phase power supply 400 V - 15 %…500 V + 10 % 50/60 Hz													
90	(6)	159	145	(6)	128	170	155	(6)	136	213	2400	**ATV-68FC10N4**	60.000
110	(6)	193	175	(6)	155	206	187	(6)	165	258	2800	**ATV-68FC13N4**	95.000
132	(6)	234	212	(6)	188	250	227	(6)	200	312	3250	**ATV-68FC15N4**	95.000
160	(6)	280	269	(6)	226	300	288	(6)	240	375	3800	**ATV-68FC19N4**	95.000
200	(6)	365	338	(6)	293	390	362	(6)	312	488	4700	**ATV-68FC23N4**	190.000
250	(6)	453	411	(6)	365	485	440	(6)	388	606	5800	**ATV-68FC28N4**	190.000
315	(6)	533	483	(6)	429	570	517	(6)	456	713	7300	**ATV-68FC33N4**	190.000
400	(6)	692	662	(6)	556	740	708	(6)	592	926	9100	**ATV-68FC43N4**	500.000
500	(6)	860	808	(6)	692	920	864	(6)	736	1151	11 300	**ATV-68FC53N4**	500.000
630	(6)	1015	942	(6)	816	1085	1008	(6)	868	1356	14 000	**ATV-68FC63N4**	500.000

(1) Power values are given for a switching frequency of 2.5 kHz in steady state. For switching frequencies of 5 or 10 kHz the drive must be derated, see page 2/242.

(2) Typical value with additional choke for a 4-pole motor.
The presumed short-circuit current for a 3-phase power supply of 400 to 500 V is 22,000 A.

(3) For 60 seconds every 10 minutes for a voltage of 400 V (corresponding to 1.5 times the maximum drive nominal current).

(4) Power dissipated at maximum nominal current and switching frequency of 2.5 kHz.

(5) For 60 seconds every 10 minutes for a voltage of 400 V (corresponding to 1.2 times the maximum drive nominal current).

(6) At 460 V, only high torque is available.

Presentation:
pages 2/240 and 2/241

Characteristics:
pages 2/242 to 2/245

Dimensions, installation:
pages 2/264 to 2/269

Schemes:
pages 2/270 to 2/273

Variable speed drives for asynchronous motors

Altivar 68

Options: reduction of harmonic currents

The main solutions for reducing harmonic currents are as follows:

- line chokes,
- passive filters (1),
- active compensators, also called SineWave active filters. Please consult the Merlin Gerin catalogue (1),
- hybrid filters (1),
- twelve pulse connection (1).

All five solutions can be used on the same installation. It is always easier and less expensive to handle the harmonics at installation level as a whole rather than at the level of each individual unit, particularly when using passive filters and active compensators.

Line chokes

This is an inexpensive solution, which can be applied to each unit individually, but which is of limited effectiveness in reducing harmonics because too high an inductance will cause an unacceptable voltage drop.

Example of currents and harmonic levels at 400 V (with line chokes)

High torque applications, 400 V/50 Hz (Isc = 22,000 A, L supply = 33.4 µH)

ATV-68 drives		**●10N4**	**●13N4**	**●15N4**	**●19N4**	**●23N4**	**●28N4**	**●33N4**	**●43N4**	**●53N4**	**●63N4**
Power	kW	75	90	110	132	160	200	250	315	400	500
Line current	A	131.5	159.3	191.9	232.2	286.9	359.8	451.6	567.8	707.3	885.1
H1	A	122.8	148.9	178.1	215.6	266.2	334.8	420.7	534.4	669.2	844.6
H5	%	35.6	35.7	36.7	37.0	36.7	36.5	35.9	32.1	31.1	29.8
H7	%	11.8	11.9	12.7	12.9	12.8	12.6	9.6	9.5	8.9	8.3
H11	%	6.5	6.7	6.7	6.7	6.9	6.8	6.6	6.2	6.0	5.6
H13	%	3.2	3.2	3.3	3.2	3.3	3.3	3.2	3.2	3.2	3.2

Standard torque applications, 400 V/50 Hz (Isc = 22,000 A, L supply = 33.4 µH)

ATV-68 drives		**●10N4**	**●13N4**	**●15N4**	**●19N4**	**●23N4**	**●28N4**	**●33N4**	**●43N4**	**●53N4**	**●63N4**
Power	kW	90	110	132	160	200	250	315	400	500	630
Line current	A	157.1	189.5	228.2	276.5	341.0	428.0	537.6	678.2	843.6	1057.2
H1	A	148.0	179.2	214.5	259.6	320.4	402.9	506.8	644.8	805.6	1018.2
H5	%	33.0	33.1	34.1	34.4	34.1	34.0	33.3	29.8	28.9	27.6
H7	%	9.9	10.1	10.7	10.8	10.7	10.6	9.9	8.3	8.0	7.7
H11	%	6.0	6.3	6.4	6.3	6.5	6.4	6.1	5.7	5.4	4.9
H13	%	3.2	3.2	3.2	3.1	3.2	3.2	3.2	3.2	3.2	3.2

Harmonic levels at 400 V for harmonic orders H17 to H49

All drive ratings, for high and constant torque applications, 400 V/50 Hz (Isc = 22,000 A, L supply = 33.4 µH).

Order	**H17**	**H19**	**H23**	**H25**	**H29**	**H31**	**H35**	**H37**	**H41**	**H43**	**H47**	**H49**
Value (%)	2.32	1.75	1.08	0.99	0.62	0.57	0.45	0.37	0.33	0.28	0.23	0.20

(1) For combinations with drives, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 68
Options: line chokes

Presentation

Line chokes are essential, except for the ATV-68●10N4 to ●33N4 ratings if the line or transformer impedance is greater than:

- 245 µH for ●10N4 rating (Isc = 3000),
- 120 µH for ●13N4, ●15N4 and ●19N4 ratings (Isc = 6100),
- 60 µH for ●23N4, ●28N4 and ●33N4 ratings (Isc = 12,200).

These chokes can be used to provide improved protection against overvoltages on the line supply and to reduce harmonic distortion of the current produced by the drive. The recommended chokes are used to limit the line current.

The use of line chokes is also required for all ratings in the following cases:

- close connection of several drives in parallel,
- line supply with significant interference from other equipment (interference, overvoltages),
- line supply with voltage imbalance between phases > 1.8 % of nominal voltage,
- installation of a large number of frequency converters on the same line,
- reduction of overload in cos φ correction capacitors, if the installation has a power factor correction unit.

Characteristics

Conforming to standards			IEC 60076 (with HD 398)
Degree of protection			IP 00
Maximum ambient pollution			Level 3
Ambient air temperature around the device	Storage	**°C**	- 25…+ 70
	Operation	**°C**	0…+ 45 Up to + 55 with current derating of 2 % per °C above 45 °C.
Isolation class			F
Clearance distance in air	Conforming to IEC 60664	**mm**	5.5
Leakage distance in air	Conforming to IEC 60664	**mm**	11.5

References

VW3-A6850●

Chokes for high torque or standard torque applications (1)

Number of chokes required per drive	For drives	Choke characteristics				Reference	Weight
		Value of choke	Nominal current	Saturation current	Loss		
		µH	**A**	**A**	**W**		kg
Power supply voltage 400 V - 15 %…500 V + 15 %							
1	**ATV-68●10N4**	220	160	305	220	**VW3-A68501**	35.000
	ATV-68●13N4	155	195	370	220	**VW3-A68502**	35.000
	ATV-68●15N4	120	235	445	220	**VW3-A68503**	40.000
	ATV-68●19N4	98	280	530	245	**VW3-A68504**	50.000
	ATV-68●23N4	66	365	685	270	**VW3-A68505**	50.000
	ATV-68●28N4	49	455	855	270	**VW3-A68506**	55.000
	ATV-68●33N4	38	540	1025	280	**VW3-A68507**	60.000
2	**ATV-68●43N4**	66	365	685	270	**VW3-A68505**	50.000
	ATV-68●53N4	49	455	855	270	**VW3-A68506**	55.000
	ATV-68●63N4	38	540	1025	280	**VW3-A68507**	60.000

(1) Chokes are supplied with 2 additional mounting brackets for mounting on a vertical support.

Dimensions:
page 2/265

Variable speed drives for asynchronous motors

Altivar 68

Options: additional radio interference input filters

Presentation

Function

Additional input filters should be installed if the surrounding environment is subject to electromagnetic interference and radio-electric frequencies above 150 kHz.
These filters are designed to reduce emissions conducted on the line supply. The motor cables should be shielded and not exceed the maximum length given in the table below.
For the filter to operate efficiently, the installation conditions must be carefully respected.

Use according to the type of network

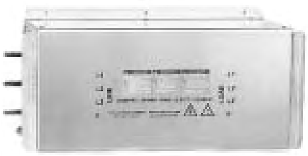
Use of these filters is only possible on TN (connected to neutral) and TT (neutral to earth) type networks. These filters are not permitted on IT (impeding or isolated neutral) networks.

Characteristics

Degree of protection			IP 00
Ambient air temperature around the device	Operation	**°C**	0... + 45 Up to + 55 with current derating of 2 % per °C above 45 °C.
	Storage	**°C**	- 25... + 70
Maximum operating altitude	Without derating	**m**	1000 (above this, derate the current by 1 % per additional 100 m)

References

VW3-A68403



VW3-A68465

No. of filters required per drive	For drive	Max. length of motor cable (1) With motor choke	Max. length of motor cable (1) Without motor choke	Nominal filter current	Max. filter leakage current On power-up	Max. filter leakage current Continuous	Loss	Reference	Weight
		m	m	A	mA	mA	W		kg
Power supply voltage 400 V (± 15 %) (2)									
1	**ATV-68●10N4**	120	40	170	500	100	20	**VW3-A68401** (2)	5.000
	ATV-68●13N4	150	40	300	500	100	40	**VW3-A68402** (2)	5.500
	ATV-68●15N4	150	40	300	500	100	40	**VW3-A68402** (2)	5.500
	ATV-68●19N4	100	40	300	500	100	40	**VW3-A68402** (2)	5.500
	ATV-68●23N4	120	40	570	500	100	60	**VW3-A68403** (2)	6.000
	ATV-68●28N4	120	40	570	500	100	60	**VW3-A68403** (2)	6.000
	ATV-68●33N4	120	40	570	500	100	60	**VW3-A68403** (2)	6.000
	ATV-68●43N4	100	40	1100	1000	200	120	**VW3-A68404** (3)	11.000
	ATV-68●53N4	100	40	1100	1000	200	120	**VW3-A68404** (3)	11.000
	ATV-68●63N4	100	40	1100	1000	200	120	**VW3-A68404** (3)	11.000
Power supply voltage 440…500 V (± 15 %) (2)									
1	**ATV-68●10N4**	100	25	180	(4)	6	38	**VW3-A68415**	6.500
	ATV-68●13N4	120	25	320	(4)	6	40	**VW3-A68435**	10.500
	ATV-68●15N4	120	25	320	(4)	6	40	**VW3-A68435**	10.500
	ATV-68●19N4	120	25	320	(4)	6	40	**VW3-A68435**	10.500
	ATV-68●23N4	100	25	600	(4)	6	65	**VW3-A68465**	11.000
	ATV-68●28N4	100	25	600	(4)	6	65	**VW3-A68465**	11.000
	ATV-68●33N4	100	25	600	(4)	6	65	**VW3-A68465**	11.000
2	**ATV-68●43N4**	120	25	600	(4)	6	65	**VW3-A68465**	11.000
	ATV-68●53N4	100	25	600	(4)	6	65	**VW3-A68465**	11.000
	ATV-68●63N4	100	25	600	(4)	6	65	**VW3-A68465**	11.000

(1) If motors are connected in parallel, it is the total length that should be taken into account.
The motor cable lengths are given for a modulation frequency of 2.5 kHz. They should be multiplied by 0.6 for a frequency of 5 kHz and by 0.3 for 10 kHz. If the motor cable is longer, the addition of a motor choke enables the length to be multiplied by 2.5, and the use of a single cable with a larger cross-section instead of several cables in parallel enables it to be multiplied by 1.5 or 2 if it is not shielded. In this case the radiated emissions are not limited.
(2) Filters VW3-A68401 to 403 have 2 parts: the line choke should be mounted between them.
(3) Filter VW3-A68404 has 3 parts: 2 parts similar to those of VW3-A68401 to 403, the third comprising 6 busbars. The line choke should be mounted between the first 2 and the third.
(4) Information not available.

Dimensions:
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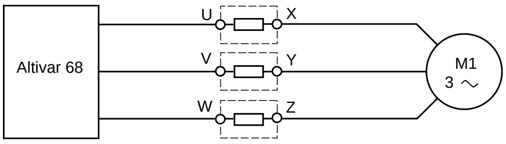
Variable speed drives for asynchronous motors

Altivar 68
Options: additional motor chokes

Presentation

The use of an output choke between the drive and the motor is recommended for motor cables which are longer than 50 metres (shielded cables) or 80 metres (non-shielded cables). This makes it possible to:

- Limit $\frac{dv}{dt}$ within the following limits:
  - 500 V/µs at 400 V
  - 750 V/µs at 500 V
- Limit overvoltages on the motor terminals to:
  - 1000 V at 400 V
  - 1300 V at 500 V
- Filter interference caused by opening a contactor placed between the filter and the motor,
- Reduce the motor earth leakage current.

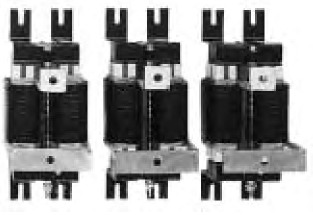


3 single-phase chokes

Characteristics

Ambient air temperature around the device	Storage	**°C**	25…+ 70
	Operation	**°C**	0…+ 45
Degree of protection			IP 00

References



VW3-A68553

For drives	Maximum length of motor cable (1) non-shielded	shielded	Nominal current	Max. loss	Reference	Weight
	m	m	A	W		kg
Power supply voltage 400 V ± 15 %						
ATV-68●10N4	250	150	170	500	**VW3-A68551**	11.500
ATV-68●13N4	300	200	300	650	**VW3-A68552**	18.000
ATV-68●15N4	300	200	300	650	**VW3-A68552**	18.000
ATV-68●19N4	250	150	300	650	**VW3-A68552**	18.000
ATV-68●23N4	300	250	580	800	**VW3-A68553**	40.000
ATV-68●28N4	300	250	580	800	**VW3-A68553**	40.000
ATV-68●33N4	250	200	580	800	**VW3-A68553**	40.000
ATV-68●43N4	300	250	1085	1000	**VW3-A68554**	110.000
ATV-68●53N4	300	250	1085	1000	**VW3-A68554**	110.000
ATV-68●63N4	250	200	1085	1000	**VW3-A68554**	110.000
Power supply voltage 440 V -10 %…500 V + 15 %						
ATV-68●10N4	200	150	170	500	**VW3-A68551**	11.500
ATV-68●13N4	250	200	300	650	**VW3-A68552**	18.000
ATV-68●15N4	250	200	300	650	**VW3-A68552**	18.000
ATV-68●19N4	200	150	300	650	**VW3-A68552**	18.000
ATV-68●23N4	280	200	580	800	**VW3-A68553**	40.000
ATV-68●28N4	250	200	580	800	**VW3-A68553**	40.000
ATV-68●33N4	220	180	580	800	**VW3-A68553**	40.000
ATV-68●43N4	280	250	1085	1000	**VW3-A68554**	110.000
ATV-68●53N4	250	200	1085	1000	**VW3-A68554**	110.000
ATV-68●63N4	220	170	1085	1000	**VW3-A68554**	110.000

(1) For longer cables, please consult your Regional Sales Office. Choke performance is ensured by not exceeding the cable lengths between the motor and the drive given in the table above. For an application with several motors connected in parallel, the cable length must include all cabling. If a cable longer than that recommended is used, there is risk of the motor chokes overheating.

**Dimensions:
page 2/266**

Variable speed drives for asynchronous motors

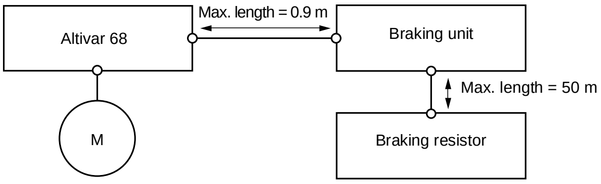
Altivar 68

Options: braking units and resistors

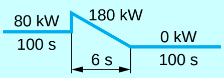
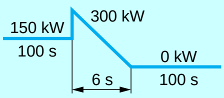
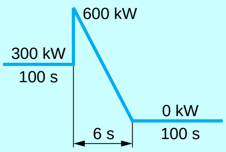
Presentation

The braking unit and resistor are external modules. They enable the Altivar 68 to operate while braking to a standstill or during “generator” operation, by dissipating the braking energy in the resistor.
Resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed in any way. The air must be free of dust, corrosive gas and condensation.

Schematic diagram



Characteristics of braking units

Type of braking unit			**VW3 A687537**	**VW3 A687575**	**2 x VW3 A687575**
Ambient air temperature	Operation	**°C**	0…+ 45		
	Storage	**°C**	- 25…+ 65		
Degree of protection of enclosure			IP 20		
Degree of pollution			2 according to standard EN 50178		
Relative humidity without condensation		**%**	Class 3K3 without condensation		
Maximum operating altitude		**m**	2000		
Vibration resistance			0.2 gn		
Nominal supply voltage and drive supply voltage (rms value)		**V**	400 - 15 %…500 V + 10 %		
Pull-in threshold (adjustable value)		**V ⎓**	660…820 ± 1 %		
Maximum DC bus voltage		**V ⎓**	920		
Maximum braking power on 400 V ∼ supply (790 V default setting)	790 V ⎓ *(1)*	**kW**	180	300	600
	680 V ⎓ *(1)*	**kW**	140	220	440
% conduction time at constant power at 690 V ⎓			6 % at 180 kW	6 % at 300 kW	6 % at 600 kW
			15 % at 140 kW	15 % at 250 kW	15 % at 500 kW
			50 % at 80 kW	50 % at 150 kW	50 % at 300 kW
Cycle time		**s**	≤ 200		
Max. continuous power		**kW**	37	75	150
Braking power on a vertical movement (values given for a 200 s cycle time)			 	 	
Thermal protection			Integrated, via thermal probe		
Forced ventilation		**m³/h**	Flow 45	Flow 90	Flow 2 x 90
Mounting			Vertical		

Characteristics of braking resistors

Type of braking resistor			**VW3 A68706 to VW3 A68718**
Ambient air temperature	Operation	**°C**	0…+ 50
	Storage	**°C**	- 25…+ 75
Degree of protection of enclosure			IP 23
Thermal protection			Via thermal overload relay or via the drive

(1) Braking unit engage threshold

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Selection:
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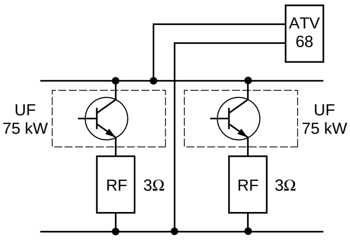
Variable speed drives for asynchronous motors

Altivar 68

Options: braking units and resistors

VW3 A687575



Resistance at drive end = 1.5 Ω (2)

Braking units *(1)*

400 V - 500 V nominal supply voltage

Power		Loss	Cable (drive-braking unit)		Cable (braking unit-resistors)		Reference	Weight
Cont.	**Max.**	**at Pn**	**Cross-section**	**Max. length**	**Cross-section**	**Max. length**		
kW	**kW**	**W**	**mm^2**	**m**	**mm^2**	**m**		**kg**
37	180	250	2 x 50	0.9	2 x 50	50	**VW3 A687537**	9.000
75	300	500	2 x 95	0.9	2 x 95	50	**VW3 A687575**	10.000

Minimum resistance value according to drive

Drive		Braking unit		
Type	**Power High torque/ standard torque**	**VW3 A687537 37 kW unit**	**VW3 A687575 75 kW unit**	**2 75 kW units** *(2)*
	kW	**Ohm**	**Ohm**	**Ohm**
ATV68C10N4	75/90	4.2	4.2	–
ATV68C13N4	90/110	3.3	3	3
ATV68C15N4	110/132	3.3	3	3
ATV68C19N4	132/160	3.3	3	3
ATV68C23N4	160/200	3.3	2.1	1.5
ATV68C28N4	200/250	3.3 *(3)*	2.1	1.5
ATV68C33N4	250/315	3.3 *(3)*	2.1	1.5
ATV68C43N4	315/400	3.3 *(3)*	2.1 *(3)*	1.05
ATV68C53N4	400/500	3.3 *(3)*	2.1 *(3)*	1.05
ATV68C63N4	500/630	3.3 *(3)*	2.1 *(3)*	1.05

Braking resistors

Ohmic value at 20° C *(4)*	*(5)*	Power continuous	Rating of thermal relay	Reference	Weight
		kW			**kg**
4.16	5.64	5	35	**VW3 A68706**	43.000
3.36	4.57	8	49	**VW3 A68707**	50.000
2.16	2.9	10	68	**VW3 A68708**	56.000
4.55	6.23	18	63	**VW3 A68709**	68.000
3.33	4.5	26	88.5	**VW3 A68710**	113.000
4.26	5.74	28.4	82	**VW3 A68711**	113.000
3.28	3.8	32	99	**VW3 A68712**	100.000
2.2	2.6	47	146.5	**VW3 A68713**	115.000
2.1	2.44	59	168	**VW3 A68714**	142.000
3.35	4.5	50	108.5	**VW3 A68715**	135.000
3.1	3.6	70	150.5	**VW3 A68716**	152.000
2.1	2.87	88	205	**VW3 A68717**	115.000
2.1	2.48	100	218.5	**VW3 A68718**	119.000

*(1) For ratings **ATV 68●13N4** to **●63N4** braking units should be connected to the DC bus using the DC bus connection kit **VW3 A68802**, see page 2/260.*

(2) For 2 braking units in parallel, the value given corresponds to the resistance at the drive end. Example: a resistance of 1.5 Ω minimum corresponds to two 3 Ω resistors minimum on each braking unit (see diagram opposite).

(3) Use possible, but not recommended (maximum braking unit power < maximum drive power).

(4) Do not use a resistor with a value less than the minimum value given in the table.

(5) Continuous power ohmic value in a 20 °C environment.

***Nota :** to increase the braking power, it is possible to install several braking resistors in parallel on the same braking unit. In this case do not forget to take into account the minimum resistance value on each unit.*

Presentation, characteristics:
page 2/252

Selection:
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pages 2/276 and 2/277

Variable speed drives for asynchronous motors

Altivar 68

Options: braking units and resistors

Determining the braking unit and resistor

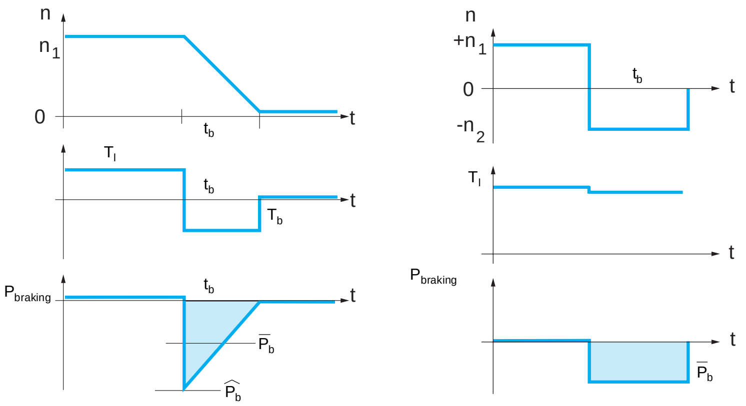
Calculating the various braking powers makes it possible to determine the braking unit and the braking resistor.

Presentation of the two main types of operation: A and B

A The braking power during deceleration is characterised by a peak power $\hat{P}b$ obtained at the start of deceleration, which decreases to 0 in proportion with the speed.
Example: stopping centrifuges, travel, change of direction, etc.

B Braking power at constant speed n_2.
Example: vertical downward movement, motor/generator test bench, gravity conveyors, etc.

n_1	Motor speed	[rpm]
n_2	Motor speed during deceleration	[rpm]
T_l	Load torque	[Nm]
T_b	Braking torque	[Nm]
$\hat{P}_b$	Peak braking power	[W]
P_b	Average braking power during t_b	[W]
t_b	Braking time	[s]



Note: both these types of operation can be combined.

Type A operation

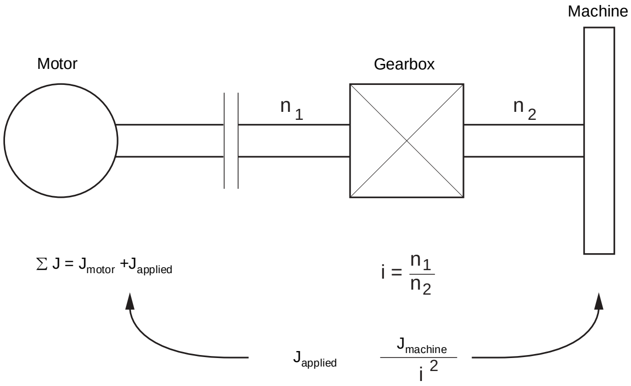
Calculating the braking time from the inertia

$$t_b = \frac{J \cdot \omega}{T_b + T_r} \qquad \omega = \frac{2\pi \cdot n}{60} \qquad T_b = \frac{\Sigma J \cdot (n_1 - n_2)}{9{,}55 \cdot t_b}$$

$$\hat{P}b = \frac{T_b \cdot n_1}{9{,}55}$$

$$\bar{P}b = \frac{\hat{P}b}{2}$$

T_b	Motor braking torque	[Nm]
ΣJ	Total inertia applied to the motor	[kgm²]
n_1	Motor speed ahead of gearbox	[rpm]
n_2	Motor speed after gearbox	[rpm]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
P_b	Average braking power during time t_b	[W]
T_r	Braking torque	[mN]



Variable speed drives for asynchronous motors
Altivar 68
Options: braking units and resistors

W	Kinetic energy	[Joule]
w	Weight	[kg]
v	Speed	[m/s]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
P_b	Average braking power during time t_b	[W]
T_b	Braking torque	[Nm]
n	Motor speed	[rpm]

g	Acceleration	9.81 m/s^2
a	Deceleration	[m/s^2]
v	Linear downward speed	[m/s]
J	Moment of inertia	[kgms^2]
ω	Angular speed	[rad/s]
t_b	Downward stopping time	[s]

$\hat{P}_{bR}$	Maximum actual braking power	[W]
P_{bR}	Continuous actual braking power	[W]
η_{total}	Total efficiency	
P_{load}	Braking power connected with the resistive or driving torque (not taken into account in the calculation). P_{load} can be positive or negative.	[W]
η_{drive}	Drive efficiency = 0.98	
η_{mec}	Mechanical efficiency	
η_{mot}	Motor efficiency	

U_{dc}	Braking unit engage threshold	[V]

t_c	Cycle time	[s]
P_{b0}	Upward braking power, therefore zero	[W]
t_0	Upward movement time	[s]
P_{b1}	Average braking power during downward movement	[W]
t_1	Downward movement time	[1]
$\hat{P}_b$	Peak braking power	[W]
P_{b2}	Average power during braking to a standstill	[W]
t_2	Standstill braking time	[s]

$$P_{continuous} = \frac{\bar{P}_{b0} \times t_0 + \bar{P}_{b1} \times t_1 + \bar{P}_{b2} \times t_2}{t_c} \quad [W]$$

Type B operation

1 *Braking power of a load moving horizontally with constant deceleration (eg.: carriage)*

$$W = \frac{w \cdot v^2}{2} \qquad \bar{P}_f = \frac{W}{t_b} \qquad \hat{P}_b = \bar{P}_b \cdot 2$$

2 *Braking power for an active load (eg.: test bench)*

$$\bar{P}_b = \frac{T_b \cdot n}{9,55}$$

3 *Braking power for a downward vertical movement*

$$\bar{P}_b = w \cdot g \cdot v \qquad \hat{P}_b = w \cdot (g + a) \cdot v + \frac{J \cdot \omega^2}{t_b} \qquad \omega = \frac{2\pi \cdot n}{60}$$

All the braking power calculations are only true if it is assumed that there are no losses (η = 1) and that there is no resistive torque.

To be even more precise, the following must be considered:
- the losses and the resistive torque of the system, which reduce the necessary braking power,
- the driving torque, for example the wind, which increases the braking power.

The required braking power is calculated as follows:

$$\hat{P}_{bR} = (\hat{P}_b - P_{load}) \times \eta^2 total \qquad \bar{P}_{bR} = (\bar{P}_b - P_{load}) \times \eta^2 total$$

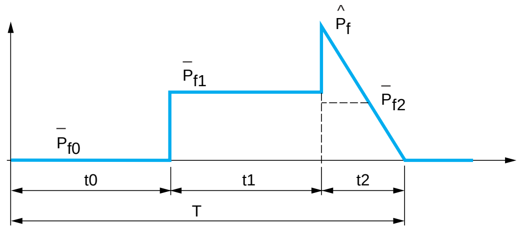
$$\eta_{total} = \eta_{mec} \times \eta_{mot} \times 0,98$$

For braking, the value of the braking resistor is selected to match the required power and the braking cycle.

In general:

$$\hat{P}_{bR} = \frac{U^2 dc}{R} \Rightarrow R = \frac{U^2 dc}{\hat{P}_{bR}}$$

Continuous power is obtained by taking the operating cycle into account.



The braking unit is selected taking the following into account:
- the continuous power $\bar{P}_{b1}$
- the average braking power during downward movement $\bar{P}_{b2}$
- the peak power $\hat{P}_b$

Select the braking unit according to the characteristics on page 2/252.
The braking resistor is selected taking account of the same elements listed above but with the addition of a check to ensure that the resistance value will allow the peak power to be exceeded $\left(R = \frac{U^2 dc}{\hat{P}_b}\right)$.

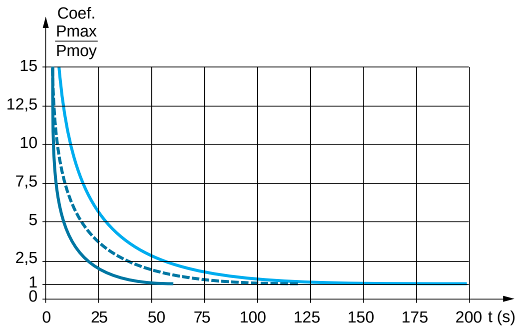
Note: the resistance value must always be greater than or equal to the values given in the table on page 2/253.

Variable speed drives for asynchronous motors

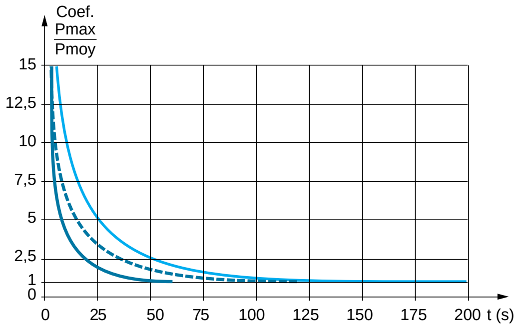
Altivar 68

Characteristics of braking resistors

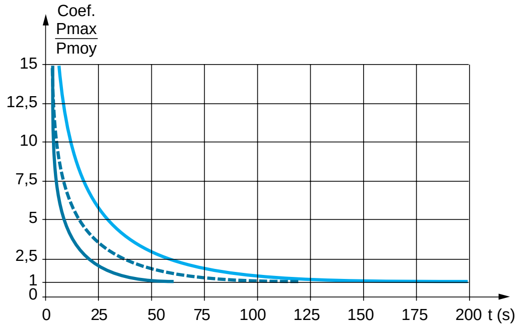
VW3 A68706 (P continuous = 5 kW)



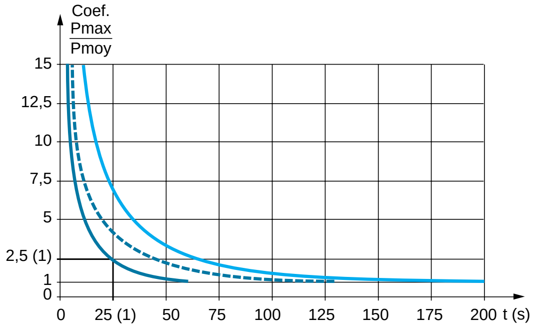
VW3 A68706 (P continuous = 8 kW)



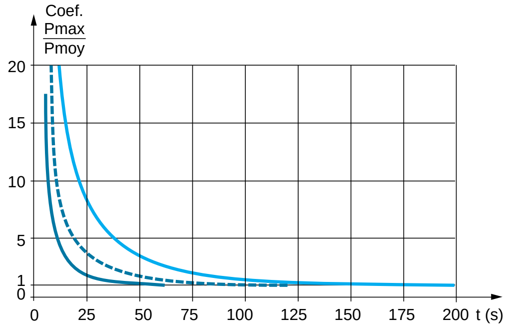
VW3 A68708 (P continuous = 10 kW)



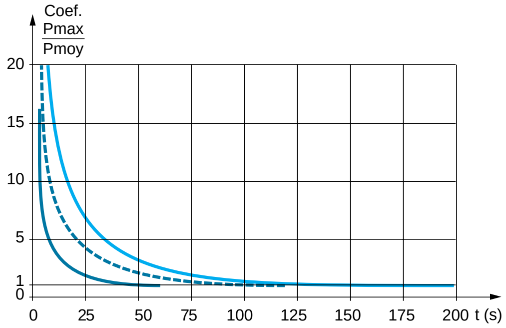
VW3 A68709 (P continuous = 18 kW) ***(1)***



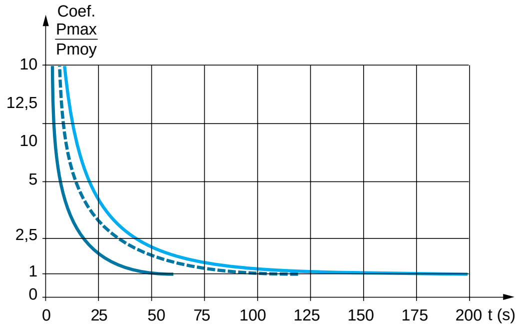
VW3 A68710 (P continuous = 26 kW)



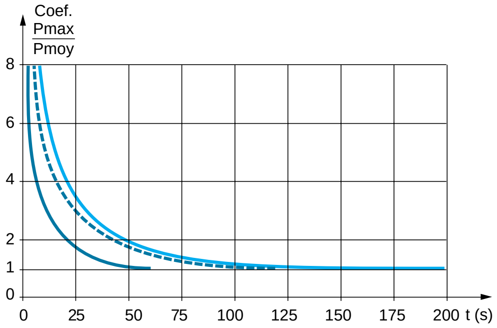
VW3 A68711 (P continuous = 28.4 kW)



VW3 A68712 (P continuous = 32 kW)



VW3 A68713 (P continuous = 47 kW)



— *P max/P av (60 s cycle)*
- - *P max/P av (120 s cycle)*
— *P max/P av (200 s cycle)*

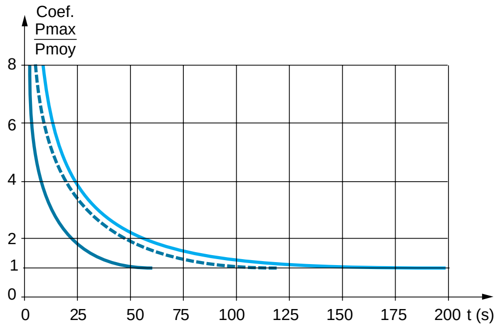
(1) Example:
for a 60 s cycle, resistor VW3 A68709 18 kW will take an overload of 2.5 x 18 for 25 s i.e. 45 kW for 25 s.

Variable speed drives for asynchronous motors

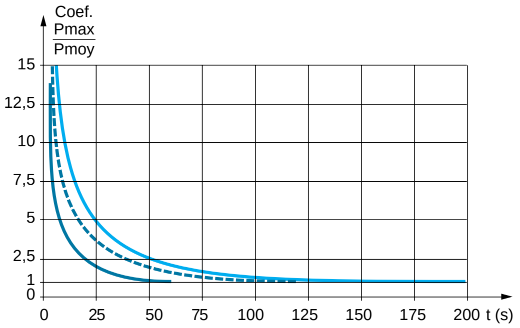
Altivar 68

Characteristics of braking resistors

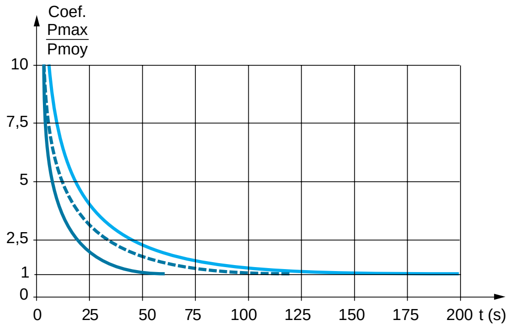
VW3 A68714 (P continuous = 59 kW)



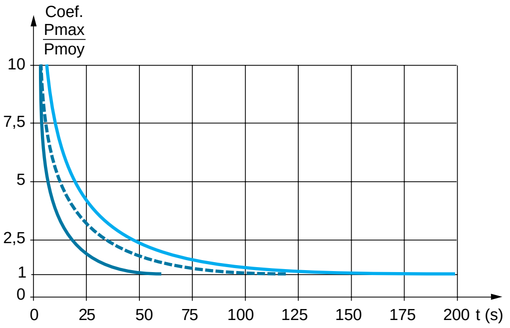
VW3 A68715 (P continuous = 50 kW)



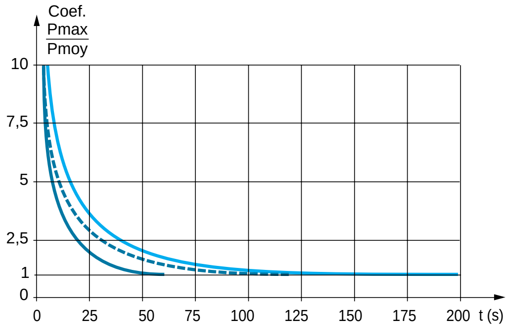
VW3 A68716 (P continuous = 70 kW)



VW3 A68717 (P continuous = 88 kW)



VW3 A68718 (P continuous = 100 kW)



— *P max/P av (60 s cycle)*
- - - *P max/P av (120 s cycle)*
— *P max/P av (200 s cycle)*

Presentation

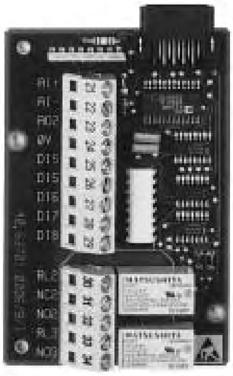
The card comprises:
- 1 analogue input 0(4)…20 mA,
- 1 analogue output 0(4)…20 mA,
- 4 logic inputs,
- 1 output relay with C/O contact,
- 1 output relay with N/O contact.

All these I/O have identical characteristics to those of the basic drive.
It is possible to mount 2 I/O cards or 1 I/O extension card and 1 Profibus communication card on each drive. They are connected to the control card connector.

Characteristics

Analog input AI2 (differential amplifier)	1 analogue current input: 0(4)…20 mA Load: 250 Ω Precision ± 1.1 % of full scale (20 mA) 10-bit resolution Stability ± 0.2 % for a 10 °C variation Zero current monitoring (detection at 3 mA) Programmable limit and operation Acquisition time 5 ms
Analogue output AO2	1 analogue current output: 0(4)…20 mA with programmable limit and operation Maximum external load: 600 Ω 10-bit resolution Precision: - frequency, current, voltage: ± 1.5 % - torque, apparent or actual power: ± 5 % Acquisition time 5 ms
Logic inputs LI	4 2-pole inputs DI5 to DI8: positive or negative logic Programmable operation (1) Minimum recognition time: 10 ms Consumption: approx. 8 mA at 24 V
Relay outputs RL	2 relay outputs RL2 and RL3 Programmable relay Switching voltage: ∿ 250 V or ⎓ 30 V Switching power: 1250 VA max., 150 W Max. DC current: 3 A Min. switched current (new relay): ⎓ 24 V, 3 mA In PELV conditions, the external power supply must also be PELV (24 V) Electrical isolation between the line supply and the relay power supply RL2: changeover contact: N/C + N/O RL3: N/O contact

References



VW3-A68201

Description	For drives	Reference	Weight kg
I/O extension card	ATV-68 all ratings	**VW3-A68201**	0.200

(1) On the 1st I/O extension card, input DI5 is assigned to locking the drive.

Presentation, characteristics, references

Variable speed drives for asynchronous motors

Altivar 68
Options: communication cards

Presentation

The Altivar 68 can be adapted for communication by adding a communication card or module.
The models are available for the following buses: Fipio, Modbus Plus, Modbus RTU and Profibus DP.
The Fipio and Modbus Plus cards require the use of a connection kit.
The Modbus RTU module requires connection cables.
The Profibus DP card is connected directly to the drive.

Functions common to the Fipio, Modbus Plus, Modbus RTU and Profibus DP cards and module

- **Control** (accessible in read and write): run/stop, braking, frequency reference, fault reset, etc.
- **Signalling** (only accessible in read): drive status register, motor speed, motor current, logic I/O status register, fault register, etc.
- **Authorisation** of local control (via terminals)

Functions specific to the Profibus DP card

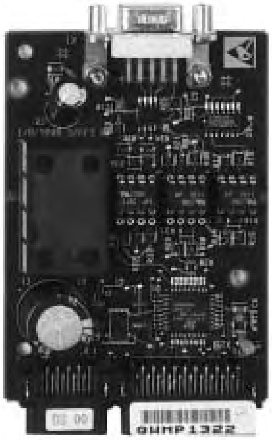
- **Configuration** (accessible in read and write): line supply frequency, motor voltage, ramp profile, I/O assignment, etc.
- **Adjustment** (accessible in read and write): DC injection time and amplitude, thermal protection, speed range, ramp time, current limitation, etc.

Characteristics

Protocol	Fipio	Modbus Plus	Modbus RTU	Profibus DP
Number of drives controlled	62	64	31	127
Transmission speed	19.2 Kbps	19.2 Kbps	1.2 to 19.2 Mbps	1.5 Mbps

References

VW3-A68301 or VW3-A68302



VW3-A68307

Communication kits, module and cards

For ATV-68 drives, all ratings Protocol	Reference	Weight kg
Fipio :	**VW3-A68301**	1.400
The kit comprises:		
- the FIPIO communication card, reference VW3-A58311, equipped with a 9-way male SUB-D connector, which will take a TSX FP ACC 12 removable connector with TSX FP CA●● connecting cable or TSX FP CC●● tap cable (1)		
- the communication interface, reference VW3-A68300,		
- the connecting cable, reference VW3-A68332.		
An external 24 V ⎓, 200 mA minimum, power supply must be provided (type TBX SUP10) to be ordered separately.		
Modbus Plus:	**VW3-A68302**	1.400
The kit comprises:		
- the Modbus Plus card, reference VW3-A58302, equipped with a 9-way female SUB-D connector, which will take a Modbus Plus tap cable equipped with connectors, reference 990 NAD 21110 or 990 NAD 21130, to be connected to a Modbus Plus tap, reference 990 NAD 230 00, for connection to the Modbus Plus trunk cable, reference 490 NAA 271 ●● (1)		
- the communication interface, reference VW3-A68300,		
- the connecting cable, reference VW3-A68332.		
An external 24 V ⎓, 200 mA minimum, power supply must be provided (type TBX SUP10) to be ordered separately.		
Modbus RTU		
Communication module equipped with an RJ45 connector and a 9-way female SUB-D connector, 2-wire RS 485 serial link.	**VW3-A68303**	1.400
The module is supplied without cable or documentation, which should be ordered separately.		
Connecting cable from ATV 68 to the module.	**VW3-A68313**	0.150
Connecting cable from the module to a Modbus T-junction box TSX SCA62 (1).	**VW3-A68306**	0.150
Documentation: user manual.	**VVDED301064**	–
The module configuration can be modified using ABC Configurator software.		
An external 24 V ⎓ power supply must be provided.		
Profibus DP: The card is equipped with a 9-way female SUB-D connector for connection using cables equipped with connectors (please consult manufacturer's catalogue).	**VW3-A68307**	0.300

(1) To order **Fipio** cables and **Modbus Plus** and **Modbus RTU** cables and connectors, please consult our "Modicon Premium and PL7 software" and "Modicon TSX Micro and PL7 software" catalogues.

Variable speed drives for asynchronous motors

Altivar 68

Options: programming terminal support, PC-based setup software, DC bus connection

VW3 A68800

Programming terminal remote mounting kit

The terminal is supplied with the drive.

A terminal support option allows remote location of the drive terminal at a maximum distance of 3 metres. This mechanical option supports the control card, the programming terminal and any I/O cards. It is particularly suitable for mounting on the enclosure door.

Description	For drives	Reference	Weight kg
Terminal support with 3 m remote location cable	ATV-68 all ratings	**VW3 A68800**	3.000

PC-based setup software

This option is available in the form of a kit for setting up an RS 232 C standard link between the Altivar and a PC operating in a Microsoft Windows environment.

Minimum configuration: 486 PC with 8 Mb of RAM.
Recommended configuration: Pentium 2 with 32 Mb of RAM.
Possible environment: Windows 95, Windows 98, or Windows NT.

Main functions:

- drive configuration,
- configuration backup,
- print out of complete parameter list,
- ability to load a configuration from one drive to another,
- oscilloscope mode for maintenance,
- local control.

Description	For drives	Reference	Weight kg
PC interconnection kit comprising: - a VW3 A68332 connection cable, length 3 m, with 1 9-way SUB-D socket and 1 RJ45 data socket, - 3 x 3" 1/2 1.44 Mb disks, - a quick reference guide.	ATV-68 all ratings	**VW3 A68331**	0.250

DC bus connection

This kit is used to connect the braking unit or external load circuit options to the drive’s DC bus, and also to connect several drives in parallel.

Description	For drives (1)	Reference	Weight kg
DC bus connection kit comprising: - 1 U-shaped copper bar, - 1 20 mm thick copper bar with fixing nuts.	ATV-68●13N4 to ●63N4	**VW3 A68802**	0.250

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(1) For the ATV-68●10N4 drive, the DC bus is directly accessible on the power terminals.

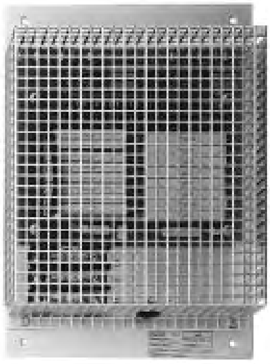
Dimensions:
page 2/267

Schemes:
page 2/274

Variable speed drives for asynchronous motors

Altivar 68
Options: external load circuit, earth protection and IT connection, air ducting kit, fan

External load circuit (degree of protection IP 20)


VW3 A68180

This circuit is used when connecting several drives in parallel on the DC bus, the total power of which must not exceed 500 kW (for high torque applications), in order to avoid a possible overload when powering up.

Description	For drives	Reference	Weight kg
External load circuit	ATV-68 all ratings	**VW3 A68180**	3.000

Earth fault detection in IT connection (isolated neutral)


VW3 A68190

This option protects the drive in the event of an earth fault between the drive and the motor, by measuring the differential current between the three phases of the line supply.
It is connected to a 0-20 mA analogue input.

Description	For drives	Reference	Weight kg
Detection kit for earth faults comprising: a current transformer with an integrated load block	ATV-68 all ratings	**VW3 A68190**	0.500

Air ducting kit (enclosure with IP 23 protection)

This kit evacuates hot air from the power part to the outside when the drive is mounted in an enclosure with IP 23 protection.
The temperature outside the enclosure must not exceed the maximum ambient temperature around the drive - 5 °C, see drive characteristics, page 2/242 and installation recommendations, page 2/269.


VW3 A68801

Description	For drives	Number of kits required per drive	Reference	Weight kg
Kit comprises: - a tube, - an IP 23 protection grille.	ATV-68●13N4 to ●19N4	1	**VW3 A68801**	0.500
	ATV-68●23N4 to ●33N4	2	**VW3 A68801**	0.500
	ATV-68●43N4 to ●63N4	4	**VW3 A68801**	0.500

External fan (enclosure with IP 23 protection)

The fan enables the drive to be mounted in an enclosure with IP 23 protection by increasing the evacuation or hot air to the outside. This is used to obtain a maximum temperature outside the enclosure equal to the maximum ambient temperature around the drive, see drive characteristics, page 2/242 and installation recommendations, page 2/269.


VW3 A68820

Description	For drives	Number of kits required per drive	Reference	Weight kg
Ventilation kit comprising: - a fan, - an IP 23 protection unit.	ATV-68●10N4 to ●33N4	1	**VW3 A68820**	15.000
	ATV-68●43N4 to ●63N4	2	**VW3 A68820**	15.000

Dimensions:
page 2/267

Schemes:
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Variable speed drives for asynchronous motors

Altivar 68

Combinations

Line supply	Motor		ATV-68 drive for applications		Options				
Supply voltage 50/60 Hz	Power indicated on plate		standard torque (120 % Tn)	high torque (150 % Tn)	Line chokes	RFI input filter 400 V	RFI input filter 440…500 V	Motor chokes	Braking unit and resistor
	kW	HP	See p. 2/246 and 2/247		See p. 2/249	See p. 2/250	See p. 2/250	See p. 2/251	See p. 2/253
400 …500 V 3-phase	75	100	–	**ATV-68●10N4**	VW3-A68501	VW3-A68401	VW3-A68415	VW3-A68551	VW3-A68●●●
	90	–	**ATV-68●10N4**	–	VW3-A68501	VW3-A68401	VW3-A68415	VW3-A68551	VW3-A68●●●
	90	125	**–**	**ATV-68●13N4**	VW3-A68502	VW3-A68402	VW3-A68435	VW3-A68552	VW3-A68●●●
	110	–	**ATV-68●13N4**	–	VW3-A68502	VW3-A68402	VW3-A68435	VW3-A68552	VW3-A68●●●
	110	150	–	**ATV-68●15N4**	VW3-A68503	VW3-A68402	VW3-A68435	VW3-A68552	VW3-A68●●●
	132	–	**ATV-68●15N4**	–	VW3-A68503	VW3-A68402	VW3-A68435	VW3-A68552	VW3-A68●●●
	132	200	–	**ATV-68●19N4**	VW3-A68504	VW3-A68402	VW3-A68435	VW3-A68552	VW3-A68●●●
	160	–	**ATV-68●19N4**	–	VW3-A68504	VW3-A68402	VW3-A68435	VW3-A68552	VW3-A68●●●
	160	250	–	**ATV-68●23N4**	VW3-A68505	VW3-A68403	VW3-A68465	VW3-A68553	VW3-A68●●●
	200	–	**ATV-68●23N4**	–	VW3-A68505	VW3-A68403	VW3-A68465	VW3-A68553	VW3-A68●●●
	200	300	–	**ATV-68●28N4**	VW3-A68506	VW3-A68403	VW3-A68465	VW3-A68553	VW3-A68●●●
	250	–	**ATV-68●28N4**	–	VW3-A68506	VW3-A68403	VW3-A68465	VW3-A68553	VW3-A68●●●
	250	350	–	**ATV-68●33N4**	VW3-A68507	VW3-A68403	VW3-A68465	VW3-A68553	VW3-A68●●●
	315	–	**ATV-68●33N4**	–	VW3-A68507	VW3-A68403	VW3-A68465	VW3-A68553	VW3-A68●●●
	315	500	–	**ATV-68●43N4**	VW3-A68505 (1)	VW3-A68404	VW3-A68465 (2)	VW3-A68554	VW3-A68●●●
	400	–	**ATV-68●43N4**	–	VW3-A68505 (1)	VW3-A68404	VW3-A68465 (2)	VW3-A68554	VW3-A68●●●
	400	600	–	**ATV-68●53N4**	VW3-A68506 (1)	VW3-A68404	VW3-A68465 (2)	VW3-A68554	VW3-A68●●●
	500	–	**ATV-68●53N4**	–	VW3-A68506 (1)	VW3-A68404	VW3-A68465 (2)	VW3-A68554	VW3-A68●●●
	500	800	–	**ATV-68●63N4**	VW3-A66507 (1)	VW3-A68404	VW3-A68465 (2)	VW3-A68554	VW3-A68●●●
	630	–	**ATV-68●63N4**	–	VW3-A66507 (1)	VW3-A68404	VW3-A68465 (2)	VW3-A68554	VW3-A68●●●

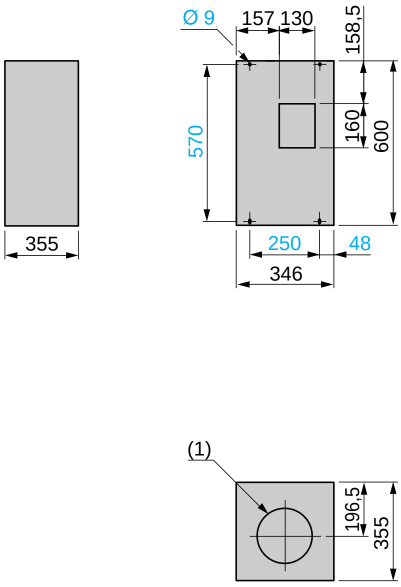
(1) Allow for 2 chokes per speed drive.
(2) Allow for 2 filters per speed drive.

I/O extension card See p. 2/258	Communi-cation cards See p. 2/259	Programming terminal remote mounting kit See p. 2/260	PC-based setup software See p. 2/260	DC bus connection See p. 2/260	External load circuit See p. 2/261	Earth fault detection in IT connection See p. 2/261	Air ducting kit to exterior of IP 23 enclosure See p. 2/261	External fan IP 23 enclosure See p. 2/261
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	–	VW3-A68180	VW3-A68190	–	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	–	VW3-A68180	VW3-A68190	–	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820
VW3-A68201	VW3-A●830●	VW3-A68800	VW3-A68331	VW3-A68802	VW3-A68180	VW3-A68190	VW3-A68801	VW3-A68820

Variable speed drives for asynchronous motors

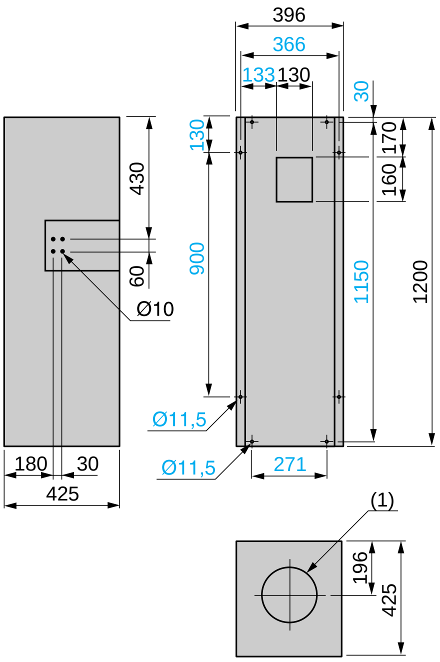
Altivar 68

ATV-68●10N4 (Size 2)



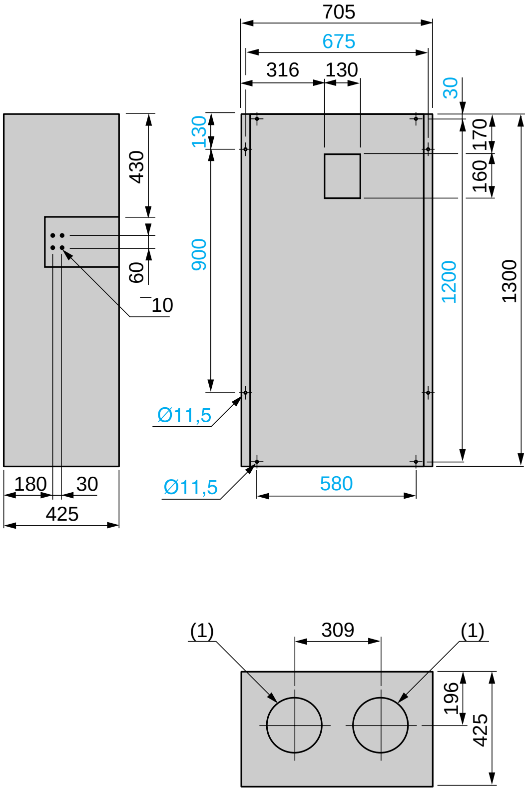
(1) Air outlet Ø 200 mm

ATV-68●13N4 to ●19N4 (Size 3)



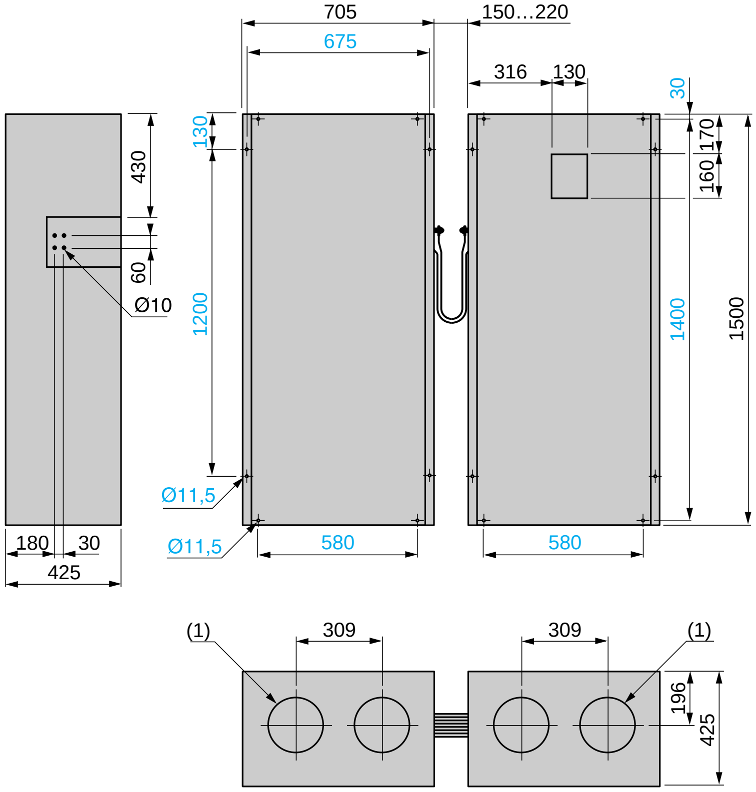
(1) Air outlet Ø 200 mm

ATV-68●23N4 to ●33N4 (Size 4)



(1) Air outlet Ø 200 mm

ATV-68●43N4 to ●63N4 (Size 5)

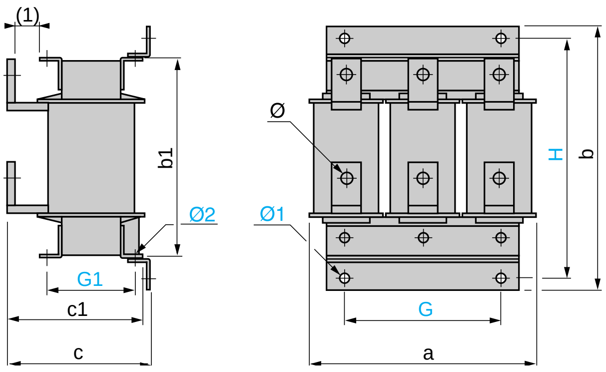


(1) Air outlet Ø 200 mm

Variable speed drives for asynchronous motors

Altivar 68

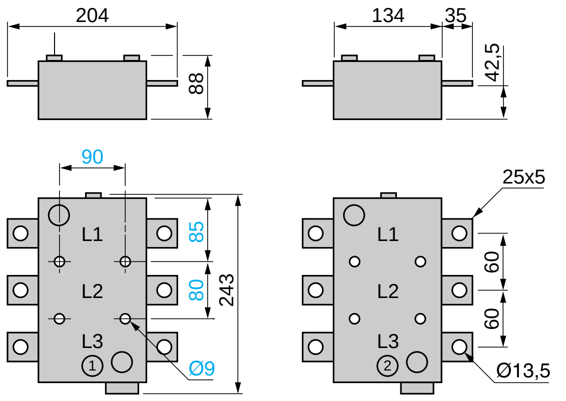
Line chokes
VW3-A68501 to A68507



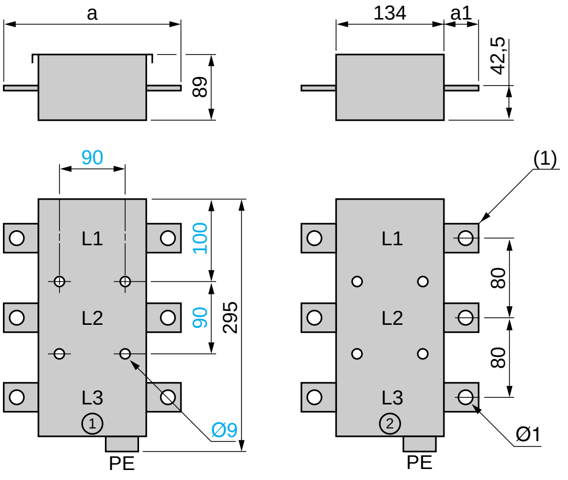
VW3-	a	b	b1	c	c1	G	G1	H	Ø	Ø1	Ø2
A68501	280	305	240	210	200	200	125	275	9	9	9
A68502	280	330	260	210	200	200	125	300	11	9	9
A68503	320	380	300	210	200	225	150	350	11	9	9
A68504	320	380	300	210	200	225	150	350	11	9	9
A68505	320	380	300	250	230	225	150	350	13	11	11
A68506	320	380	300	250	230	225	150	350	13	11	11
A68507	320	380	300	250	230	225	150	350	13	11	11

(1) 25 mm min.

Radio interference input filters
VW3-A68401 (2 elements)

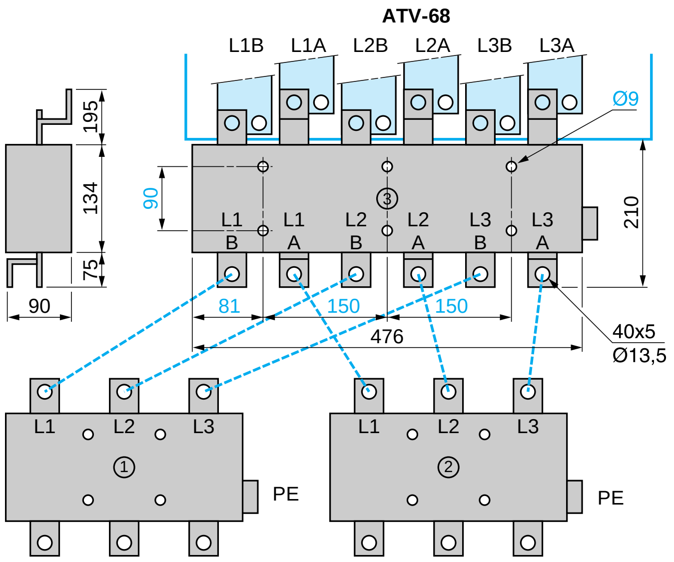


Radio interference input filters
VW3-A68402, A68403 (2 elements)

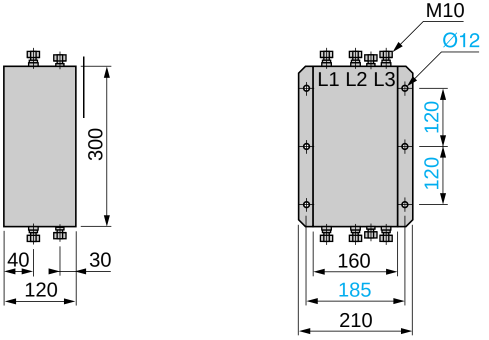


VW3-	a	a1	Ø1	(1)
A68402	204	35	11	30 x 5 bar
A68403	224	40	13.5	40 x 5 bar

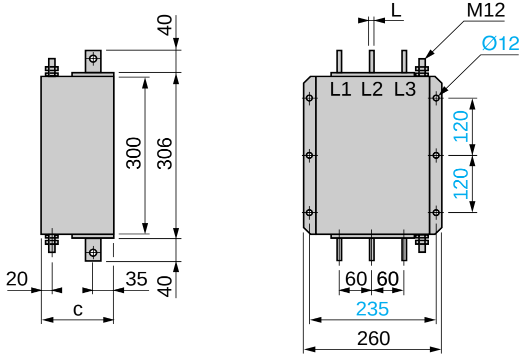
VW3-A68404 (3 elements)



VW3-A68415



VW3-A68435 and A68465



VW3-	c	L
A68435	115	6
A68465	135	8

Presentation:
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Characteristics:
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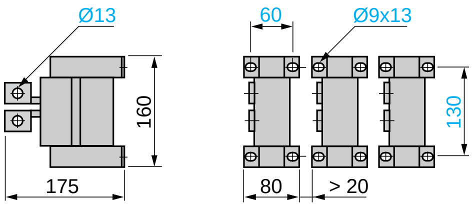
References:
pages 2/248 to 2/250

Variable speed drives for asynchronous motors

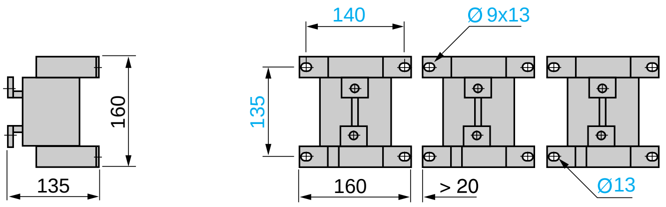
Altivar 68

Additional motor chokes

VW3 A68551

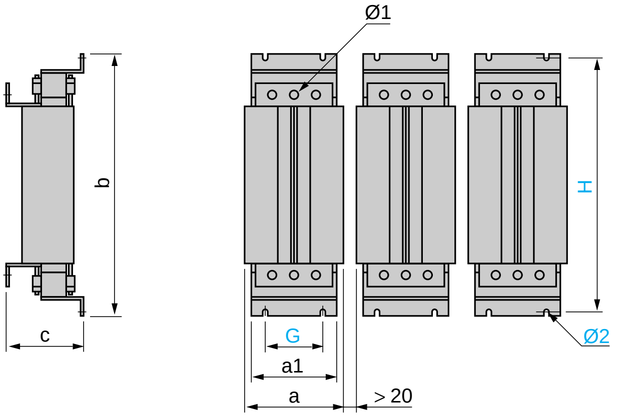


VW3 A68552



Additional motor chokes

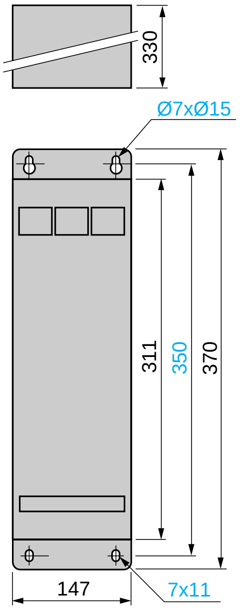
VW3 A68553 and **VW3 A68554**



VW3	a	a1	b	c	G	H	Ø1	Ø2
A68553	185	120	375	155	75	325…345	13	9 x 20
A68554	210	170	475	210	125	425…445	2 x 13	9 x 20

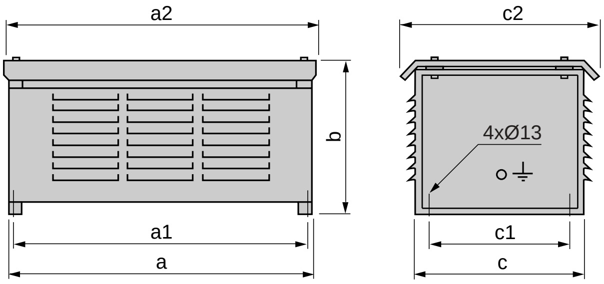
Braking units

VW3 A687537 and **VW3 A687575**

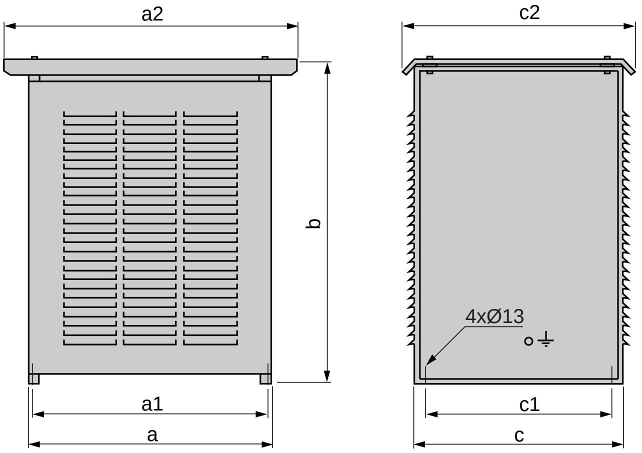


Braking resistors

VW3 A68706 to **VW3 A68711**



VW3 68712 to **VW3 A68718**

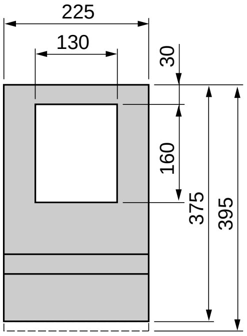


VW3	a	a1	a2	b	c	c1	c2
A68706	500	472	530	440	480	400	540
A68707	580	552	610	440	480	400	540
A68708	670	642	700	440	480	400	540
A68709	860	232	890	440	480	400	540
A68710	860	232	890	690	480	400	540
A68711	860	232	890	690	480	400	540

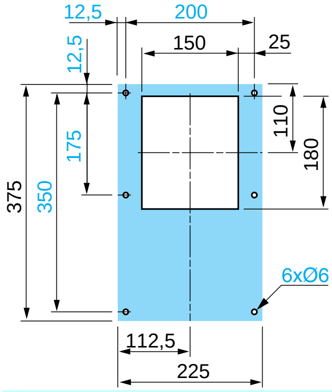
VW3	a	a1	a2	b	c	c1	c2
A68712	960	932	1140	1150	380	300	460
A68713	960	932	1140	1150	540	460	620
A68714	960	832	1040	1150	540	660	820
A68715	860	932	1140	1150	740	460	620
A68716	960	932	1140	1150	540	660	820
A68717	960	832	1040	1150	740	460	620
A68718	860	932	1140	1150	540	460	620

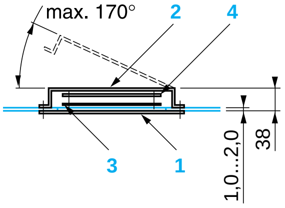
Remote mounting kit for programming terminal

VW3 A68800



Cut-out for mounting support
VW3 A68552

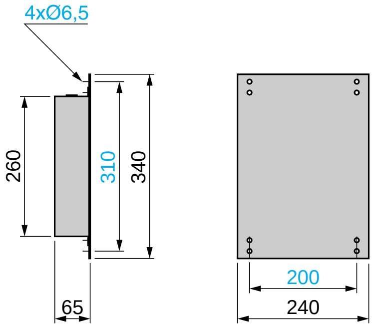




1 Front plate
2 Internal pivoting plate
3 Keyboard membrane
4 Terminal card

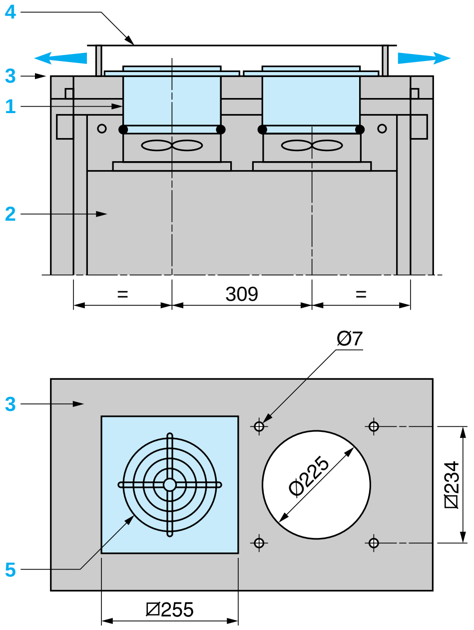
External load circuit

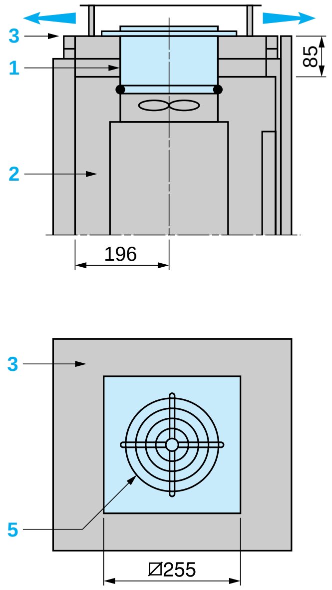
VW3 A68180



Air ducting kit

VW3 A68801



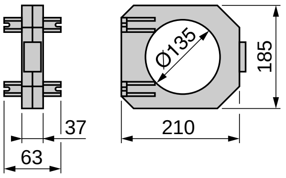


1 VW3-A68801 tube
2 Drive size 4 (for size 5, 4 VW3 A68801) tubes are necessary
3 Enclosure top cover
4 Additional cover grille
5 Cover grille

1 VW3 A68801 tube
2 Drive size 3
3 Enclosure top cover
4 Additional cover grille
5 Cover grille

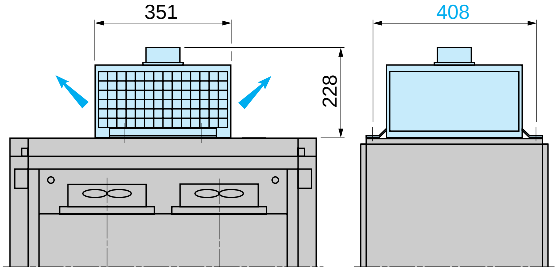
Earth fault detection kit

VW3 A68190

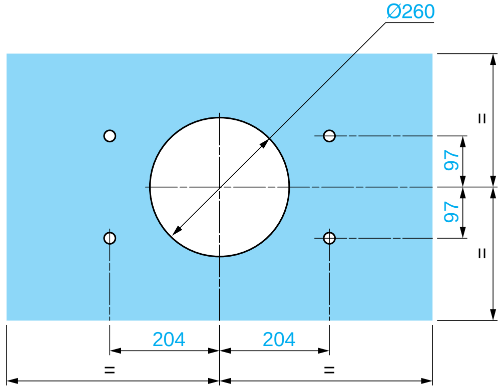


External fan

VW3 A68820



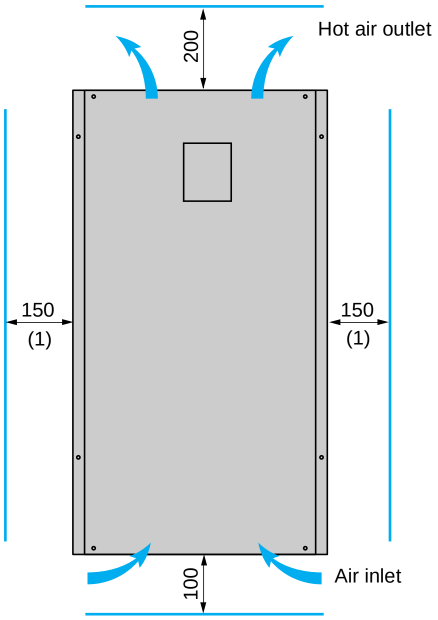
Cut-out for support



Variable speed drives for asynchronous motors

Altivar 68

Installation recommendations for all ratings of ATV-68



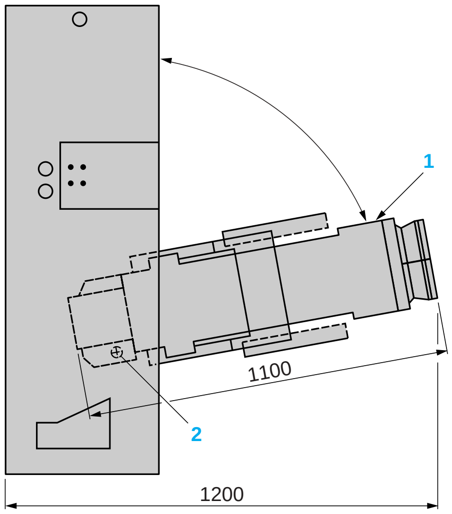
- Observe the minimum dimensions shown opposite when installing.
- Install the Altivar in a vertical position (2).
- Make provision for evacuation of the hot air to the outside of the enclosure.
- Make provision for an air inlet on the door of the enclosure.

Pay attention to the ambient temperature (see Characteristics, page 2/242).

Avoid harmful environments such as those with high temperature and humidity levels as well as environments containing dust, dirt or corrosive gases. The location must be well ventilated and away from direct sunlight.
Install the equipment against a vertical surface which is fireproof and vibration-free.

(1) Clearances at the sides are only required for access during maintenance. If the equipment can be easily removed, these distances are not necessary.
(2) To ensure convection cooling, the Altivar 68 drives are designed for vertical installation. Observe the minimum recommended clearances, especially if the equipment is enclosed.
The ingress of objects during installation risks causing damage to the installation: ensure that no objects, wires, wire insulation, swarf or dust enter the equipment by covering it when it is not connected to the supply.

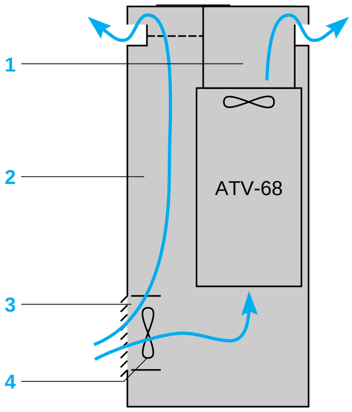
Installation recommendations for ATV-68●13N4 to ●63N4



- The power block is accessed by tilting it forward, for ratings ATV-68●13N4 to ●63N4. For maintenance provide a free space of 1.20 m in front of the Altivar.

1 Power block
2 Rotation axis

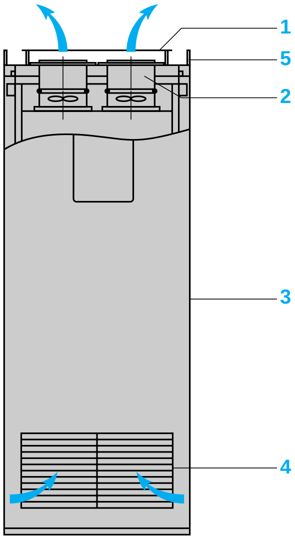
Installing the ATV-68●10N4 drive in an IP 20 or IP 23 enclosure
For a maximum ambient temperature of + 40 °C outside the enclosure

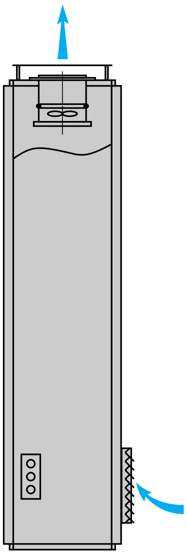


1 Air duct in order to avoid circulation of air from the power part inside the enclosure
2 Open section to facilitate the circulation of air
3 Air inlet (without filter) 6 dm^3
4 Fan

Air flow: 450 m^3/h

Installing ATV-68●13N4 to ●63N4 drives in IP 20 or IP 23 enclosures (1)
For a maximum ambient temperature of + 35…+ 40 °C (2) outside the enclosure





1 Top cover should be a minimum of 60 mm from the air outlets.
2 Hot air evacuation duct (VW3-A68801): 1, 2 or 4 outlets in the upper part of the enclosure depending on the rating (internal diameter 195 mm with rubber seal).
3 Partition with holes for cables to pass through, do not obstruct.
4 Drive air inlet.
5 Compulsory separator.

The grille in the upper part 1 must be at least 60mm away from the roof of the enclosure and should guarantee air circulation on all sides.
Mounting of separators 5 is essential if the fans of adjacent enclosures create back pressure.
Circulation of air within the enclosure must not be obstructed by the presence of additional components (line chokes, motor chokes, etc., except for radio interference filters and wiring) mounted between the enclosure air inlet and the drive air inlet 4 in the lower part and between the drive air outlet and enclosure air outlet in the upper part.

No heat source should be mounted under the drive!

Surface area of air inlet 4 according to drive rating

ATV-68	Surface area in dm² (3)
●13N4 to **●19N4**	7
●23N4 to **●33N4**	10
●43N4 to **●68N4**	20

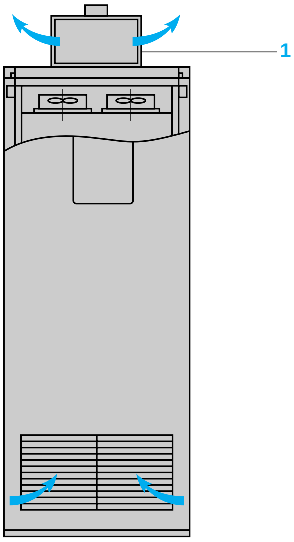
Air circulation around the ventilation outlet should be around 10 m/s (approx. 35 km/h) so that each air duct creates an increase in pressure.

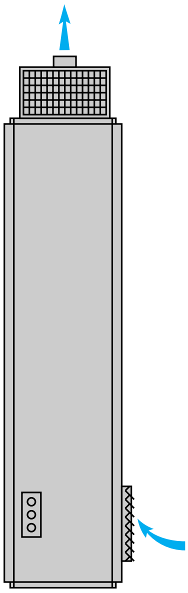
Air flow according to drive rating

ATV-68	Flow in m³/h
●13N4 to **●19N4**	600
●23N4 to **●33N4**	2 x 600
●43N4 to **●68N4**	4 x 600

If another enclosure is mounted immediately adjacent to the drive, the enclosure partition 3 must be closed to avoid heat exchange.

For a maximum ambient temperature of + 40…+ 45 °C outside the enclosure





1 Additional fan VW3-A68820.

The additional fan 1 avoids drive derating for an ambient air temperature outside the enclosure of + 40…+ 45 °C, see drive characteristics, page 2/242.

Volume processed > 1500 m³/h.

The cooling air flowing through the enclosure fans is evacuated by the additional fan (air duct need not be used).

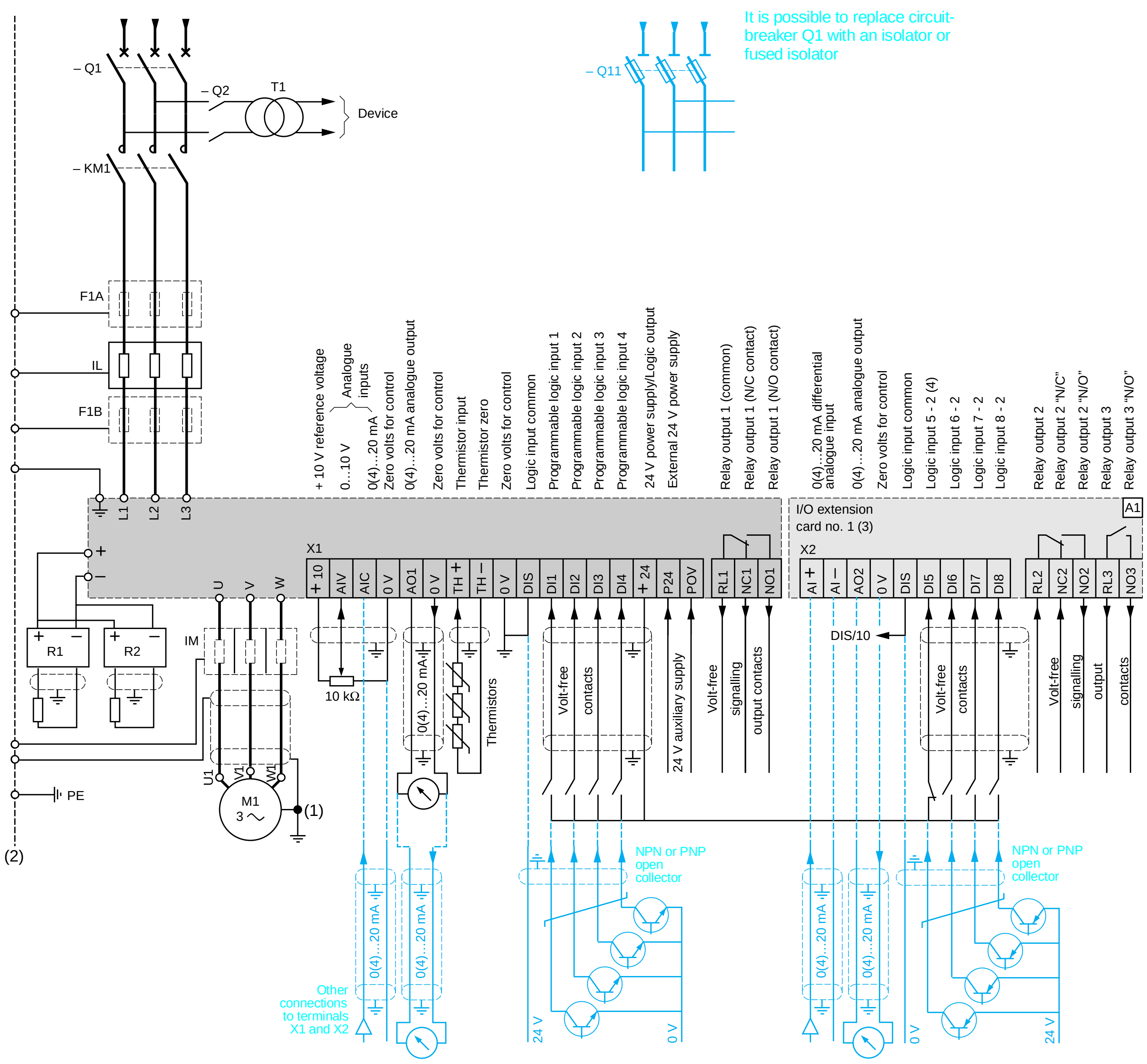
---

(1) For IP 54 installation, please consult your Regional Sales Office.
(2) To determine the maximum ambient temperature: see drive characteristics, page 2/242 and reduce by 5 °C to take account of the temperature rise due to mounting in an enclosure.
(3) Defined surface area without filter.

Variable speed drives for asynchronous motors

Altivar 68

Wiring diagram for ATV-68●10N4 to ATV-68●33N4 (supply voltage 400 V)



It is possible to replace circuit-breaker Q1 with an isolator or fused isolator

Other connections to terminals X1 and X2

---

(1) Motor cable shielding is necessary if the environment is sensitive to radiated interference. At the drive end, fix and ground the shielding to the mounting plate using 360° contact stainless steel clamps.
The main function of the motor cable shielding is to limit radio frequency radiation. Therefore use a 4-pole cable for the motor, connecting each end of the shielding. The protection material (copper or steel) is of less importance than the quality of the connection at both ends. An alternative is to use metal trunking of high conductivity ensuring continuity throughout.
(2) Conductive mounting plate (in stainless or galvanised steel) to connect the motor cable shielding ground and to ensure ground equipotentiality between filter, drive and shielding.
All connections should be marked --- representing the EMC equipotential required for the flow of high frequency interference: protection connections, ground connections to shielding plates and interconnection of shielding.
They require low impedance at high frequencies; use machine ground wiring or, when this is not possible, large cross-section braiding (as short as possible). They can be in parallel with the normal protective conductor (green/yellow) which ensures safety.
(3) It is possible to mount a second I/O card on the X3 connector.
(4) Not programmable on the first I/O extension card assigned to: "drive locking".

Presentation:
pages 2/240 and 2/241

Characteristics:
pages 2/242 to 2/245

References:
pages 2/246 and 2/247

Dimensions:
page 2/264

Components to connect to ATV-68●10N4 to ATV-68●33N4 drives

Label	Description
A1	ATV-68 ●10N4 to ●33N4 drives
F1A - F1B	Radio interference input filters in 2 parts, see page 2/250. Their IL line choke connections must be as short as possible. At 500 V, the filter is a single part, place it at F1B.
IL	Line chokes, see page 2/249.
IM	Motor chokes, see page 2/251.
KM1	LC1-F●●● with suppressor (see pages 2/278 and 2/279). Optional contactor - Avoid frequent operation of contactor KM1 (risk of premature ageing of filter capacitors). Instead use the drive locking function. - In the case of cycles < 60 s, this is essential, to avoid risk of damaging the capacitator load card. - If the safety standards require motor isolation, install a contactor at the drive output and lock the drive when the contactor is closed.
Q1	Circuit-breaker (see pages 2/278 and 2/279).
Q2	GV2-L rated at twice the primary nominal current of T1.
Q11	Isolator or fused isolator Fuse rating depends on drive and supply voltage

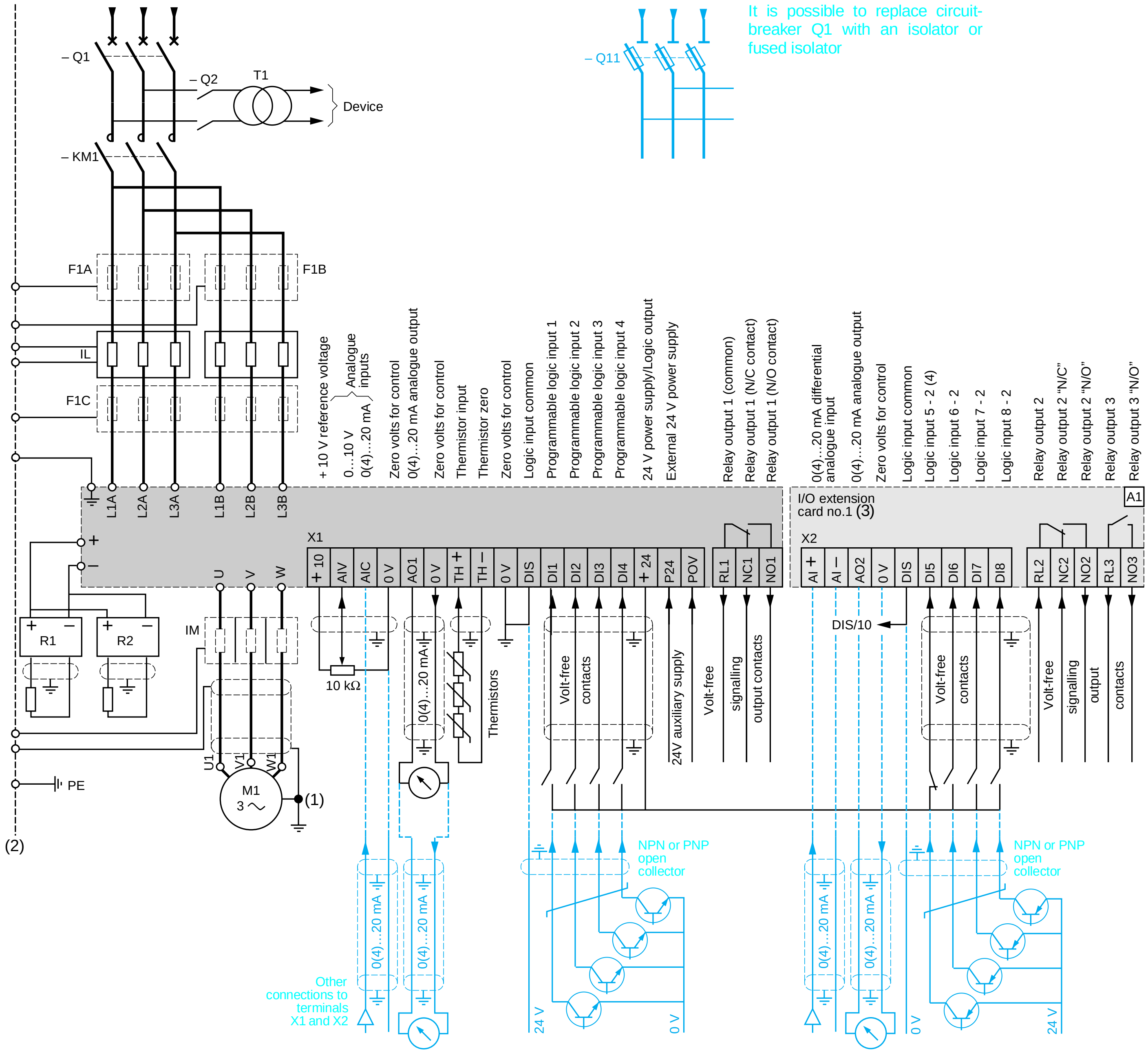
Drive	Supply voltage		Maximum tripping value
	400...440 V	500 V	I^2t
ATV-68●10N4	200 A	160 A	75 x 10^3 A^2.s
ATV-68●13N4	250 A	200 A	245 x 10^3 A^2.s
ATV-68●15N4	315 A	250 A	245 x 10^3 A^2.s
ATV-68●19N4	400 A	315 A	245 x 10^3 A^2.s
ATV-68●23N4	500 A	400 A	1000 x 10^3 A^2.s
ATV-68●28N4	630 A	500 A	1000 x 10^3 A^2.s
ATV-68●33N4	800 A	630 A	1000 x 10^3 A^2.s

Label	Description
R1 - R2	Braking units, see pages 2/252 to 2/257.
T1	Control supply transformer, depends on the application.

Variable speed drives for asynchronous motors

Altivar 68

Wiring diagram for ATV-68●43N4 to ATV-68●63N4 (supply voltage 400 V)



It is possible to replace circuit-breaker Q1 with an isolator or fused isolator

---

(1) Motor cable shielding is necessary if the environment is sensitive to radiated interference. At the drive end, fix and ground the shielding to the mounting plate using 360° contact stainless steel clamps.

The main function of the motor cable shielding is to limit radio frequency radiation. Therefore use a 4-pole cable for the motor, connecting each end of the shielding. The protection material (copper or steel) is of less importance than the quality of the connection at both ends. An alternative is to use metal trunking of high conductivity ensuring continuity throughout.

(2) Conductive mounting plate (in stainless or galvanised steel) to connect the motor cable shielding ground and to ensure ground equipotentiality between filter, drive and shielding.

All connections should be marked --- representing the EMC equipotential required for the flow of high frequency interference: protection connections, ground connections to shielding plates and interconnection of shielding.

They require low impedance at high frequencies; use machine ground wiring or, when this is not possible, large cross-section braiding (as short as possible). They can be in parallel with the normal protective conductor (green/yellow) which ensures safety.

(3) It is possible to mount a second I/O card on the X3 connector.

(4) Not programmable on the first I/O extension card assigned to: “drive locking”.

Presentation: pages 2/240 and 2/241
Characteristics: pages 2/242 to 2/245
References: pages 2/246 and 2/247
Dimensions: page 2/264

Components to connect to ATV-68●43N4 to ATV-68●63N4 drives

Label	Description
A1	ATV-68●43N4 to ●63N4 drives
F1A - F1B - F1C	Radio interference input filters in 3 parts, see page 2/250. Their IL line choke connections must be as short as possible. At 500 V, these are 2 identical filters: one is connected at F1C for L1A, L2A, L3A, the other at F1C for L1B, L2B, L3B.
IL	Line chokes, see page 2/249.
IM	Motor chokes, see page 2/251.
KM1	LC1-F●●● with suppressor (see pages 2/278 and 2/279). Optional contactor - Avoid frequent operation of contactor KM1 (risk of premature ageing of filter capacitors). Instead use the drive locking function. - In the case of cycles < 60 s, this is essential, to avoid risk of damaging the capacitor load card. - If the safety standards require motor isolation, install a contactor at the drive output and lock the drive when the contactor is closed.
Q1	Circuit-breaker (see pages 2/278 and 2/279).
Q2	GV2-L rated at twice the primary nominal current of T1.
Q11	Isolator or fused isolator Fuse rating depends on drive and supply voltage

Drive	Supply voltage		Maximum tripping value
	400…440 V	500 V	I2t
ATV-68●43N4	2 x 500 A (1)	2 x 400 A (1)	1000 x 10^3 A^2.s
ATV-68●53N4	2 x 630 A (1)	2 x 500 A (1)	1000 x 10^3 A^2.s
ATV-68●63N	2 x 800 A (1)	2 x 630 A (1)	1000 x 10^3 A^2.s

Label	Description
R1 - R2	Braking units, see pages 2/252 to 2/257.
T1	Control supply transformer, depends on the application

---

(1) 2 x 3-pole fuses as there are two input bridges.

Presentation:
pages 2/240 and 2/241
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pages 2/242 to 2/245
References:
pages 2/246 and 2/247
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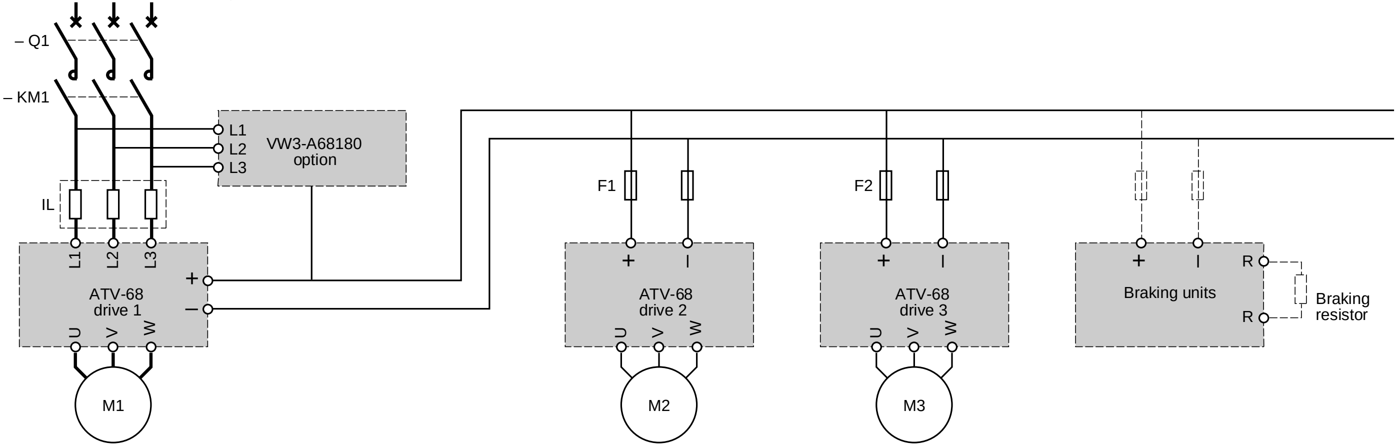
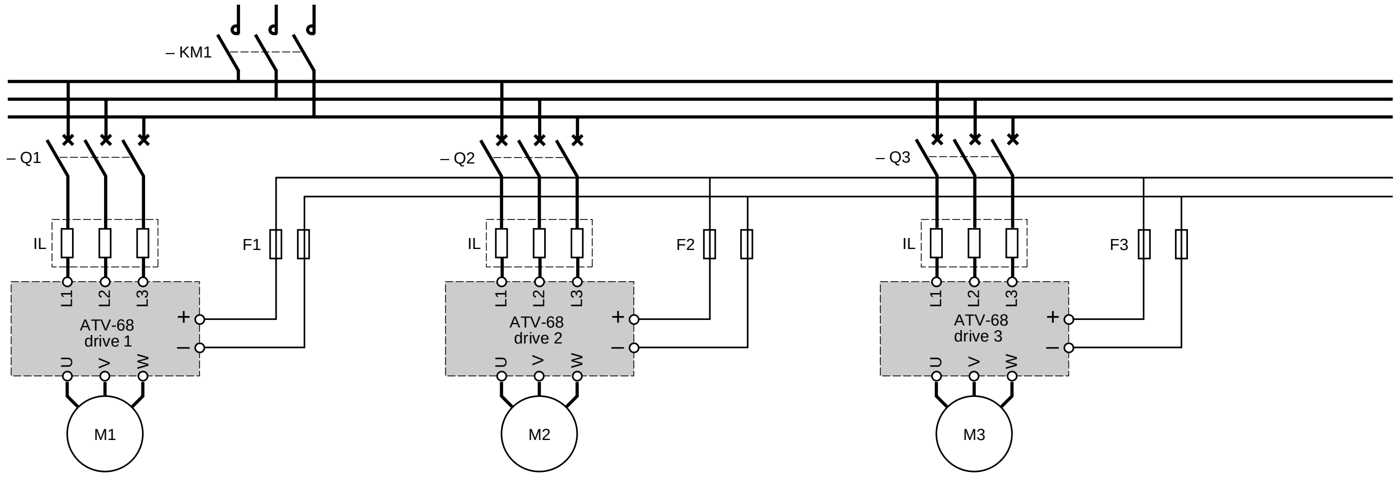
Connection of several drives in parallel on the DC bus
Drives of different rating



Label	Description
Drive 1	Standard frequency inverter. The Altivar 68, connected directly to the mains supply, determines the maximum motor power possible for drives 1 + 2 + 3.
Drives 2 and 3	Drives powered by the DC bus. Protection should be provided by fast-acting fuses. Contactors on the ⎓ circuit are no use as the switching action may blow the fuses because of a high load current.
VW3-A68180 option	“External load circuit” option. This option is necessary to avoid overloading the Altivar 68 load circuits. This option can be used to load drive 1 for a total power of 630 kW. (Standard torque of drives 1 + 2 + 3).
F1, F2	Fast-acting fuses for protection on the DC bus side, see table on opposite page.
Braking unit	Braking unit and braking resistor if necessary.

Connection of several drives in parallel on the DC bus
Drives of same rating



Label	Description
KM1	Using a common line contactor, all Altivar 68 load circuits function in parallel and so cannot be overloaded. **Warning**: If one contactor per drive is used, the “external load circuit” option **VW3-A68180** should be connected to each drive.
Q1, Q2, Q3	Line-side circuit-breakers for drive overload protection. Use the trip contacts acting on the “external fault” logic input or on the line contactor. The line contactor must only be energised if the three circuit-breakers are closed, otherwise there is a risk of drive deterioration.
F1, F2, F3	Fast-acting fuses protection on the DC bus side, see table on opposite page.
Drives 1, 2 and 3	Generally the number and size of drives can be freely selected, but only drives of the same size or the first rating of the next size can be used together. Line chokes (IL) must be used.

References:
page 2/260

DC bus fuse size (F1, F2, F3) according to drive rating

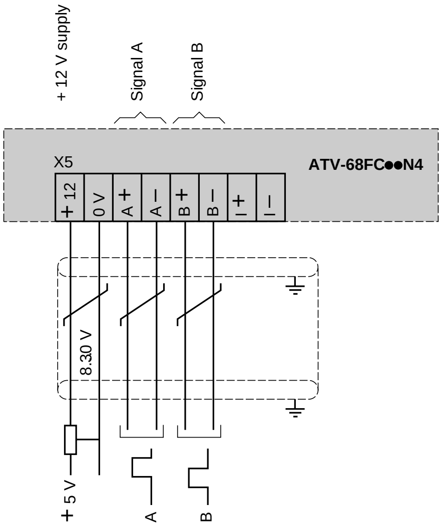
Drive	Fast-acting fuses (1)	
	400 and 440 V	460 and 500 V
ATV-68●10N4	250 A	200 A
ATV-68●13N4	315 A	250 A
ATV-68●15N4	400 A	315 A
ATV-68●19N4	500 A	400 A
ATV-68●23N4	630 A	500 A
ATV-68●28N4	800 A	500 A
ATV-68●33N4	800 A	630 A
ATV-68●43N4	1000 A	800 A
ATV-68●53N4	1250 A	1000 A
ATV-68●63N4	1600 A	1250 A

(1) Nominal voltage of fast-acting fuse:
400 V: fast-acting 690 V
440 V: fast-acting 800 V
460 V: fast-acting 800 V
500 V: fast-acting 800 V

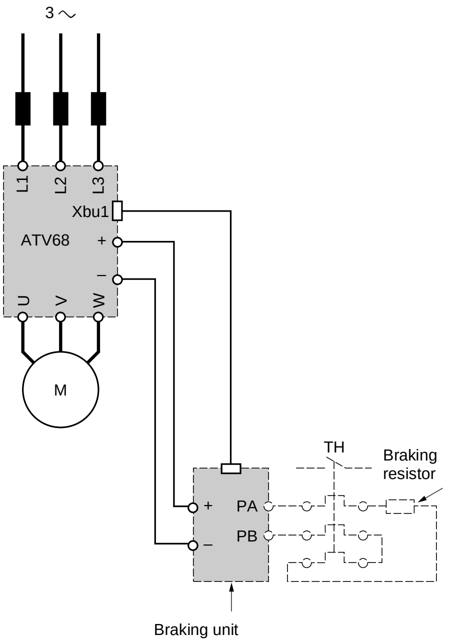
Variable speed drives for asynchronous motors

Altivar 68

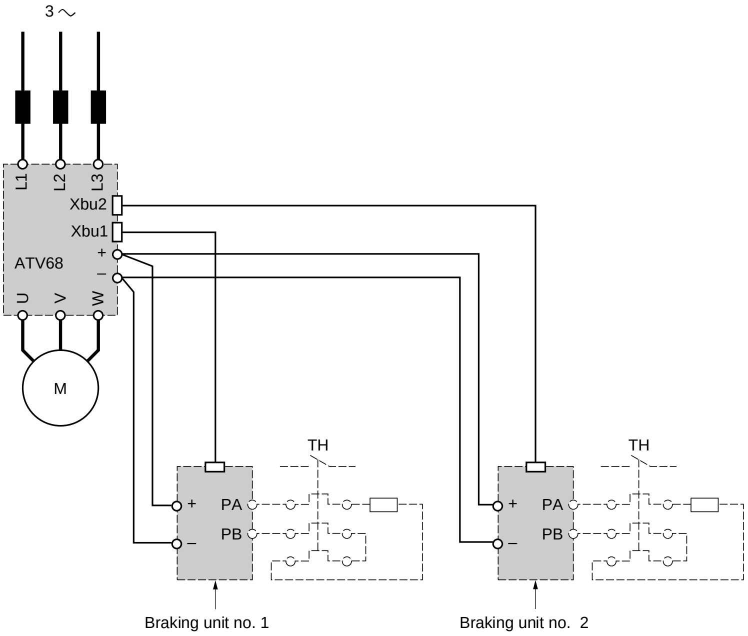
Encoder feedback card



Drive combined with one braking unit and one braking resistor



Drive combined with two braking units



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Characteristics:
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References:
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Dimensions:
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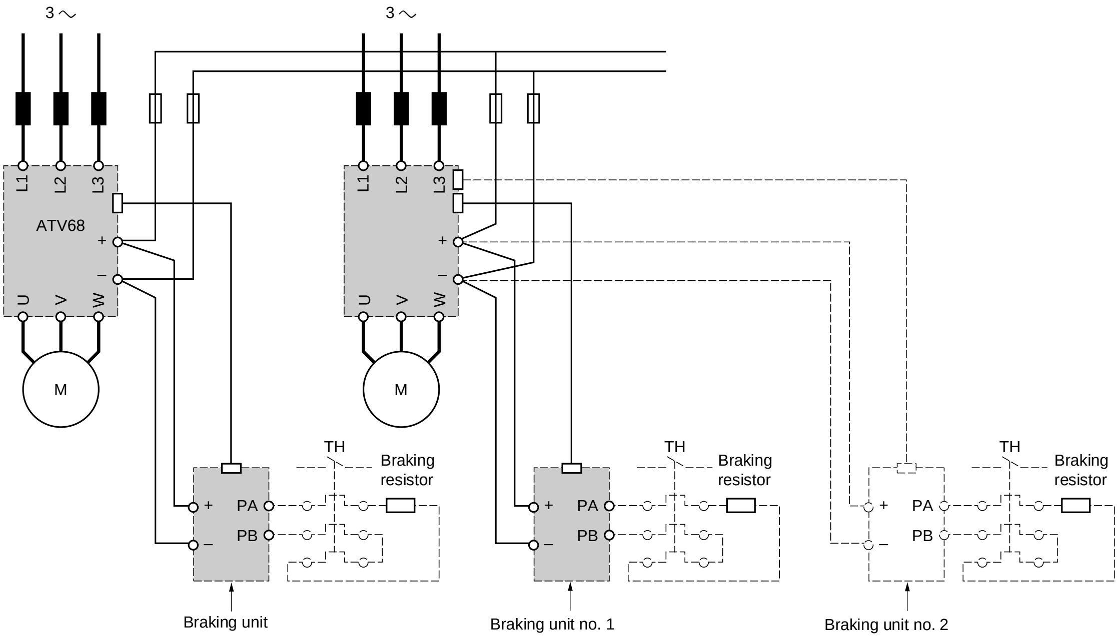
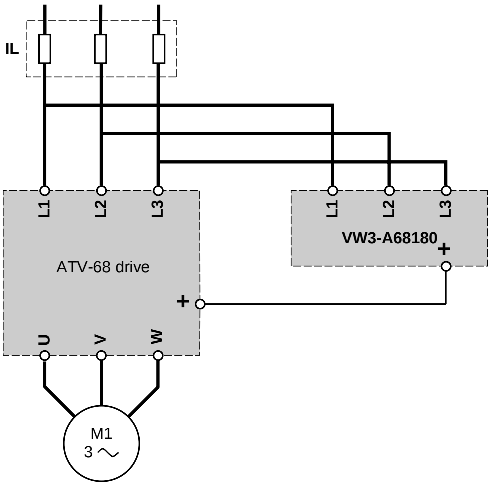
Drives combined with one or two braking units, wired to the same DC Bus



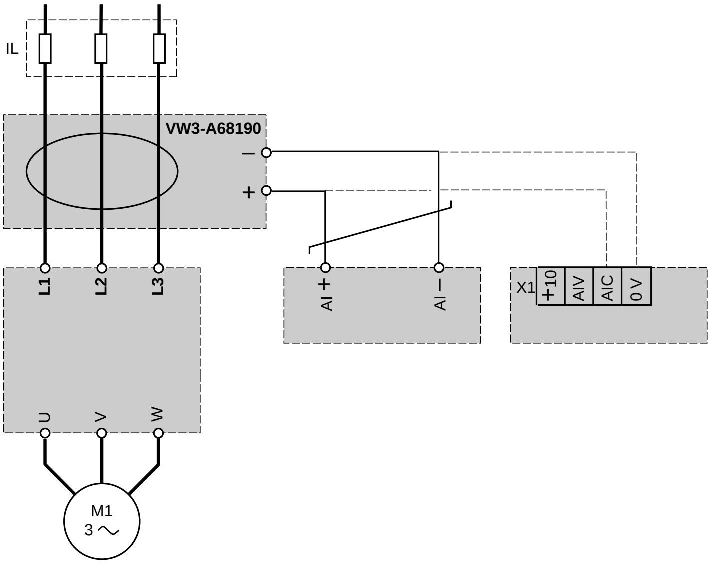
External load circuit

VW3-A68180



Earth fault detection kit

VW3-A68190



References:
pages 2/253 and 2/261

Dimensions:
pages 2/266 and 2/267

Variable speed drives for asynchronous motors

Altivar 68
Motor starters

NS250HMA
+
LC1-F185●●
+
ATV-68●13N4

Applications

Circuit-breaker-contactor-drive combinations ensure service continuity of the installation with optimum safety.
The coordination between the circuit-breaker and the contactor reduces maintenance costs in the event of a short-circuit by minimising intervention time and the expense of replacing equipment.
The combinations available provide type 1 or type 2 coordination.
Type 2 coordination: there will be no damage and no loss of settings after a short-circuit. The motor starter should be operational after the electrical fault has been cleared. Electrical isolation provided by the circuit-breaker is maintained after the incident. The risk of soldering the line contactor contacts is accepted, as these can easily be separated.
Type 1 coordination: electrical isolation provided by the circuit-breaker is maintained after the incident and parts other than the contactor are not damaged following the short-circuit.

The circuit-breaker protects against short-circuits of power supply cables and internal drive cables.
The contactor powers up the motor starter as well as isolating the variable speed drive from the line supply, when the motor stops.
The drive controls the motor, protects against short-circuits between the drive and the motor, and protects the motor cable against overload. This protection against overload is ensured by the drive's thermal motor protection. If this is removed, external thermal protection should be provided.

The cause of the trip should be cleared before the installation is powered up again.

3-phase supply voltage 400 V

Standard 4-pole motor 50/60 Hz		Circuit-breaker				Line contactor		Drive	Line current with choke (4)
P	In max.	Reference to be completed (1)	Rating	In at 55 °C (5)	Irm	Basic reference to be completed (2)	AC-1 at 55 °C	Reference to be completed (3)	
kW	A		A	A	A		A		A
For high torque applications									
Type 2 coordination									
75	142	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●10N4**	133
90	172	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●13N4**	161
110	208	**NS250HMA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●15N4**	194
132	250	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●19N4**	234
160	325	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●23N4**	304
200	404	**NS400●MA**	320	390	2880	**LC1-F400●●**	430	**ATV-68●28N4**	378
220	430	**NS630●MA**	500	585	4500	**LC1-F400●●**	430	**ATV-68●33N4**	402
250	475	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●33N4**	444
315	617	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●43N4**	577
Type 1 coordination									
400	767	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●53N4**	717
450	800	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●63N4**	748
500	904	**C1001●STR35ME**	1000	925	2000	**LC1-F800●●**	850	**ATV-68●63N4**	845
For standard torque applications									
Type 2 coordination									
90	170	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●10N4**	159
110	206	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●13N4**	193
132	250	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●15N4**	234
160	300	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●19N4**	280
200	390	**NS400●MA**	320	390	2880	**LC1-F400●●**	430	**ATV-68●23N4**	365
220	430	**NS630●MA**	500	585	4500	**LC1-F400●●**	430	**ATV-68●28N4**	402
250	485	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●28N4**	453
315	570	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●33N4**	533
Type 1 coordination									
400	675	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●43N4**	692
450	860	**C1001●STR35ME**	1000	925	2000	**LC1-F800●●**	850	**ATV-68●53N4**	804
500	855	**C1001●STR35ME**	1000	925	2000	**LC1-F780●●**	1350	**ATV-68●53N4**	860
630	1045	**C1251●STR35ME**	1250	1100	2500	**LC1-F780●●**	1350	**ATV-68●63N4**	1015

(1) Magnetic circuit-breaker marketed under the Merlin Gerin brand.
Replace the point in the reference with the letter which corresponds to the circuit-breaking performance:
Circuit-breaking performance in kA (at 400 V/440 V/500 V)

Circuit-breaker	N	H	L
NS160●MA	35/35/30	70/65/50	130/130/70
NS250●MA	35/35/22	70/65/35	130/130/50
NS400●MA	–	70/65/50	130/130/70
NS630●MA	–	70/65/35	130/130/50
C801● to C1251●	50/42/40	70/65/50	–

(2) In order to define the complete reference for contactors: auxiliary contacts, control circuit voltage, and if applicable, number of poles, please consult our catalogue "Motor starter solutions".
(3) Replace the point in the reference according to the type of drive required, see pages 2/246 and 2/247.
(4) Line current corresponding to the maximum motor current for an ambient temperature of 40 to 45 °C max. depending on the rating (see pages 2/242, 2/268 and 2/269).
(5) In type 2 coordination, circuit-breaker In at 55 °C is higher than the circuit-breaker rating current. The drive limits current peaks on startup contrary to a direct startup from the mains.

Variable speed drives for asynchronous motors

Altivar 68
Motor starters

NS250HMA
+
LC1-F185●●
+
ATV-68●13N4

3-phase supply voltage 440 V

Standard 4-pole motor 50/60 Hz		Circuit-breaker				Line contactor (2)		Drive	Line current with choke (4)
P	In max.	Reference to be completed (1)	Rating	In at 55 °C (5)	Irm	Basic reference to be completed	AC-1 at 55 °C	Reference to be completed (3)	
kW	A		A	A	A		A		A
For high torque applications									
Type 2 coordination									
75	129	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●10N4**	121
90	156	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●13N4**	146
110	189	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●15N4**	177
132	240	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●19N4**	224
160	302	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●23N4**	282
200	367	**NS400●MA**	320	390	2880	**LC1-F330●●**	360	**ATV-68●28N4**	343
220	391	**NS400●MA**	320	390	2880	**LC1-F400●●**	430	**ATV-68●33N4**	366
250	431	**NS630●MA**	500	585	4500	**LC1-F400●●**	430	**ATV-68●33N4**	403
315	590	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●43N4**	552
Type 1 coordination									
400	720	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●53N4**	673
450	781	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●63N4**	730
500	840	**C1001●STR35ME**	1000	925	2000	**LC1-F800●●**	850	**ATV-68●63N4**	785
For standard torque applications									
Type 2 coordination									
90	155	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●10N4**	145
110	187	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●13N4**	175
132	227	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●15N4**	212
160	288	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●19N4**	269
200	362	**NS400●MA**	320	390	2880	**LC1-F330●●**	360	**ATV-68●23N4**	338
220	391	**NS400●MA**	320	390	2880	**LC1-F400●●**	430	**ATV-68●28N4**	365
250	440	**NS630●MA**	500	585	4500	**LC1-F400●●**	430	**ATV-68●28N4**	411
517	517	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●33N4**	483
Type 1 coordination									
400	708	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●43N4**	662
450	781	**C801●STR35ME**	800	7701	1600	**LC1-F630●●**	850	**ATV-68●53N4**	730
500	864	**C1001●STR35ME**	1000	925	2000	**LC1-F800●●**	850	**ATV-68●53N4**	808
630	1008	**C1251●STR35ME**	1250	1100	2500	**LC1-F780●●**	1350	**ATV-68●63N4**	942

3-phase supply voltage 500 V

For high torque applications									
Type 2 coordination									
75	113	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●10N4**	106
90	137	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●13N4**	129
110	167	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●15N4**	157
132	200	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●19N4**	188
160	260	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●23N4**	244
200	323	**NS400●MA**	320	390	2880	**LC1-F330●●**	360	**ATV-68●28N4**	304
220	350	**NS400●MA**	320	390	2880	**LC1-F330●●**	360	**ATV-68●33N4**	329
250	380	**NS400●MA**	320	390	2880	**LC1-F330●●**	360	**ATV-68●33N4**	357
315	494	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●43N4**	464
400	614	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●53N4**	577
Type 1 coordination									
450	670	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●63N4**	630
500	723	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●63N4**	680
For standard torque applications									
Type 2 coordination									
90	136	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●10N4**	128
110	165	**NS160●MA**	150	160	1350	**LC1-D115●●**	200	**ATV-68●13N4**	155
132	200	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●15N4**	188
160	240	**NS250●MA**	220	235	1980	**LC1-F185●●**	275	**ATV-68●19N4**	226
200	312	**NS400●MA**	320	390	2880	**LC1-F265●●**	300	**ATV-68●23N4**	293
220	350	**NS400●MA**	320	390	2880	**LC1-F330●●**	360	**ATV-68●28N4**	329
250	388	**NS400●MA**	320	390	2880	**LC1-F400●●**	430	**ATV-68●28N4**	365
517	456	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●33N4**	429
400	592	**NS630●MA**	500	585	4500	**LC1-F500●●**	580	**ATV-68●43N4**	556
Type 1 coordination									
450	670	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●53N4**	630
500	736	**C801●STR35ME**	800	770	1600	**LC1-F630●●**	850	**ATV-68●53N4**	692
630	868	**C1001●STR35ME**	1000	925	2000	**LC1-F800●●**	850	**ATV-68●63N4**	816

(1) Magnetic circuit-breaker marketed under the Merlin Gerin brand. Replace the point in the reference with the letter which corresponds to the circuit-breaking performance, see opposite page.

(2) In order to define the complete reference for contactors: auxiliary contacts, control circuit voltage, and if applicable, number of poles, please consult our catalogue “Motor starter solutions”.

(3) Replace the point in the reference according to the type of drive required, see pages 2/246 and 2/247.

(4) Line current corresponding to the maximum motor current for an ambient temperature of 40 to 45 °C max. depending on the rating (see pages 2/242, 2/268 and 2/269).

(5) In type 2 coordination, circuit-breaker In at 55 °C is higher than the circuit-breaker rating current. The drive limits current peaks on startup contrary to a direct startup from the mains.

Variable speed drives for asynchronous motors

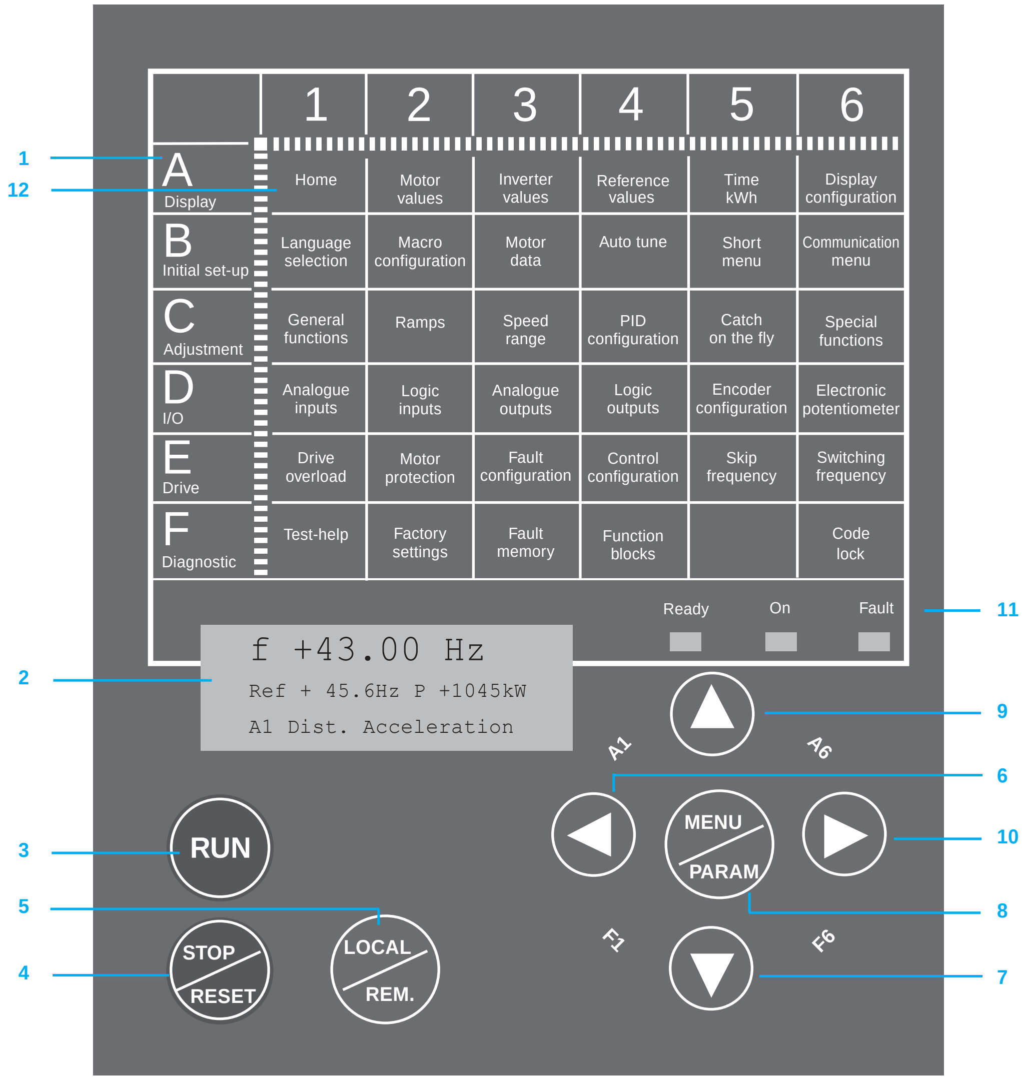
Altivar 68
Dialogue

Presentation of the programming terminal

The Altivar 68 has a programming terminal on the front panel which allows:

- local control of the drive,
- configuration of different parameters,
- remote display and signalling of drive status.

Presentation of the control keypad



	1	2	3	4	5	6
A Display	Home	Motor values	Inverter values	Reference values	Time kWh	Display configuration
B Initial set-up	Language selection	Macro configuration	Motor data	Auto tune	Short menu	Communication menu
C Adjustment	General functions	Ramps	Speed range	PID configuration	Catch on the fly	Special functions
D I/O	Analogue inputs	Logic inputs	Analogue outputs	Logic outputs	Encoder configuration	Electronic potentiometer
E Drive	Drive overload	Motor protection	Fault configuration	Control configuration	Skip frequency	Switching frequency
F Diagnostic	Test-help	Factory settings	Fault memory	Function blocks		Code lock

1 A summary table for moving around in the menus.
2 Liquid crystal display screen.
3 "Run" key for local mode.
4 "Stop" key in local or remote mode, programmable for fault acknowledgement.
5 "Local/remote" key: choice of terminal or keypad control.
6 "Left" key for menu selection or to move the cursor left and to control reverse rotation in local mode.
7 "Down" key for menu selection or to decrement numeric values or the reference in local mode.
8 "Menu/Parameters" key accesses the parameter settings or exits adjust mode to return to the menu.
9 "Up" key for menu selection or to increment numeric values or the reference in local mode.
10 "Right" key for menu selection or to move the cursor right and to control forward rotation in local mode.
11 Drive status display: ready, running or faulty.
12 Basic display menu and parameter storage.

Presentation, characteristics:
pages 2/240 to 2/245

References:
pages 2/246 to 2/261

Dimensions:
pages 2/264 to 2/269

Schemes:
pages 2/270 to 2/277

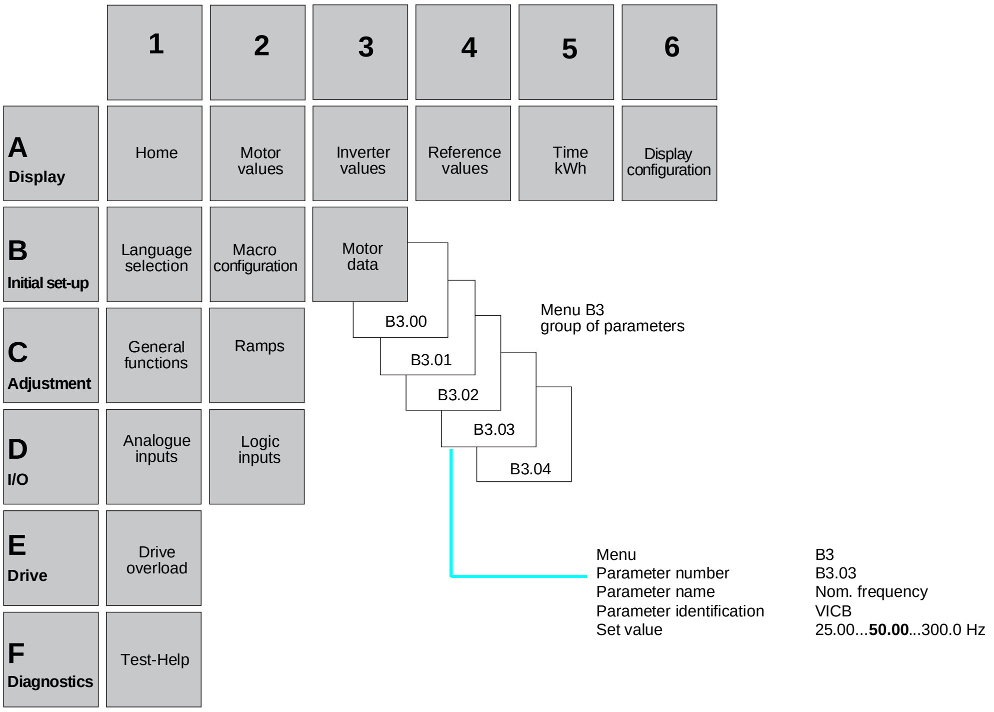
Variable speed drives for asynchronous motors

Altivar 68
Dialogue

Presentation of the programming terminal (continued)

The different menus
The different menus A, B, C, D, E, F define groups of homogenous menus. Each menu contains a group of parameters.

Menu	Function
A1 to A6	Display
B1 to B6	Start-up
C1 to C6	Function groups
D1 to D6	Configuration of the I/O, speed feedback and motorised potentiometer
E1 to E6	Limiting and protection of the drive
F1 to F6	Service, help and factory settings, logic blocks and comparators



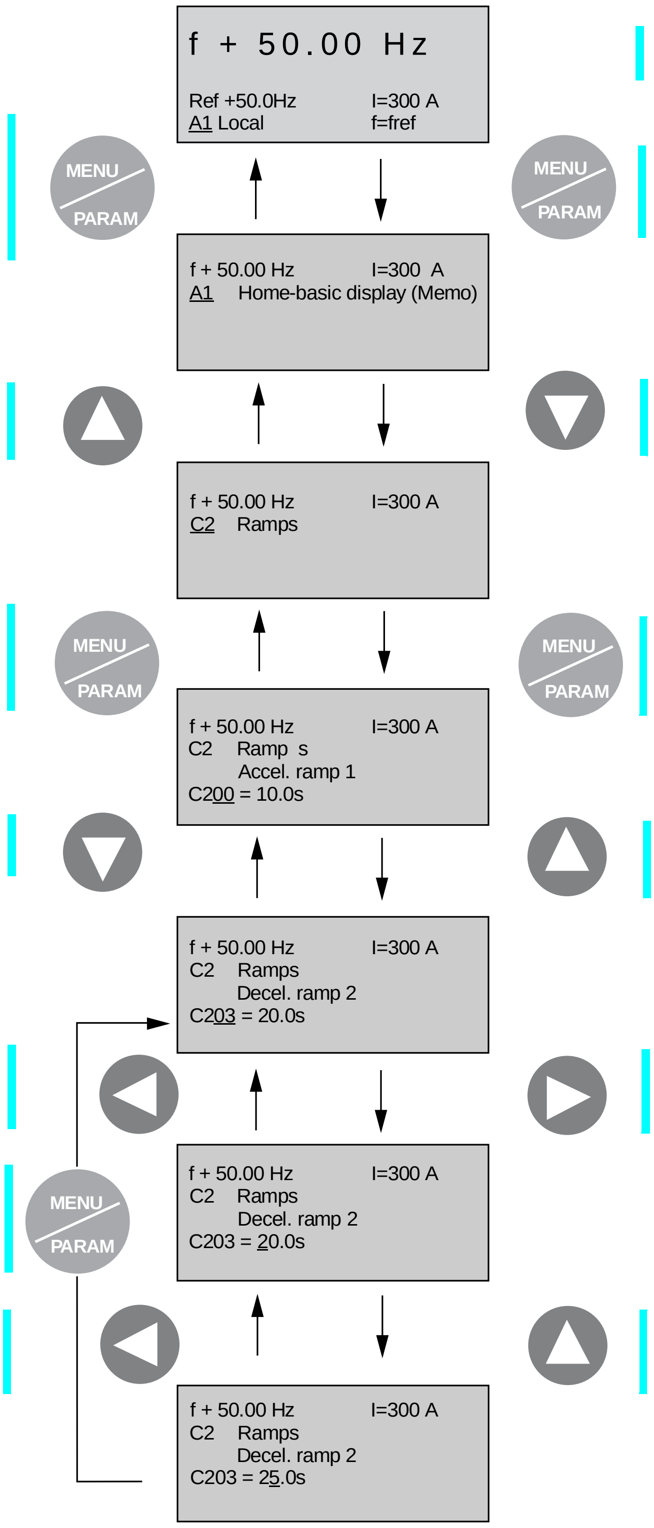
- Access the parameter menu with the MENU/PARAM key.
- The A1 Home menu has a special function:
  It does not contain parameters, instead it contains the basic display. The modified values are only stored in the drive long-term memory when changing to the basic display (MENU/PARAM key).
- Each menu can be accessed using the arrow keys.

Local control
To control the drive from the integrated terminal, local operating mode must be activated. The "Local/Remote" key allows this on exiting the basic display. In "local" mode, the following keys are active:

Keys	Basic display	Menu	Parameter group
RUN	Start-up	–	–
STOP RESET	Stop/Reset	(Stop) / Reset	(Stop) / Reset
▲	Increase reference	Menu search	Scrolls through the parameters or increases the value
▼	Decrease reference	Menu search	Scrolls through the parameters or decreases the value
◀	Rotate left	Menu search	Moves the cursor left
▶	Rotate right	Menu search	Moves the cursor left

Presentation of the programming terminal (continued)

Example of parameter setting



f + 50.00 Hz
Ref +50.0Hz I=300 A
A1 Local f=fref

Basic display

MENU/PARAM: Access to menus

Return to A1 basic display mode and **store** the modified parameters in the drive memory

f + 50.00 Hz I=300 A
A1 Home-basic display (Memo)

▼: Search through menu C2

▲: Change menu to A1

f + 50.00 Hz I=300 A
C2 Ramps

MENU/PARAM: Access to parameters of menu C2

MENU/PARAM: Exit parameter group

f + 50.00 Hz I=300 A
C2 Ramp s
Accel. ramp 1
C200 = 10.0s

▼: Scroll through the parameters within a menu

▲: Scroll through the parameters within a menu

f + 50.00 Hz I=300 A
C2 Ramps
Decel. ramp 2
C203 = 20.0s

▶: Move the cursor to the parameter value

◀: Move the cursor to the parameter number

MENU/PARAM: Parameter adjustment can be terminated with the MENU/PARAM key

f + 50.00 Hz I=300 A
C2 Ramps
Decel. ramp 2
C203 = 20.0s

▲: Modify the parameter value with immediate effect

◀: Move the cursor to the tens digit

f + 50.00 Hz I=300 A
C2 Ramps
Decel. ramp 2
C203 = 25.0s

Cursor = underlined number or letter

Summary of functions

Control keypad key and corresponding function

A **Display**

A1 Display (basic display, Home function)

A2 Display of motor values: current, speed, etc.

A3 Display of drive values: thermal state, etc.

A4 Display of references

A5 Display of the number of operating hours and the KW used

A6 Configuration of the basic display. Display of 3 parameterable values

B **Initial set-up**

B1 Language selection

B2 Choice of application macro (preset according to the application, 4 possible choices).
Storage of 2 complete adjustment configurations possible with autotuning.

B3 Adjustment of motor parameters
Acceptance of reverse mode operation

B4 Measurement of motor parameters on request

B5 Access to the main settings in the short menu. This short menu groups all the parameters which are important for the application and different to the factory settings.

C **Adjustment**

C1 General functions:
- Starting overtorque (up to 180%):
  - adjustment of the range starting overtorque.
- Choice of stop mode:
  - freewheel,
  - decelerated,
  - fast.
- Choice of braking mode:
  - no braking unit (standard),
  - with braking unit. When several ALTIVAR 68 and braking units are connected to a common DC bus, there is a function for distributing the braking power across all the braking units,
  - fast without braking unit. This type of braking is a low cost alternative for simple applications, mainly for fans, which avoids the use of an external braking unit. A 250 KW motor with a total inertia applied at the motor shaft of 2 to 3 times its inertia can be fast-stopped in 4 seconds. There is an increase in loss in the motor and noise during braking (warning: braking torque is not constant).
- Preset references
- JOG
- Energy saving, for variable torque applications (reduction of magnetising current on applications with quadratic torque)

C2 Selection of acceleration and deceleration ramps:
- 2 ramps
- Choice of ramp profile, S or U with curve adjustment
- Adjustment of a threshold for switching from no. 1 acceleration (deceleration) ramp to no. 2 acceleration (deceleration) ramp.
- Adjustment of a time delayed low speed threshold before stopping. This operation is obtained after a stop request.

C3 Adjustment at low speed and high speed
- Possible to phohibit a direction of rotation
- Possible to reverse motor rotation phases without reversing the motor wiring

C4 Simple PID drive or PID drive for reference correction:
- Possible to use the PID drive reference as a process reference (eg pressure or flow reference) or as a speed reference (press applications).

C5 Catch on the fly

C6 Special functions:
- Line contactor control
- Brake logic suitable for hoisting with the brake release pulse, possible management of a closed brake contact, detection of speed deviation between the reference and the speed feedback (adjustment possible), anti-repeat
- Brake logic suitable for translational movement
- Adaptation of maximum speed as a function of the load (lifting applications).

Summary of functions (continued)

Control keypad key and corresponding function

D I/O

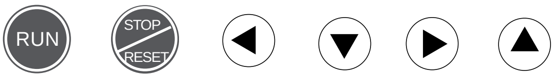
D1 Configuration of the analogue inputs and adjustment of max. and min. signal values on each input:

- Frequency reference (automatic), standard choice
- Manual frequency reference
- PID reference
- PID feedback
- Reference correction
- Torque limitation

D2 Configuration of the logic inputs:

- MAN/AUTO
  This command switches between the references : automatic reference or manual reference.
- LOCAL/REMOTE. This command selects local or remote mode.

Local corresponds to commands from the graphic terminal keypad and to logic signals sent by the logic inputs assigned to local mode:



Remote corresponds to logic and analogue signals sent via the terminals (apart from those programmed in local mode) and via the line:
- run/stop by stay-put control (2-wire control),
- run/stop by pulse control (3-wire control),
- remote motorised potentiometer (+/- speed),
- run/stop by local pulse control (3-wire control),
- local motorised potentiometer (+/- speed),
- JOG,
- preset references (8 possible),
- selection of ramps 1 or 2,
- selection of user macro. Allows control of a motor with 2 completely different configurations or to alternately control 2 motors. The user macro is a complete parameter configuration, including motor parameter measurement and thermal calculation,
- drive locking, freewheel stop.

- External event monitoring, with a display of fault type according to configuration:
  - external fault,
  - external motor fault,
  - external isolation fault,
  - external braking unit fault,
  - drive locking: this input allows monitoring and display on the terminal screen of the state of the accessories around the drive which may prevent the drive from starting (fuse, contactor, fan, etc.),
  - fault reset,
  - external torque limitation,
  - PID activation,
  - activation of PID drive gains,
  - speed regulation or open loop, uset to change from encoder feedback mode to open loop mode,
  - open brake contact handling,
  - Emergency stop management in the case of a line contactor controlled by a drive,
  - parameter locking (this command prohibits parameter modification from the keypad),
  - local forcing (commands are only possible in local mode).

Summary of functions (continued)

Control keypad key and corresponding function

D3 Assignment of analogue outputs:

- Output frequency (signed or not signed)
- Motor current
- Torque (signed or not signed)
- Motor power
- Motor voltage
- Speed in rpm (signed or not signed)
- Internal frequency reference
- Torque limitation reference
- PID reference
- PID feedback
- PID error
- References from the line
- Motor thermal state
- Braking resistor thermal state

D4 Assignment of logic outputs

- Brake opening (brake sequence)
- Selection of user macro 1 or 2
- External torque limit activation
- Logic block output
- Comparator block output
- Different drive states:
  - ready,
  - running,
  - ready + RUN,
  - fault,
  - alarm,
  - generator mode,
  - line supply present,
  - local control mode,
  - DC bus charged,
  - manual control mode,
  - PID activated,
  - PID gain enabled,
  - drive in closed loop.
- Monitoring:
  - reference frequency greater than motor frequency (adjustable hysteresis),
  - motor frequency greater than a set level,
  - drive command word,
  - drive heatsink thermal state higher than maximum limit,
  - voltage threshold limit of DC bus reached, which leads to a decrease in the motor stator frequency,
  - motor temperature calculated by the drive higher than maximum temperature,
  - active braking unit,
  - active motor heating.

D5 Encoder feedback

- Choice of control mode:
  - no slip compensation,
  - with slip compensation, and possibility of adjusting slip compensation range,
  - with encoder feedback,
  - with load balancing on several motors. For open loop operation only (without encoder feedback),
  - with balancing of 2 motors. For closed loop operation only (with encoder feedback).

  The DMA function balances the torque for 2 motors which are mechanically linked and controlled by 2 different drives (provides the master/slave function).

  In encoder feedback mode, adjustment of the number of pulses per revolution and adjustment of the proportional, integral and derivative gain is possible.

D6 Electronic potentiometer (+/- speed)

- Choice of speed or torque reference
- Adjustment of low speed, high speed and acceleration ramps
- EEPROM reference storage after a mains power failure

  After a stop whether the drive is switched off or not, when a run command is given, the frequency increases up to the value of the stored reference (with the run command sign), if the +/- speed commands are not enabled. +/- speed has priority.
- RAM reference storage on the disappearance of a run command

  After a stop without the drive being switched off, when a run command is given, the frequency increases up to the value of the stored reference (with the run command sign), if the +/- speed commands are not enabled. +/- speed has priority. In the case of a mains power failure, the reference is not stored.
- Choice of +/- speed control at the terminals in local or remote mode
- Choice of +/- speed control via the keypad or terminals

Summary of functions (continued)

Control keypad key and corresponding function

E Adapting the drive to the installation requirements

E1 Overload limitation :

- Adjustment of maximum drive current (activation of limitation possible via logic input)
- Adjustment of maximum motor torque (activation of limitation possible via logic input)

E2 Protection adapted to the motor :

- Use of a PTC probe
- Thermal motor protection by calculating I^2t and UL thermal protection
- Processing of a pump underload from the PID drive or from the estimated torque.
- Thermal braking resistor protection
- Stalled rotor detection, with frequency and stalling time adjustment
- Overspeed protection
- Detection of maximum motor speed

Protection processing is possible as a default or in emergency.

E3 Processing of external faults

- Undervoltage fault:
  - an undervoltage fault need not be considered as a permanent fault or it may be considered as such only when the drive is running,
  - adjustment of time delay before acceptance of an undervoltage fault,
  - automatic restart (3 times in 5 minutes).

- 4/20 mA loss
  When the 4 - 20mA signal is lost, it is possible to select either a fallback speed to a fixed reference, or the recorded rotation speed brefore the break.

- Processing of external faults:
  - acceptance of a time before tripping,
  - configuration of acceptance conditions (drive running, normally closed or normally open contact, etc.).

- Selection of type of stop on fault

E4 Selection of drive control modes:

- Selection of frequency reference origin:
  - local and remote,
  - local,
  - remote.

- Control mode:
  - local and remote,
  - local,
  - remote.

- Origin of local and remote control:
  - keypad,
  - terminals.

E5 Skip frequency

- Hysteresis adjustment

E6 Choice of switching frequency

- 2.5 kHz

- 5 kHz

- 10 kHz

Summary of functions (continued)

Control keypad key and corresponding function

F Diagnostic

F1 Test-help

- Possible earth fault test
- Control circuit test

F2 Return to factory settings (except for motor data)

- Return to motor data factory settings
- Return to application program factory settings (all parameters except for motor data and language)

F3 Fault memory

- Fault counter
- Selection of 16 most recent faults, 14 data items relating to the fault are displayed (time, output frequency, current, etc.). This information correspond to the real values 10 ms before the appearance of the fault.

F4 Logic function blocks

The drive contains 4 comparator blocks (greater than, less than, equal to and different from) and 2 logic function blocks (AND, OR, equal, different).
The function block output signals can be operated with a time delay.
The block input can be either an external signal or an internal data item from the drive.
The block output can be either a logic output or a direct action on the drive.

F6 Locking parameter modifications by an access code

- Choice of lock : keypad, line or terminals
- Choice of access code

Variable speed drives for asynchronous motors

Altivar 68 ready-assembled in enclosure

Presentation

501620

ATV-68E●C●●N4

501621

ATV-68EX●C●●N4

Altivar 68 variable speed drives can be supplied ready-assembled in an enclosure to facilitate installation and particularly to ensure optimum ventilation. The enclosure equipment can be split into two offers: a standard offer and a modular offer.
The ATV-68E●●●●●● standard offer comprises an enclosure with non-modifiable hardware configuration only for 400 V power supply with IP 23 and IP 54 degrees of protection.
The ATV-68EX●●●●●● modular offer comprises an enclosure with a selection of options linked to the drive rating and to the torque characteristics (high torque or standard torque) for line supplies of 400 V to 500 V, with IP 23 and IP 54 protection.
For supply voltages over 400 V, order the 500 V option.

The standard offer comprises:

- a ready-assembled pre-wired enclosure,
- an Altivar 68 drive,
- a switch and fast-acting fuses (see pages 2/271 and 2/273),
- line chokes (see page 2/249).

The modular offer comprises:

- a ready-assembled pre-wired enclosure,
- an Altivar 68 drive,
- a switch and fast-acting fuses (see pages 2/271 and 2/273),
- line chokes and one or more options to be selected from the following list (see page 2/249).

The Altivar 68 in the modular offer enclosures can be fitted with the same options as the ATV-68 range.

Options common to all ratings:
- I/O extension card,
- Fipio, Modbus Plus, Profibus DP communication cards,
- programming terminal remote mounting kit (IP 54 degree of protection),
- earth fault detection in IT connection (isolated neutral).

Options depending on the drive rating and/or torque characteristics (modular offer) (see pages 2/292 and 2/293):
- protection circuit-breaker with handle extension (replaces the switch and fuses on ATV-A68 ●10N4 to ●33N4 drives),
- line contactor to be combined with a circuit-breaker,
- line contactor to be combined with switches and fuses,
- radio interference input filters,
- additional motor chokes,
- twelve-phase power supply option.

Special options for mounting in enclosure (modular offer):
- 500 V line supply,
- external fan in IP 23 version,
- access window to IP 54 programming terminal (1),
- switch handle extension,
- enclosure lighting,
- 400 V or 500 V/230V transformer,
- voltage loss coil for 400 V circuit-breaker,
- ⎓ 24 V supply for drive control circuit,
- customised terminals,
- emergency stop button,
- anti-condensation heater (see pages 2/292 and 2/293),
- enclosure baseplate (see pages 2/292 and 2/293).

Characteristics

Degree of protection of enclosure	IP 23	Air inlet via grille on enclosure door Air outlet on roof of enclosure, protected by a plate
	IP 54	Air inlet via fan fitted with a filter for ATV-68●10N4 to ●19N4 drives Air inlet via grille located in the baseplate and via filtered and ventilated grille, located in the enclosure door, for ATV-68●23N4 to ●63N4 drives Air outlet via horizontal grille on front panel, located on enclosure roof
Maximum external temperature of enclosure		+ 35 °C for **ATV-68E●C19N4**, **ATV-68E●C33N4** and **ATV-68E●C63N4** (+ 5 °C with external fan option) + 40 °C for other ratings (+ 5 °C with external fan option)
Line supply connection		Directly to switch or circuit-breaker, cable entry required at base of enclosure
Motor connection		Directly to drive, cable entry required at base of enclosure
Control terminal connection		Directly to drive Customised terminals option (40 contacts)
Colour of 6000 SAREL Spacial Cell Enclosures		RAL 7032

(1) Without this option the programming terminal can be viewed through a fixed bakelized plastic window.

References:
pages 2/289 and 2/290

Dimensions:
page 2/291

Compatibility:
pages 2/292 and 2/293

Variable speed drives for asynchronous motors

Altivar 68 ready-assembled in enclosure

ATV-68E●C●●N4

Standard ATV-68E●C●●N4 offer for 400 V 50/60 Hz three-phase line supply in IP 23 and IP 54 enclosure

Degree of protection	Power in kw for applications		With ATV-68 drive	Ready-assembled enclosure reference	Weight kg
	standard torque (120 % Tn)	high torque (150 % Tn)			
IP 23	90	75	**ATV-68C10N4**	**ATV-68E2C10N4**	240.000
	110	90	**ATV-68C13N4**	**ATV-68E2C13N4**	325.000
	132	110	**ATV-68C15N4**	**ATV-68E2C15N4**	330.000
	160	132	**ATV-68C19N4**	**ATV-68E2C19N4**	335.000
	200	160	**ATV-68C23N4**	**ATV-68E2C23N4**	520.000
	250	200	**ATV-68C28N4**	**ATV-68E2C28N4**	525.000
	315	250	**ATV-68C33N4**	**ATV-68E2C33N4**	530.000
	400	315	**ATV-68C43N4**	**ATV-68E2C43N4**	1110.000
	500	400	**ATV-68C53N4**	**ATV-68E2C53N4**	1115.000
	630	500	**ATV-68C63N4**	**ATV-68E2C63N4**	1135.000
IP 54	90	75	**ATV-68C10N4**	**ATV-68E5C10N4**	255.000
	110	90	**ATV-68C13N4**	**ATV-68E5C13N4**	340.000
	132	110	**ATV-68C15N4**	**ATV-68E5C15N4**	345.000
	160	132	**ATV-68C19N4**	**ATV-68E5C19N4**	350.000
	200	160	**ATV-68C23N4**	**ATV-68E5C23N4**	570.000
	250	200	**ATV-68C28N4**	**ATV-68E5C28N4**	575.000
	315	250	**ATV-68C33N4**	**ATV-68E5C33N4**	580.000
	400	315	**ATV-68C43N4**	**ATV-68E5C43N4**	1220.000
	500	400	**ATV-68C53N4**	**ATV-68E5C53N4**	1225.000
	630	500	**ATV-68C63N4**	**ATV-68E5C63N4**	1245.000

ATV-68EX●C●●N4

Modular ATV-68EX●C●●N4 offer for 400 V to 500 V 50/60 Hz line supply in IP 23 and IP 54 enclosure (1)

Degree of protection	Power in kW for applications		With ATV-68 drive	Ready-assembled enclosure reference	Weight kg (2)
	standard torque (120 % Tn)	high torque (150 % Tn)			
IP 23	90	75	**ATV-68C10N4**	**ATV-68EX2C10N4**	
	110	90	**ATV-68C13N4**	**ATV-68EX2C13N4**	
	132	110	**ATV-68C15N4**	**ATV-68EX2C15N4**	
	160	132	**ATV-68C19N4**	**ATV-68EX2C19N4**	
	200	160	**ATV-68C23N4**	**ATV-68EX2C23N4**	
	250	200	**ATV-68C28N4**	**ATV-68EX2C28N4**	
	315	250	**ATV-68C33N4**	**ATV-68EX2C33N4**	
	400	315	**ATV-68C43N4**	**ATV-68EX2C43N4**	
	500	400	**ATV-68C53N4**	**ATV-68EX2C53N4**	
	630	500	**ATV-68C63N4**	**ATV-68EX2C63N4**	
IP 54	90	75	**ATV-68C10N4**	**ATV-68EX5C10N4**	
	110	90	**ATV-68C13N4**	**ATV-68EX5C13N4**	
	132	110	**ATV-68C15N4**	**ATV-68EX5C15N4**	
	160	132	**ATV-68C19N4**	**ATV-68EX5C19N4**	
	200	160	**ATV-68C23N4**	**ATV-68EX5C23N4**	
	250	200	**ATV-68C28N4**	**ATV-68EX5C28N4**	
	315	250	**ATV-68C33N4**	**ATV-68EX5C33N4**	
	400	315	**ATV-68C43N4**	**ATV-68EX5C43N4**	
	500	400	**ATV-68C53N4**	**ATV-68EX5C53N4**	
	630	500	**ATV-68C63N4**	**ATV-68EX5C63N4**	

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(1) For supply voltages over 400 V, order the 500 V option.

(2) The weight depends on the options selected. The weights shown in the table on page 2/291 should be added to the standard offer weights.

Presentation, characteristics:
page 2/288

Dimensions:
page 2/291

Compatibility:
pages 2/292 and 2/293

Options common to all ratings (modular offer)

Description	For protocol	Reference	Weight kg
I/O extension card	–	**VW3-A68E201**	0.200
Communication card	Fipio	**VW3-A68E301**	1.400
	Modbus Plus	**VW3-A68E302**	1.400
	Profibus DP	**VW3-A68E307**	0.300
Programming terminal remote mounting kit	–	**VW3-A68E800**	3.000
Earth fault detection in IT connection (isolated neutral)	–	**VW3-A68E190**	1.000

Special options for mounting in enclosure (modular offer)

Description	Voltage	Reference	Weight kg
500 V line supply option (1)	–	**VW3-A68E500V**	–
External fan For IP 23 version: enables additional 5 °C of ambient temperature without derating the drive (please refer to characteristics on page 2/288). Order 2 fans for ATV-68●C43N4 to ●C63N4 drives.	400 V	**VW3-A68E820**	17.000
	500 V	**VW3-A68E821**	17.000
Programming terminal access window	–	**VW3-A68E805**	–
Switch handle extension on front panel of door	–	**VW3-A68E807**	–
Enclosure lighting power supply ∿ 220 V - 240 V, 20 W	(2)	**VW3-A68E885**	–
500 VA control transformer for ATV-68EX●C10N4 to ●C33N4	400/500 V 230 V secondary	**VW3-A68E886**	4.000
800 VA control transformer for ATV-68EX●C43N4 to ●C63N4	400/500 V 230 V secondary	**VW3-A68E8862**	4.000
Voltage loss coil for 400 V circuit-breaker	110 V	**VW3-A68E862**	–
	230 V (2)	**VW3-A68E861**	–
Supply for the drive control circuit (2) (Imax: 1.6 A)	24 V DC	**VW3-A68E887**	–
Customised terminals (remote control terminals)	–	**VW3-A68E806**	–
Emergency stop button Wired in sequence if contactor and circuit-breaker with voltage loss coil options are present	230 V	**VW3-A68E808**	–
Anti-condensation heater activated by thermostat between + 10 ° - 10 °C	230 V (2)	(3)	–
150 W on ATV-68EX●C10N4 to ●C33N4 ratings			1.500
300 W on ATV-68EX●C43N4 to ●C63N4 ratings			2.500
Enclosure baseplate	–	(3)	(4)

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(1) Reference VW3-A68E500V should be ordered for supply voltages > 400 V (fast-acting fuse characteristics, correct power supply for options).

(2) If 230 V single-phase supply is not available (eg: non-distributed neutral), the control transformer option should be used.

(3) Depends on drive ratings (please refer to compatibility on pages 2/292 and 2/293).

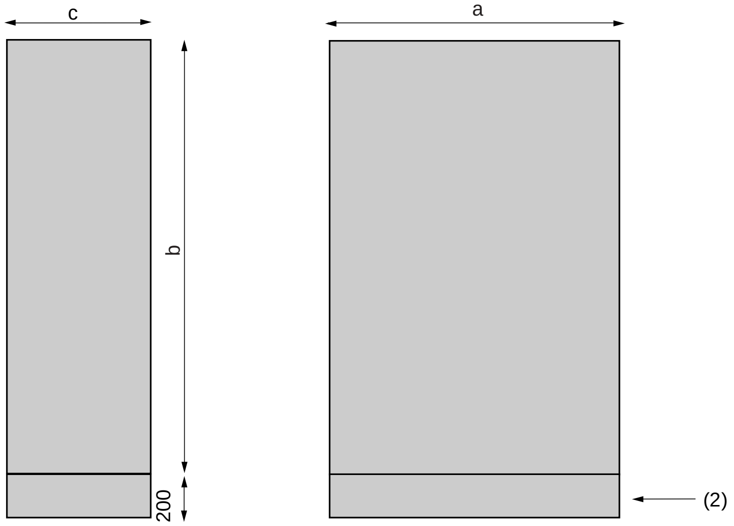
(4) Please refer to the table of weights on page 2/291.

Variable speed drives for asynchronous motors

Altivar 68 ready-assembled in enclosure

Dimensions

Altivar 68 ready-assembled in enclosure



ATV-68E●●C●●N4 offer for 400 or 500 V three-phase 50/60 Hz line supply, in IP 23 and IP 54 enclosures

Degree of protection of enclosure IP 23

Reference	a	b	c
ATV-68E●2C10N4	600	2060	500
ATV-68E●2C13N4 **ATV-68E●2C15N4** **ATV-68E●2C19N4**	800	2060	500
ATV-68E●2C23N4 **ATV-68E●2C28N4** **ATV-68E●2C33N4**	1200	2060	500
ATV-68E●2C43N4 **ATV-68E●2C53N4** **ATV-68E●2C63N4**	2400	2060	500

Degree of protection of enclosure IP 54

Reference	a	b	c
ATV-68E●5C10N4	600	2220	500
ATV-68E●5C13N4 **ATV-68E●5C15N4** **ATV-68E●5C19N4**	800	2220	500
ATV-68E●5C23N4 **ATV-68E●5C28N4** **ATV-68E●5C33N4**	1200	2420	500
ATV-68E●5C43N4 **ATV-68E●5C53N4** **ATV-68E●5C63N4**	2400	2420	500

Additional dimensions of enclosures according to options selected (1).

Reference	Motor choke	Twelve-phase supply	Baseplate	Fan kit
	a	a	b	b
ATV-68EX●C10N4	–	400	200	230
ATV-68EX●C13N4	–	400	200	230
ATV-68EX●C15N4	–	400	200	230
ATV-68EX●C19N4	–	400	200	230
ATV-68EX●C23N4	200	400	200 (2)	230
ATV-68EX●C28N4	200	400	200 (2)	230
ATV-68EX●C33N4	200	400	200 (2)	230
ATV-68EX●C43N4	600	–	200 (2)	230
ATV-68EX●C53N4	600	–	200 (2)	230
ATV-68EX●C63N4	600	–	200 (2)	230

(1) These dimensions should be added to those given for the enclosures in the above table.

(2) For references ATV-68EX5C23N4 to ATV-68EX5C63N4, the height of the baseplate is already included in the height of the enclosure.

Additional weights in kg according to the drive ratings and options selected.

Reference	Line contactor				Radio interference input filters	Motor choke		Twelve-phase supply	Baseplate	Fan kit
	400 V St. torque	400 V High torque	500 V St. torque	500 V High torque		IP 23	IP 54			
ATV-68EX●C10N4	5	8	5	5	6	15	15	200	7	17
ATV-68EX●C13N4	8	8	5	5	7	20	20	230	8	17
ATV-68EX●C15N4	8	8	5	8	7	20	20	230	8	17
ATV-68EX●C19N4	10	10	8	8	7	20	20	230	8	17
ATV-68EX●C23N4	10	13	10	10	8	50	50	250	15	17
ATV-68EX●C28N4	13	15	12	13	8	50	50	250	15	17
ATV-68EX●C33N4	15	15	12	15	8	50	50	250	15	17
ATV-68EX●C43N4	22	22	18	18	13	235	260	5	31	17
ATV-68EX●C53N4	26	26	22	22	13	235	260	5	31	17
ATV-68EX●C63N4	26	26	22	22	13	235	260	5	31	17

Presentation, characteristics:
page 2/288

References:
pages 2/289 and 2/290

Compatibility:
pages 2/292 and 2/293

Variable speed drives for asynchronous motors

Altivar 68 in ready-assembled enclosure

Combinations for ready-assembled enclosure on 400 V mains supply

Options linked to the rating of the drive and the torque characteristic (standard torque/high torque applications) for the modular offer.

IP 23 or IP 54 enclosure	Circuit-breaker for applications		Line contactor to be used with a circuit-breaker (1) (2) for applications	
	standard torque	high torque	standard torque	high torque
ATV68EX●C10N4	VW3-A68E8611	VW3-A68E8610	VW3-A68E8711	VW3-A68E8710
ATV68EX●C13N4	VW3-A68E8612	VW3-A68E8612	VW3-A68E8711	VW3-A68E8711
ATV68EX●C15N4	VW3-A68E8612	VW3-A68E8612	VW3-A68E8711	VW3-A68E8711
ATV68EX●C19N4	VW3-A68E8614	VW3-A68E8614	VW3-A68E8714	VW3-A68E8714
ATV68EX●C23N4	VW3-A68E8615	VW3-A68E8615	VW3-A68E8715	VW3-A68E8714
ATV68EX●C28N4	VW3-A68E8616	VW3-A68E8615	VW3-A68E8716	VW3-A68E8715
ATV68EX●C33N4	VW3-A68E8617	VW3-A68E8617	VW3-A68E8716	VW3-A68E8716
ATV68EX●C43N4	VW3-A68E8618	VW3-A68E86171	VW3-A68E87191	VW3-A68E87181
ATV68EX●C53N4	VW3-A68E8619	VW3-A68E8618	VW3-A68E87211	VW3-A68E87191
ATV68EX●C63N4	VW3-A68E8620	VW3-A68E8619	VW3-A68E87211	VW3-A68E87201

Combinations for ready-assembled enclosure on 500 V mains supply

Options linked to the rating of the drive and the torque characteristic (standard torque/high torque applications) for the modular offer.

IP 23 or IP 54 enclosure	Circuit-breaker for applications		Line contactor to be used with a circuit-breaker (1) (2) for applications	
	standard torque	high torque	standard torque	high torque
ATV68EX●C10N4	VW3-A68E8651	VW3-A68E8651	VW3-A68E8751	VW3-A68E8751
ATV68EX●C13N4	VW3-A68E8652	VW3-A68E8652	VW3-A68E8751	VW3-A68E8751
ATV68EX●C15N4	VW3-A68E8653	VW3-A68E8652	VW3-A68E8753	VW3-A68E8751
ATV68EX●C19N4	VW3-A68E8653	VW3-A68E8653	VW3-A68E8753	VW3-A68E8753
ATV68EX●C23N4	VW3-A68E8655	VW3-A68E8655	VW3-A68E8755	VW3-A68E8755
ATV68EX●C28N4	VW3-A68E8655	VW3-A68E8655	VW3-A68E8756	VW3-A68E87551
ATV68EX●C33N4	VW3-A68E8657	VW3-A68E86561	VW3-A68E8757	VW3-A68E87551
ATV68EX●C43N4	VW3-A68E8658	VW3-A68E8658	VW3-A68E87571	VW3-A68E87571
ATV68EX●C53N4	VW3-A68E8659	VW3-A68E8658	VW3-A68E87581	VW3-A68E87571
ATV68EX●C63N4	VW3-A68E8660	VW3-A68E8659	VW3-A68E87591	VW3-A68E87581

(1) Consult the additional weights and dimensions (page 2/291).
(2) If a single-phase 230 V power supply is not available (for example: non-distributed neutral), the control transformer option must be used.
(3) Only for IP 23 enclosures.
(4) The option makes it possible to connect to the transformer output with 2 secondary windings. It consists of a 6-pole switch, fast-acting fuses, a power-up sequence and an additional line choke. The transformer must be ordered separately.
(5) For **ATV-68●C43N4** to **●C63N4** drives the references of the line contactors to be used are:
2 x LC1-F400 for **VW3-A68E8718** and **VW3-A68E8758**, 2 x LC1-F500 for **VW3-A68E8719** and 2 x LC1-265 for **VW3-A68E87572**.

Note: check the characteristics of the following:
- circuit-breakers and contactors, pages 2/278 and 2/279,
- radio interference input filters, page 2/250,
- motor choke, page 2/251.

Presentation, characteristics: page 2/288
References: pages 2/289 and 2/290
Dimensions: page 2/291

Line contactor to be used with switches and fuses (1) (2) for applications		Radio interference input filters	Motor choke (1)	Anti-condensation heater (2)	Twelve pulse power supply option	Baseplate
standard torque	high torque					
VW3-A68E8711	VW3-A68E8710	VW3-A68E401	VW3-A68E551	VW3-A68E881	VW3-A68E150	VW3-A68E891
VW3-A68E8711	VW3-A68E8711	VW3-A68E402	VW3-A68E552	VW3-A68E881	VW3-A68E160	VW3-A68E892
VW3-A68E8711	VW3-A68E8711	VW3-A68E402	VW3-A68E552	VW3-A68E881	VW3-A68E160	VW3-A68E892
VW3-A68E8714	VW3-A68E8714	VW3-A68E402	VW3-A68E552	VW3-A68E881	VW3-A68E160	VW3-A68E892
VW3-A68E8715	VW3-A68E8714	VW3-A68E403	VW3-A68E553	VW3-A68E881	VW3-A68E170	VW3-A68E893 (3)
VW3-A68E8716	VW3-A68E8715	VW3-A68E403	VW3-A68E553	VW3-A68E881	VW3-A68E170	VW3-A68E893 (3)
VW3-A68E8716	VW3-A68E8716	VW3-A68E403	VW3-A68E553	VW3-A68E881	VW3-A68E170	VW3-A68E893 (3)
VW3-A68E8718 (5)	VW3-A68E8718 (5)	VW3-A68E404	VW3-A68E554	VW3-A68E882	VW3-A68E175	VW3-A68E894 (3)
VW3-A68E8719 (5)	VW3-A68E8719 (5)	VW3-A68E404	VW3-A68E554	VW3-A68E882	VW3-A68E175	VW3-A68E894 (3)
VW3-A68E8719 (5)	VW3-A68E8719 (5)	VW3-A68E404	VW3-A68E554	VW3-A68E882	VW3-A68E175	VW3-A68E894 (3)

Line contactor to be used with switches and fuses (1) (2) for applications		Motor choke (1)	Anti-condensation heater (2)	Twelve pulse power supply option (4)	Baseplate
standard torque	high torque				
VW3-A68E8751	VW3-A68E8751	VW3-A68E551	VW3-A68E881	VW3-A68E150	VW3-A68E891
VW3-A68E8751	VW3-A68E8751	VW3-A68E552	VW3-A68E881	VW3-A68E160	VW3-A68E892
VW3-A68E8753	VW3-A68E8751	VW3-A68E552	VW3-A68E881	VW3-A68E160	VW3-A68E892
VW3-A68E8753	VW3-A68E8753	VW3-A68E552	VW3-A68E881	VW3-A68E160	VW3-A68E892
VW3-A68E8755	VW3-A68E8755	VW3-A68E553	VW3-A68E881	VW3-A68E170	VW3-A68E893 (3)
VW3-A68E8756	VW3-A68E87551	VW3-A68E553	VW3-A68E881	VW3-A68E170	VW3-A68E893 (3)
VW3-A68E8757	VW3-A68E87551	VW3-A68E553	VW3-A68E881	VW3-A68E170	VW3-A68E893 (3)
VW3-A68E87572 (5)	VW3-A68E87572 (5)	VW3-A68E554	VW3-A68E882	VW3-A68E175	VW3-A68E894 (3)
VW3-A68E8758 (5)	VW3-A68E8758 (5)	VW3-A68E554	VW3-A68E882	VW3-A68E175	VW3-A68E894 (3)
VW3-A68E8758 (5)	VW3-A68E8758 (5)	VW3-A68E554	VW3-A68E882	VW3-A68E175	VW3-A68E894 (3)

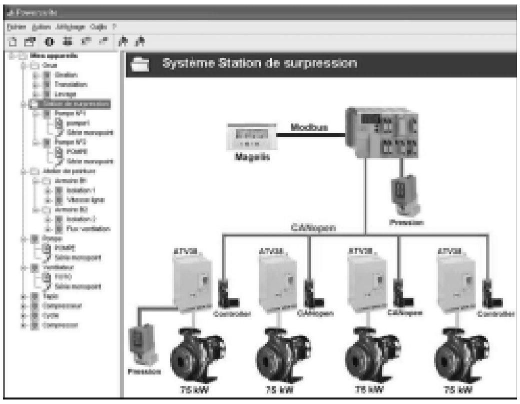
Presentation, characteristics: page 2/288
References: pages 2/289 and 2/290
Dimensions: page 2/291

3 - PowerSuite software workshop

PowerSuite software workshop

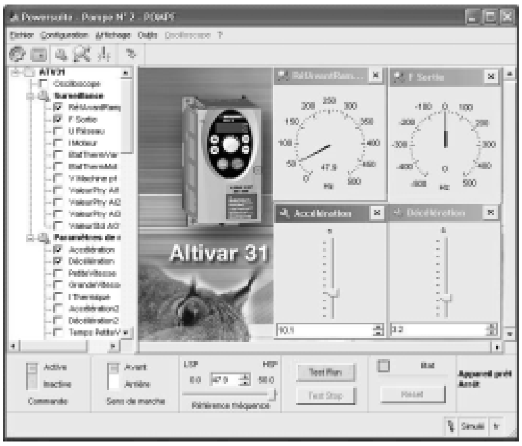
PowerSuite software workshop

531819



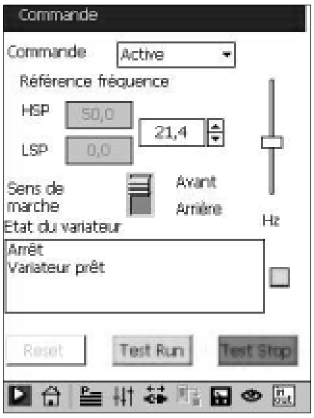
PowerSuite with PC screen
Installation management

531820



PowerSuite with PC screen
Monitoring screen

531440


Commande

Commande: Active

Référence fréquence

HSP: 50,0

LSP: 0,0

21,4 Hz

Sens de marche: Avant / Arrière

Etat du variateur: Arrêt, Variateur prêt

PowerSuite with Pocket PC screen

Presentation

The PowerSuite software workshop, for PC or Pocket PC, is designed for setting up Telemecanique starters and variable speed drives.

This single program is an easy-to-use interface for configuring Altistart and Tesys model U starters as well as all Altivar drives in a Microsoft Windows® environment, in five languages (English, French, German, Italian and Spanish).

Functions

The PowerSuite software workshop can be used for preparing, programming, setting up and maintaining Telemecanique starters and variable speed drives.

The PowerSuite software workshop can be used:
- ■ stand alone to prepare and store starter or drive configuration files,
- ■ connected to the starter or drive to:
  - □ configure,
  - □ adjust,
  - □ monitor (except for Altivar 11 drives),
  - □ control (except for Altivar 11 drives),
  - □ transfer and compare configuration files between PowerSuite and the starter or drive.

The configuration files generated by the PowerSuite software workshop can be:
- ■ saved to hard disk, CD-Rom, floppy disk, etc...
- ■ printed,
- ■ exported to office automation software applications,
- ■ exchanged between a PC and a Pocket PC using standard synchronization software. PowerSuite PC and Pocket PC configuration files have the same format,
- ■ they are password protected.

The software associated with the Altivar 31 has been enhanced to include: oscilloscope function, parameter name customisation, creation of a user menu, creation of monitoring screens, searching and sorting on different parameters.
The PowerSuite software workshop has on-line contextual help.

Connections

■ The PowerSuite software workshop can be connected directly to the terminal port on the starter or variable speed drives, via the serial port on the PC or Pocket PC.
Two types of connection are possible:
- either with a single starter or drive (point to point connection)
- or with a group of starters or drives (multi-point connection).

■ The PowerSuite software workshop for PC can be connected to an Ethernet network (see pages 4/2 to 4/5). In this case the starters and drives can be accessed using:
- either an Ethernet-Modbus 174 bridge CEV 300 20,
- or a communication option card VW3 A58310 (for Altivar 38, 58 and 58F drives only).

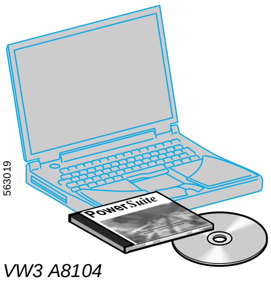
Hardware and software environment

■ The PowerSuite for PC software workshop can operate in the following PC environments and configurations:
- □ Microsoft Windows® 95 OSR2, Microsoft Windows® 98 SE, Microsoft Windows® NT4 X SP5, Microsoft Windows® Me, Microsoft Windows® 2000, Microsoft Windows® XP,
- □ Pentium III, 800 MHz, hard disk with 300 Mb available, 128 Mb RAM,
- □ SVGA or higher definition monitor

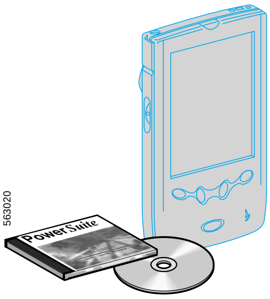
■ The PowerSuite for Pocket PC software workshop, version V2.0.0, is compatible with Pocket PCs equipped with Windows for Pocket PC 2002 or 2003 operating system and an ARM or XSCALE processor.
Performance tests for version V2.00 of the PowerSuite software workshop have been carried out on the following Pocket PCs:
- □ Hewlett Packard® IPAQ 2210,
- □ Compaq® IPAQ series 3800 and 3900,
- □ Hewlett Packard® Jornada series 560.

PowerSuite software workshop

References



VW3 A8104



VW3 A8104

PowerSuite software workshop for PC or Pocket PC *(1)*

Description	Composition	Reference	Weight kg
PowerSuite CD-Rom	■ Software for PC and Pocket PC in English, French, German, Italian and Spanish, ■ technical documentation and ABC configurator program.	**VW3 A8104**	0.100
PowerSuite upgrade CD	■ Software for PC and Pocket PC in English, French, German, Italian and Spanish, ■ technical documentation and ABC configurator program.	**VW3 A8105**	0.100
PC connection kit	■ 2 x 3 m connection cables with 2 x RJ 45 connectors, ■ 1 RJ 45/9-way SUB-D adapter for connecting ATV 58/58F/38 drives, ■ 1 RJ 45/9-way SUB-D adapter for connecting ATV 68 drives, ■ 1 converter marked “RS 232/RS 485 PC” with one 9-way female SUB-D connector and one RJ 45 connector, ■ 1 converter for ATV 11 drives, with one 4-way male connector and one RJ 45 connector.	**VW3 A8106**	0.350
Pocket PC connection kit *(2)*	■ 2 x 0.6 m connection cables with 2 x RJ 45 connectors, ■ 1 RJ 45/9-way SUB-D adapter for connecting ATV 58/58F/38 drives, ■ 1 converter marked “RS 232/RS 485 PPC” with one 9-way male SUB-D connector and one RJ 45 connector, ■ 1 converter for ATV 11 drives, with one 4-way male connector and one RJ 45 connector.	**VW3 A8111**	0.300

(1) To find out about the latest available version, please consult your Regional Sales Office.
(2) These kits connect to the synchronization cable, which must be ordered separately from your Pocket PC supplier.

Compatibility

Compatibility of the PowerSuite software workshop with starters and variable speed drives	**Starter-controller**	**Soft start/ soft stop unit**	**Variable speed drives**						
	TeSys model U	**ATS 48**	**ATV 11**	**ATV 28**	**ATV 31**	**ATV 38**	**ATV 58 ATV 58F**	**ATV 68**
PowerSuite software workshop for PC with serial link	**⩾ V 1.40**	**⩾ V 1.30**	**⩾ V 1.40**	**⩾ V 1.0**	**⩾ V 2.0.0**	**⩾ V 1.40**	**⩾ V 1.0**	**⩾ V 1.50**
PowerSuite software workshop for PC with Ethernet link	–	**⩾ V 1.50** and Ethernet-Modbus bridge	–	**⩾ V 1.50** and Ethernet-Modbus bridge	**⩾ V 2.0.0** and Ethernet-Modbus bridge	**⩾ V 1.50** and Ethernet V2 communication card or bridge		–
PowerSuite software workshop for Pocket PC	**⩾ V 1.50**	**⩾ V 1.30**	**⩾ V 1.40**	**⩾ V 1.20**	**⩾ V 2.0.0**	**⩾ V 1.40**	**⩾ V 1.20**	–

▭ Compatible products and software versions.
■ Non compatible products.

Compatibility of the PowerSuite software workshops with Pocket PCs					
Operating system	**Performance tests carried out on models**	**PowerSuite software version**			
		V 1.30	**V 1.40**	**V 1.50**	**V 2.0.0**
Windows for Pocket PC 2003	Hewlett Packard® IPAQ 2210	no	no	no	yes
Windows for Pocket PC 2002	Compaq® IPAQ series 3800, 3900	no	no	yes	yes
	Hewlett Packard® Jornada series 560	no	yes	yes	yes
Windows for Pocket PC 2000	Hewlett Packard® Jornada series 525	yes	yes	yes	no
Windows CE	Hewlett Packard® Jornada 420	yes	no	no	no

4 - Communication

Starters, drives and communication

Starters, drives and communication

Ethernet TCP/IP network

Presentation

Nowadays, applications for distributed control systems can use a single communication network. The network should meet not only the demands for realtime performance on the factory floor, but also the need for open access to control/monitoring software. It should be based on products using standard communication protocols or applications using Internet technology.
Ethernet responds to these different needs in terms of data rate, capacity for open access on TCP/IP and flexibility in terms of topology.
All these criteria are reinforced by the capacity of Schneider Electric to provide high-level services which enable the user to reduce his development and operating costs.

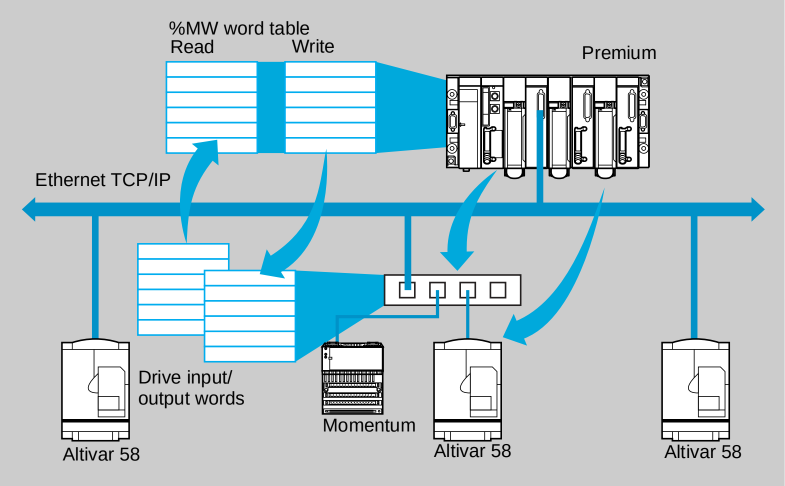
Ethernet communication is mainly aimed at applications for:
- coordination between PLCs,
- local or centralised supervision,
- communication with production management software,
- communication with remote I/O,
- communication with industrial control products.

The Altivar 58 drive connects to the Ethernet TCP/IP network via the VW3 A58310 communication card.

This communication card supports:
- a TCP/IP communication profile on Ethernet 10/100 Mbps,
- the I/O Scanning function,
- the integrated Web server function.

I/O Scanning service

Schematic diagram



The Altivar 58 drive accepts the I/O Scanning service generated by:
- automation platforms:
  - ☐ Premium equipped with a TSX ETY 410/5101 module,
  - ☐ Quantum,
  - ☐ Momentum M1E,
- a PC equipped with Modbus communication software with I/O scanner function.

This service is used to manage the exchange of remote I/O on the Ethernet network after simple configuration and without the need for special programming.
The drive I/O are scanned transparently by means of read/write requests according to the Modbus Master/Slave protocol on the TCP/IP profile.
The Altivar 58 I/O Scanning service can be disabled. Please consult our "Modicon Premium and PL7 software" catalogue.

Control configuration

The Web server “Control configuration” screen is used to:
- enable the I/O Scanning service,
- configure the I/O scanner (assignment of 10 drive input words and 10 drive output words to configurations, adjustments and signalling according to the requirements of the client application),
- configure the communication functions.

Starters, drives and communication

Ethernet TCP/IP network

Integrated Web server

The Altivar 58 drive incorporates an integrated Web server, in English.
The functions provided by the Web server require no special configuration or programming of the PC which supports the Internet browser. The Web server screens are predefined, with secure access (password).

The integrated Web server provides access to the following functions:
- Altivar Viewer,
- Data Editor,
- Statistics,
- Security,
- Web server for Pocket PC.

1 “Altivar Viewer” function

The “Altivar Viewer” screen is used to display:
- the drive status,
- the motor speed,
- the drive I/O.

2 “Data Editor” function

The “Data Editor” screen is used to access the drive configuration, adjustment and signalling functions. For safety reasons, the drive control function is not accessible.

3 “Statistics” function

The “Statistics” screen gives the Ethernet network communication statistics. It also shows the product connected to the network (reference, software version, etc).

Starters, drives and communication

Ethernet TCP/IP network

4 “Security” function

The “Security” screen is used to modify the user name and passwords:

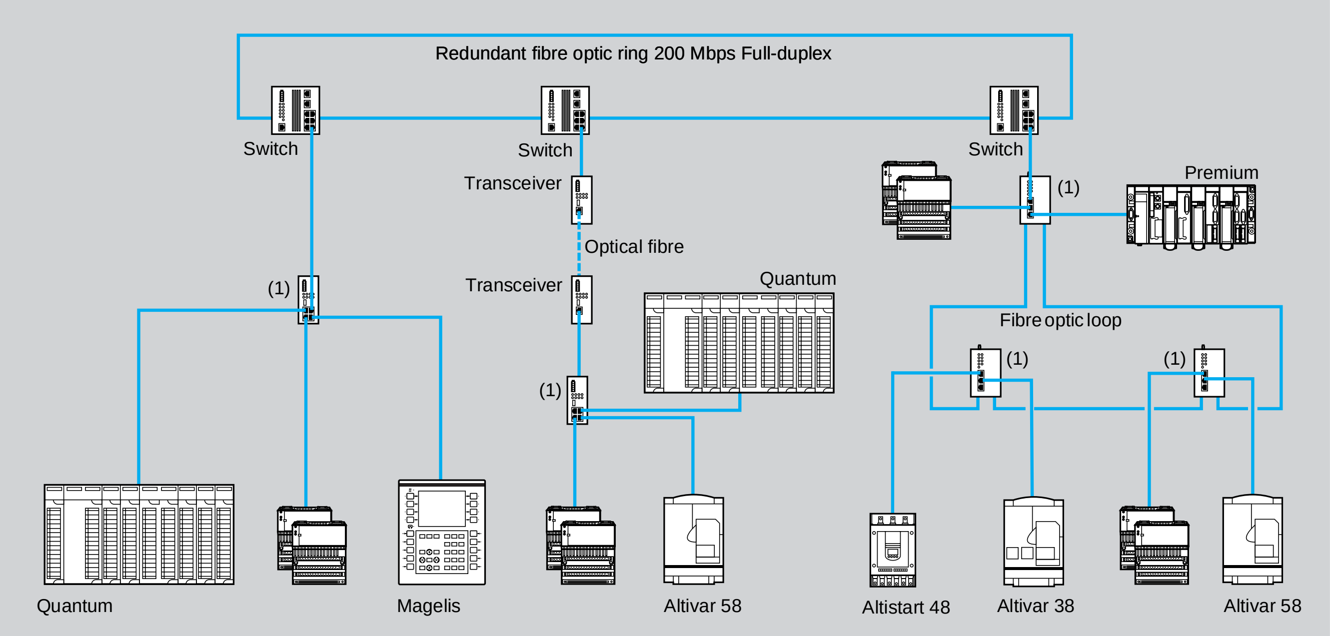
- the HTTP password authorises access to the drive function display,
- the Data Editor Write password authorises access to modification of the drive functions.

5 “Altivar Viewer for Pocket PC” function

The “Altivar Viewer for Pocket PC” screen is used to display a table of the main drive data.

The Web browsers for Pocket PC do not provide access to the screens shown opposite.

Connections



(1) Splitter block

The communication card is incorporated in the Altivar 58 drive and is connected to the Ethernet TCP/IP network via a 10/100baseT interface (RJ45).
See page 4/5 for accessories and connecting cables.

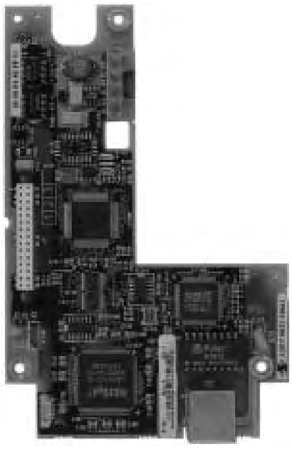
Starters, drives and communication

Ethernet TCP/IP network

Characteristics

Type of link		Ethernet
Structure	Type	Industrial local area network conforming to ANSI/IEEE Std 802.3 (4th edition 1993-07-08)
	Topology	Star network
Transmission	Mode	Manchester baseband. Half-duplex or full-duplex
	Data rate	10/100 Mbps with automatic recognition
	Medium	STP double shielded twisted pair impedance 100 Ω ± 15 Ω for 10 baseT or category 5 Ethernet cable conforming to standard TIA/EIA-568A
Configuration	Number of device stations	Point-to-point connection (via RJ45 standard connector) enabling formation of a star network (the stations are connected to concentrators or switches) 64 stations max. per network
	Length	100 m max. between concentrator and terminal device
Ethernet functions	Access security	HTTP password. Password for modifications
	I/O scanning	Performed from a master Ethernet module 10 control words (outputs), 9 of which can be configured 10 signalling words (inputs), 9 of which can be configured
	I/P addressing	IP configuration via the drive operator terminal or via BOOTP. DHCP not supported.
	TCP/Modbus	Client/server mode. 8 simultaneous connections.
	HTTP server	Simultaneous connection of 8 Internet browsers possible
	File transfer	FTP not supported
	Network management	SNMP not supported
Conforming to standards		The communication card conforms to the following standards: ISO/IEC 8802.3, ANSI/IEEE Std 802.3 (4th edition 1993-07-08), UL 508C, CSA C22.2 N14 M95, CE marking, Drive standards NF-EN50178, IEC 61800-3 class A

Ethernet network connection elements



VW3 A58310

499 NEH00410

499 NES07100

Communication interfaces

Description	For drives	Reference	Weight kg
Communication card Ethernet Modbus TCP/IP 10/100 Mbps	ATV 38 ATV 58 *(1)* ATV 58F All ratings	**VW3 A58310**	0.300
Factory-installed Web server cannot be modified			
Ethernet/Modbus bridge with 1 x Ethernet 10baseT port (RJ45 type)		**174 CEV 300 10** *(2)*	0.500

Connecting cables

Description	Connectors	Length m	Reference	Weight kg
Shielded twisted pair cables Create the link between the communication card and the Ethernet network	RJ45/RJ45	2	**490 NTW00002**	–
		5	**490 NTW00005**	–
		12	**490 NTW00012**	–
		40	**490 NTW00040**	–
		80	**490 NTW00080**	–

Wiring systems

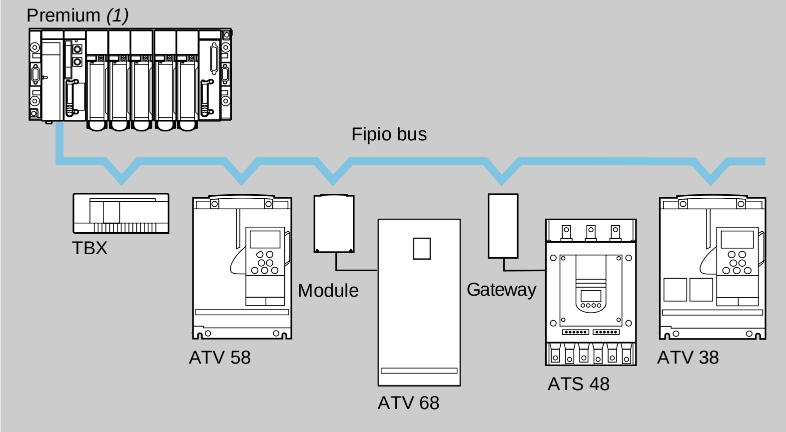
Description	Type of Ethernet network	Available ports	Reference	Weight kg
TF splitter blocks	10 Mbps	4 10baseT ports	**499 NEH00410**	0.525
		3 10baseT ports 2 10baseFL ports	**499 NOH00510**	0.900
	100 Mbps	4 100baseTX ports	**499 NEH04100**	1.450
TF switches *(3)*	10/100 Mbps	5 10baseT/100baseTX ports 2 100baseTX ports	**499 NES07100**	1.450
		5 100baseTX ports 2 100baseFX ports	**499 NOS07100**	1.450

(1) Compatible from version V2.3 ie08 of the ATV 58 drive.
(2) Please consult our "Modicon Premium and PL7 software" catalogue.
*(3) At 100 Mbps, connection of the **VW3 A58310** communication card on the Ethernet network via a switch only authorises data exchange in Half Duplex.*

Starters, drives and communication

Communication via Fipio bus

Presentation



The Fipio fieldbus is a standard means of communication between different control system components, and conforms to the World FIP standard.
The bus arbitrator is a PLC (Premium, PCX, etc).

■ Once they have been declared with the predefined profile, the following Altivar speed drives can be connected to the Fipio bus:
☐ ATV 38, ATV 58 and ATV 58F via a VW3 A58301 or VW3 A58311 communication card
☐ ATV 68 via a VW3 A68301 communication kit

■ The Altistart 48 soft start - soft stop unit can be connected to the Fipio bus via the LUF P1 gateway.
Once the predefined gateway profile has been declared, configure the control and monitoring variables using ABC Configurator software (see pages 3/2 and 3/3).

An application using Altivar variable speed drives and the Altistart 48 soft start - soft stop unit on the Fipio bus is developed by simply declaring the device using PL7 software.

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(1) Please consult our "Modicon Premium and PL7 software" catalogue.

Characteristics:
page 4/7

References:
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Connections:
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Starters, drives and communication

Communication via Fipio bus

Characteristics

Bus type		Fipio bus
Structure	Type	Industrial bus conforming to the World FIP standard
	Topology	Devices linked by extensions or tap junctions
	Access method	Bus management by an arbitrator
Transmission	Mode	Baseband physical layer on shielded twisted pair, according to standard NF C 46-604
	Data rate	1 Mbps
	Medium	Shielded twisted pair 150 Ω. Optical fibre 62.5/125 with the use of electrical/fibre optic repeaters
Configuration	No. of devices per segment	32 connection points per segment
	Maximum	64 over all segments (127 for Premium Fipio, 62 ATV type drives max.)
	No. of segments	Unlimited in tree or star architectures Limited to 5 cascaded segments (4 cascaded repeaters) The link between 2 devices may cross 4 electrical/fibre optic repeaters maximum
	Length of bus *(1)*	1000 m maximum without repeater for an electrical segment 5000 m maximum between the furthest devices (5 segments) 3000 m between 2 fibre optic repeaters

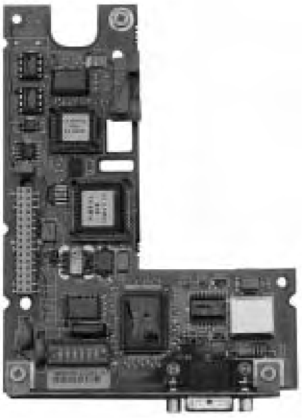
For starters and drives	ATS 48	ATV 38/58/58F	ATV 58/58F	ATV 68
Interfaces	**LUF P1**	**VW3 A58311**	**VW3 A58301**	**VW3 A68301**
Profiles	**FED C 32** or **FED C 32P**	**FED C 32**	**FSD C 8P**	**FED C 32**
Control	26 configurable words *(2)*	5 predefined words	5 predefined words	1 predefined word, 3 configurable references
Monitoring	26 configurable words *(2)*	8 predefined words	8 predefined words	1 predefined word, 3 configurable words
Configuration and adjustments	Read/write access to all ATS 48 functions via the PLC application program	Read/write access to all ATV 38/58/58F functions via the PLC application program	Read/write access to predefined functions in the PL7 software screens	–

(1) For the Fipio bus, distance of 15,000 m maximum, please consult your Regional Sales Office.

(2) To extend the I/O capacity to 26 control words and 26 monitoring words, use the ABC Configurator.

References

Starters, drives and communication
Communication via Fipio bus



VW3 A58301

VW3 A68301

LUF P1

Fipio bus connection elements with Premium PLCs

Description	Used for	Reference	Weight kg
Communication card The card is equipped with a male 9-way SUB-D connector which can take a TSX FP ACC12 mobile connector for ATV 38/58/58F or a TSX FP ACC2 for a ready-assembled ATV 58E.	**ATV 58** **ATV 58F**	**VW3 A58301**	0.300
	ATV 38 **ATV 58** **ATV 58F**	**VW3 A58311**	0.300
Communication kit The kit comprises: ■ the Fipio communication card, equipped with a male 9-way SUB-D connector, which can take a TSX FP ACC12 removable connector with a TSX FP CA●● trunk cable or TSX FP CC●● drop cable, ■ the communication interface, reference VW3 A8300, ■ the connecting cable. Fit an external power supply 24 V ⎓ 200 mA minimum (to be ordered separately).	**ATV 68**	**VW3 A68301**	1.400
Fipio Modbus gateway The gateway is equipped with: ■ a Fipio male 9-way SUB-D connector which will take a TSX FP ACC12 mobile connector for connection with A TSX FP CA●● trunk cable or a TSX FP●● drop cable, ■ an RJ45 connector for Modbus for connection with the VW3 A8306R●● cable Fit an external power supply 24 V ⎓ 100 mA minimum (to be ordered separately).	**ATS 48**	**LUF P1**	0.240

Fipio bus connection elements with Series 7 PLCs

Description	Used for	Reference	Weight kg
Communication card The card is equipped with a male 9-way SUB-D connector which can take a TSX FP ACC2 mobile connector for ATV 58E or TSX FP ACC12 for ATV 58H and ATV 58P with a TSX FP CA●● trunk cable or a TSX FP CC●● drop cable. This card may only be used with Series 7 PLCs.	**ATV 58**	**VW3 A58301 A**	0.300

Documentation

User's manuals

Description	Language	Reference	Weight kg
Fipio card VW3 A58 301	French English	**VVDED397045**	0.130
Fipio card VW3 A58 311	French English	**VVDED300024**	0.150
ATV 68 Fipio	French English	**VVDED300023**	0.120
"Internal communication variables" ATV 38/58/58F	French English	**VVDED397058**	0.100

Technical manual

Description	Language	Reference	Weight kg
International technical manual (ITM) *(1)*	French English	**DCI CD 398111**	0.150

(1) Library on CD-ROM containing:
- manuals and quick reference guides for starters and speed drives,
- user's manuals for communication gateways.

***Nota :** to order connection cables for the Fipio bus, please consult our "Modicon Premium and PL7 software" catalogue.*

Presentation:
page 4/6

Characteristics:
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Connections:
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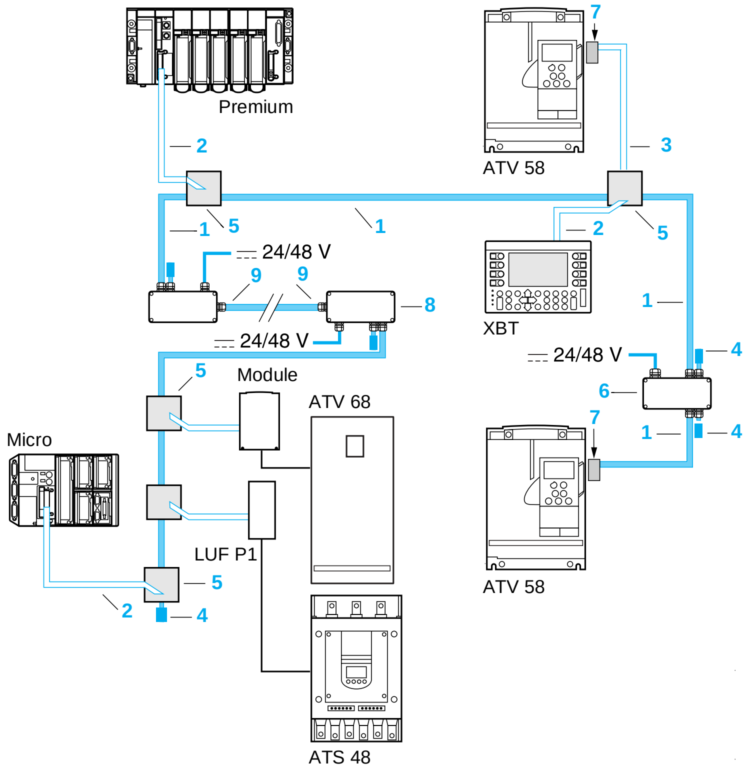
Starters, drives and communication

Communication via Fipio bus

Fipio wiring system

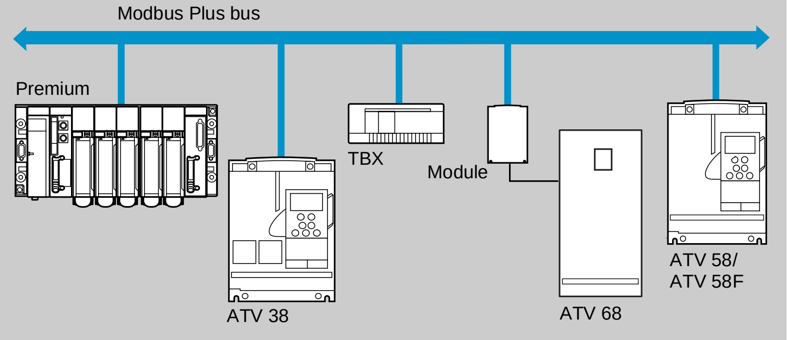


1	**TSX FP CA ●00**	Trunk cable, shielded twisted pair 150 Ω (8 mm diameter) for standard environments and inside buildings.
	TSX FP CR ●00	Trunk cable, shielded twisted pair 150 Ω (8 mm diameter) for harsh environments or use outside buildings.
2	**TSX FP CG 0●0**	Tap link cable for TSX FPP 10/20 PCMCIA module card for Micro/Premium PLCs, FTX 417-40 terminal and PC compatibles. The bus is connected on the TSX FP ACC 4 junction box 9-way SUB-D connector.
3	**TSX FP CC ●00**	Drop cable, double shielded twisted pair 150 Ω (8 mm diameter) for standard environments and inside buildings.
4	**TSX FP ACC 7**	Line terminator, to be placed at the end of each segment.
5	**TSX FP ACC 4**	Junction box: creates a tap link from the trunk cable for connecting a device via a **TSX FP CC●00** drop cable. It also has a female 9-way SUB-D connector for connecting any device which connects to the bus via a PCMCIA card.
	TSX FP ACC 14	Polycarbonate junction box.
6	**TSX FP ACC 6**	Electrical repeater: used to increase the number of stations (64 max.) and to increase the length of the network by creating additional segments of 1000 m maximum (4 cascaded repeaters maximum allowing a network length of 5000 m).
7	**TSX FP ACC 2** **TSX FP ACC 12**	Female 9-way SUB-D connector for Fipio extensions or tap junctions.
8	**TSX FP ACC 8M**	Fibre optic/electrical repeater: used to interconnect electrical segments via a fibre optic link (excellent resistance for crossing zones subject to interference) or connecting a fibre optic device.
9	**TSX FP JF 020**	Fibre optic jumper (length 2 m): used for fibre optic connection of the TSX FP ACC 8M repeater to a patch panel. Maximum optical fibre length (62.5/125) between 2 repeaters: 3000 m.
	TSX FP ACC 9	Network wiring test tool: used to test the continuity of segments and connections on the various devices, as well as to check that line terminators have been inserted correctly.

Starters, drives and communication

Communication via Modbus Plus bus

Presentation



The Modbus Plus network is a token network which enables point-to-point communication between the various subscribers. Each subscriber listens and speaks at the token rotation speed.

Altivar 38/58/58F/68 variable speed drives are connected to the Modbus Plus bus via:

- a VW3 A58302 communication card for ATV 38/58/58F,
- a communication kit for ATV 68.

Modbus Plus communication profile

Altivar 38/58/58F/68 variable speed drives on the Modbus Plus bus, controlled by a PLC, are accessed by simple configuration in the PLC using “Peer Cop” services and the Modbus Plus network “global data” database. Rapid exchange of the main drive registers is thus made possible. The PLC/drive communication speed is not affected by the number of drives on the network (20 maximum with “Peer Cop” rapid exchange). The other parameters, which are used less frequently, can be accessed via the standard PLC function block (MSTR) only for Altivar 38/58 and Altivar 58F drives.

Rapid exchange

PLC writing to drive (Peer Cop)	**Drive writing to PLC (Global Data)**
32 words for ATV 38/58/58F Frequency references Control register Low and high speed Preset speeds Acceleration/deceleration 1 and 2 IR compensation Voltage/frequency profile (U/F) Slip compensation Etc	32 words for ATV 38/58/58F Reference frequency/applied frequency Status register Motor current/speed Supply voltage Drive/motor temperature Read discrete or analogue I/O Number of faults Current fault Etc
4 words for ATV 68 Control register References	4 words for ATV 68 Status register Motor frequency Motor speed Motor current

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Starters, drives and communication

Communication via Modbus Plus bus

Characteristics

Bus type		**Modbus Plus bus**
Structure	Type	Industrial bus
	Topology	Point-to-point, bus and “self-healing” ring
	Access method	“Plug and play”
Transmission	Mode	Baseband physical layer on shielded twisted pair
	Data rate	1 Mbps, useful data rate 20,000 words/s
	Medium	Shielded twisted pair 120 W BELDEN 9841. Optical fibre 50/125, 62/125, 100/140 mm with the use of electrical/fibre optic repeaters
Configuration	No. of devices per segment	32 connection points per segment
	Maximum	64 over all segments
	Number of segments	Unlimited in tree or star architectures Limited to 4 cascaded routers (4 cascaded repeaters) The link between 2 devices should cross 4 electrical routers and/or 3 repeaters maximum
	Length of bus	450 m maximum without repeater for an electrical segment 1800 m maximum between the furthest devices (3 repeaters) 3000 m between 2 fibre optic repeaters
Services	Modbus Plus	Point-to-point requests with confirmation report: 200 bytes maximum, compatible with all Modbus/Jbus devices
	Application-to-application	Point-to-point messages (Peer Cop): 64 bytes in read and write mode, 64 bytes in broadcast mode via the global database
	Security	Each frame is protected by a CRC 16 and an acknowledgement of receipt conforming to layers 1, 2, 7, of the OSI model
	Monitoring	Network diagnostics are performed by the PC software or by the standard PLC function block (MSTR)

For drives		**ATV 38/58/58F**	**ATV 68**
Functions	“Peer Cop” control and adjustment	32 predefined words	1 predefined word, 3 configurable references
	“Global Data” monitoring	32 predefined words	1 predefined word, 3 configurable words
	“MSTR” configuration and adjustment	Read/write access to all ATV 38/58/58F functions by the PLC application program	–

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Starters, drives and communication

Communication via Modbus Plus bus

VW3 A58302

VW3 A68302

Modbus Plus bus connection elements

Cards

Description	Used with	Reference	Weight kg
Communication card The card is equipped with a female 9-way SUB-D connector which can take a Modbus Plus drop cable with connectors, reference 990 NAD 211 10 or 990 NAD 211 30. This cable should be connected to a Modbus Plus tap, reference 990 NAD 230 00 for connection to the Modbus Plus trunk cable, reference 490 NAA 271●●. To order cables and sockets, please consult our *"Modicon Premium and PL7 software"* catalogue.	**ATV 38** **ATV 58** **ATV 58F**	**VW3 A58302**	0.300
Communication card The kit comprises: ■ the Modbus Plus card, equipped with a female 9-way SUB-D connector, which can take a Modbus Plus drop cable with connectors, reference 990 NAD 21110 or 990 NAD 21130, to be connected to a Modbus Plus tap, reference 990 NAD 230 00 for connection to the Modbus Plus trunk cable, reference 490 NAA 271 ●● *(1)*, ■ the communication interface, reference VW3 A68300, ■ the connecting cable, reference VW3 A68332 Fit an external power supply ⎓ 24 V, 200 mA minimum, type TBX SUP10 (to be ordered separately).	**ATV 68**	**VW3 A68302**	1.400

Modbus Plus connection accessories

Description	Used	Reference	Weight kg
Modbus Plus tee	Trunk cable tap link	**990NAD23000** *(1)*	0.050
Modbus Plus tool	For easier insertion of cables into the tee	**043509383** *(1)*	0.050

Modbus Plus bus connecting cables

Description	Used		Length	Position of connector	Reference	Weight
	From	To				kg
Cables for Modbus Plus	Communication card	Modbus Plus tee	2.4 m	Right	**990NAD21910** *(1)*	0.100
			6 m	Right	**990NAD21930** *(1)*	0.300
			2.4 m	Left	**990NAD21810** *(1)*	0.100
			6 m	Left	**990NAD21830** *(1)*	0.300

Documentation

Description	Language	Supplied	Reference	Weight kg
Altivar 38/58/58F Modbus Plus user's manual	French English	With the communication card	**VVDED397044**	0.180
Altivar 68 user's manual	French English	With the communication kit	**VVDED300022**	0.180

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(1) Products sold under the Modicon brand.

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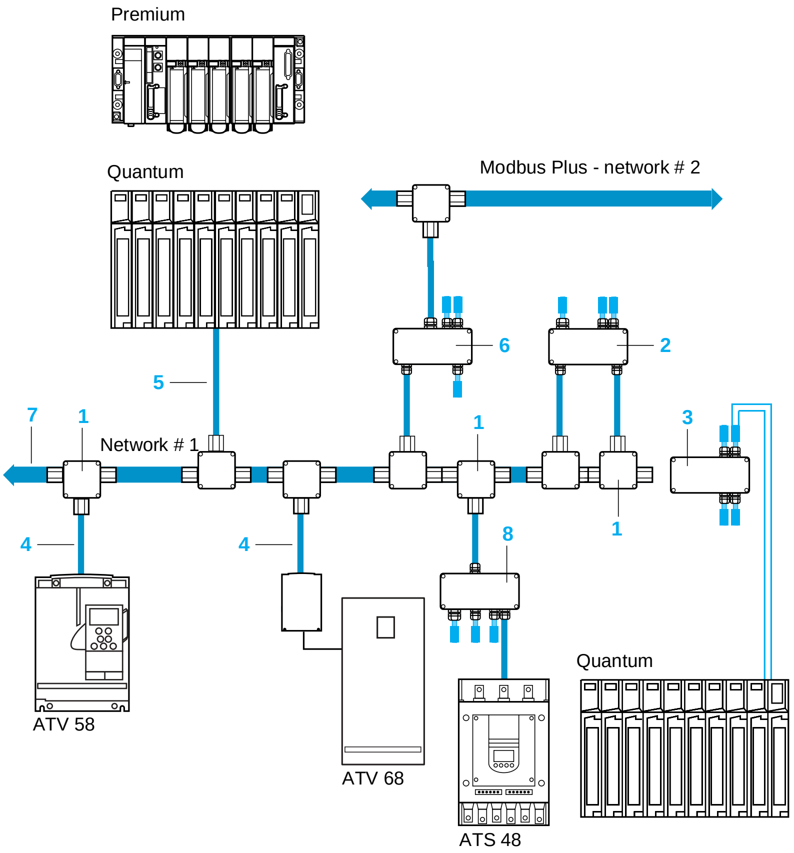
Starters, drives and communication

Communication via Modbus Plus bus

Modbus Plus wiring system

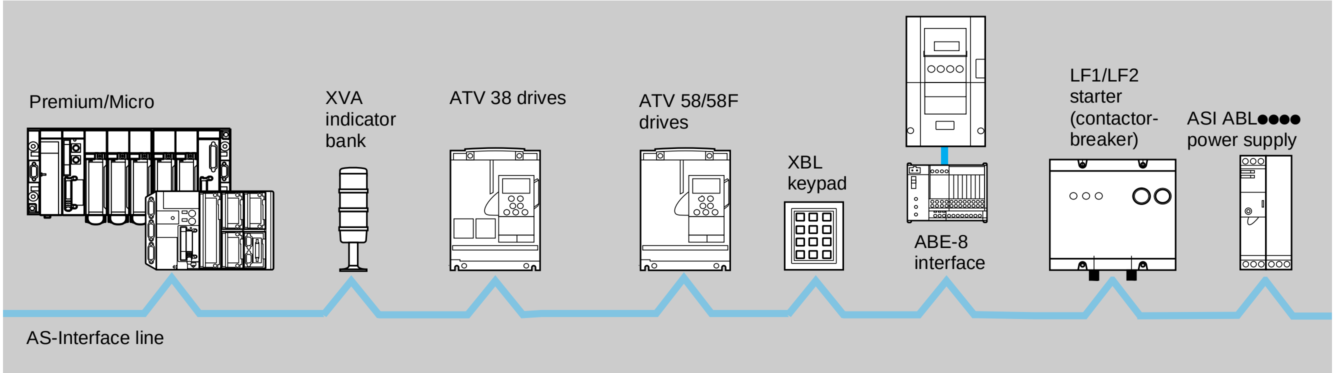


1	**990NAD23000**	Tee for Modbus Plus
2	**NWRR85001**	Repeater for Modbus Plus network (extension to 64 subscribers or extension to 450 m)
3	**490NRP25400**	Fibre optic repeater for Modbus Plus network
4	**990NAD21810**	Modbus Plus cable (length 2.4 m) with connector exiting on left
	990NAD21830	Modbus Plus cable (length 6 m) with connector exiting on left
	990NAD21910	Modbus Plus cable (length 2.4 m) with connector exiting on right
	990NAD21930	Modbus Plus cable (length 6 m) with connector exiting on right
5	**990NAD21110**	Modbus Plus cable dedicated to the Quantum PLC (length 2.4 m) with connector exiting on left
	990NAD21130	Modbus Plus cable dedicated to the Quantum PLC (length 6 m) with connector exiting on right
6	**NWBP85002**	Modbus Plus bridge
7	**490NAA27101**	Modbus Plus cable on a 30 m reel
	490NAA27102	Modbus Plus cable on a 150 m reel
	490NAA27103	Modbus Plus cable on a 305 m reel
	490NAA27104	Modbus Plus cable on a 455 m reel
	490NAA27105	Modbus Plus cable on a 1525 m reel
8	**NWBM85000**	Modbus Plus communication gateway to 4 Modbus master or slave ports

Starters, drives and communication

Communication via AS-Interface line

Presentation



The cabling system comprises a master station (Premium, Micro PLC) and a maximum of 31 slave stations.
4 inputs and/or 4 outputs can be connected to each device, giving a maximum of 248 I/O on each segment.
The AS-Interface PLC module, which supports the AS-Interface M2 profile, interrogates the devices connected on the AS-Interface line one by one and stores the data (status of sensors/actuators, operational status of devices) in the PLC memory. Communication management on the AS-Interface line is totally transparent with regard to the PLC application program.
An AS-Interface power supply must be used for powering the various components on the cabling system. Ideally, this PSU should be situated nearest to the components with the largest power demands.
For more detailed information, please consult our "AS-Interface cabling system" catalogue.

Description

ATV 38/58/58F drives are connected to the AS-Interface line via the VW3 A58305 communication card.
Any other drive or starter can be connected to the network via an ABE-8 discrete interface. The available functions then depend on the wiring between the ABE-8 interface module and the drive or starter and their I/O configuration.

The functions available are:
- control of logic commands: forward/reverse, enable preset speeds,
- reading of states: drive fault, speed reached, etc.

Start-stop commands via the AS-Interface line

The AS-Interface line communication card is used to perform the following commands:
forward, reverse, normal stop on deceleration ramp, fast stop, DC injection stop, freewheel stop, fault reset (to reset the drive).

Speed commands via the AS-Interface line

One of the following operating modes can be chosen:
2 directions of operation with 4 preset speeds, 1 direction of operation with 7 preset speeds, + speed/- speed.
Selection is made via the AS-Interface line, using 2 parameters.

Speed commands via analogue input

Inputs AI1 and AI2 can be used to accept a frequency reference.

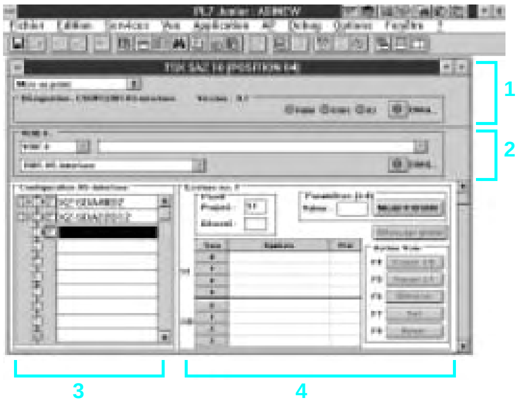
Software setup

The AS-Interface line is configured using PL7 Micro/Junior/Pro software. The utilities available are based on the principle of simplicity:

- management of profile tables, parameters and data by the master (this management is transparent to the user),
- topological I/O addressing: each AS-Interface slave declared on the line is assigned a topological address on the line. This is transparent to the user,
- each sensor/actuator on the AS-Interface line is treated as an “in-rack” input/output by the PLC.

Configuration of the AS-Interface slave devices using PL-7

Using the configuration screen, it is possible to configure all the slave devices (1 to 31), i.e. all 248 I/O.
The user selects the AS-Interface device reference from the various product families. This selection determines the AS-Interface profile and parameters associated with the device.



Diagnostics

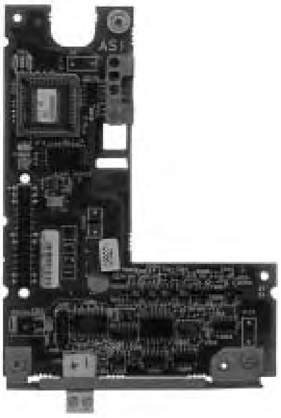
Diagnostics performed using the display unit on the Micro/Premium PLC can be completed using a PC compatible with PL7 Micro or PL7 Junior/Pro.

The terminal connected to the PLC is used for operational diagnostics of the master module, the AS-Interface line and the slave devices on the AS-Interface line.

These diagnostics are performed using a single screen divided into four sections providing information on:

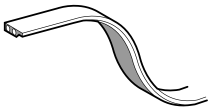
1 Operational status of the AS-Interface module (RUN, ERR, I/O)
2 Operational status of the AS-Interface channel connected to the module
3 Faulty slave
4 Data relating to any selected slave (profile, parameters, forcing, etc.)

In the event of an AS-Interface module or channel fault, a second screen can be accessed, which clearly shows the type of fault, which may be at internal or external level.



VW3 A58305

ABE 8S44SBB1



XZ-CB1●●01

References

AS-Interface line connection elements

Description	Reference	Weight kg
ATV 58/58F communication card	**VW3 A58305**	0.300

Interfaces for discrete I/O with AS-Interface line for drive and starter

Number of channels	Function Type	No.	Voltages Inputs	Outputs	Output current/ channel	Reference	Weight
			V	V	A		kg
8	Input	4	line	–	–	**ABE 8S44SBB1**	0.240
	Output	4	–	⎓ 24	1		

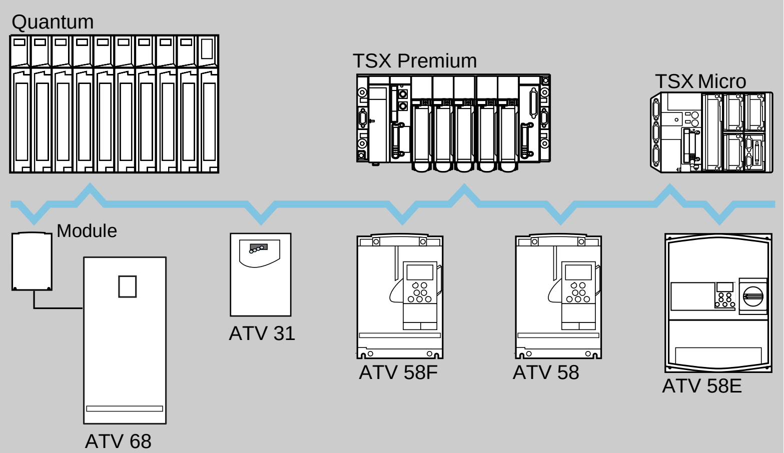
Connection accessories for AS-Interface flat cable

Description	Power supply	Length m	Reference	Weight kg
Flat cables for AS-Interface line	For AS-Interface line (yellow)	20	**XZ CB10201**	1.400
		50	**XZ CB10501**	3.500
		100	**XZ CB11001**	7.000
Tap link for connection to a cable		2	**XZ CG0122**	0.215

Starters, drives and communication

Communication via Modbus bus

Presentation



The Modbus protocol is a master-slave protocol.
Two exchange mechanisms are possible:

- Question/answer:
the requests from the master are addressed to a given slave. The master then waits for the response from the slave which has been interrogated.

- Broadcast:
the master broadcasts a message to all the slave stations on the bus, which execute the command without transmitting a response.

Altistart 48 starters and Altivar 31/38/58/58F speed drives are connected to the Modbus bus via their terminal port.
On Altivar 38/58/58F drives, the terminal port can be freed up by using a communication card.

Altivar 68 speed drives are connected to the Modbus bus via a communication module.

Characteristics

Type of connection			**Terminal port**		**Module**	**Communication card**
For starters and drives			**ATS 48**	**ATV 31/38/58/58F**	**ATV 68**	**ATV 38/58/58F**
Structure	Type		Industrial bus			
	Physical interface		RS 485			
	Access method		Master/slave type			
Transmission	Mode		RTU			RTU or ASCII
	Data rate	19.2 or 9.6 Kbps	●	●	●	●
		4.8 Kbps	●	–	●	●
		2.4 and 1.2 Kbps	–	–	●	–
	Medium		Double shielded twisted pair			
Configuration	Number of devices		18, 27 or 31 slaves, depending on polarisation *(1)*			
	Type of polarisation		Pulldown resistors of 4.7 kΩ		No pulldown	Configurable No pulldown or pulldown resistors of 4.7 kΩ
	Length of bus		1000 or 1300 m excluding tap links, depending on polarisation *(1)*			
	Tap link		3 or 20 m maximum, depending on polarisation *(1)*			

(1) See the configuration table on page 4/17.

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Starters, drives and communication

Communication via Modbus bus

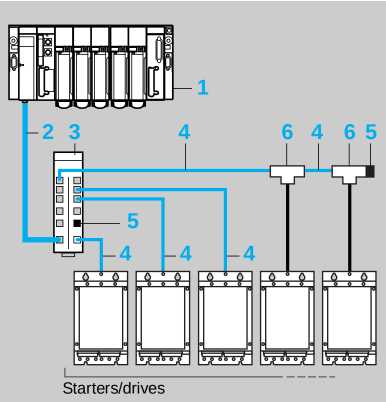
Configuration on the basis of polarisation

The specification of the physical layer provided by standard RS 485 is incomplete. Various polarisation diagrams can therefore be applied, depending on the environment in which the equipment is to be used.

		Master	
		With polarisation 4.7 kΩ	**With polarisation 470 Ω**
Slave	**Without polarisation**	Configuration not recommended	Jbus type configuration 31 slaves Length of bus: 1300 m Tap link: 3 m max. Fit a line terminator (R=150 Ω)
	With polarisation 4.7 kΩ	Uni-Telway type configuration 27 slaves Length of bus: 1000 m Tap link: 20 m max. Fit an RC line terminator	18 slaves Length of bus: 1000 m Tap link: 20 m max.

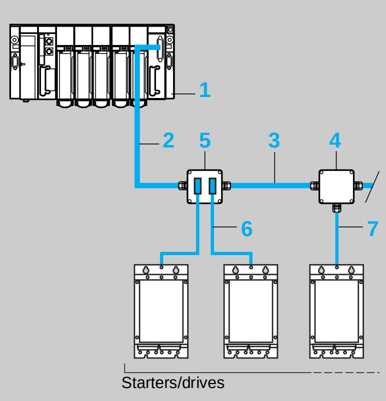
Connections

Connections via splitter blocks and RJ45 type connectors



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus splitter block **LU9 GC3**
4 Modbus drop cable **VW3 A8 306 R●●**
5 Line terminators **VW3 A8 306 RC**
6 Modbus T-junction boxes **VW3 A8 306 TF●●** (with cable)

Connections via junction boxes



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus cable **TSX CSA ●00**
4 Junction box **TSX SCA 50**
5 Subscriber sockets **TSX SCA 62**
6 Modbus drop cable **VW3 A8 306**
7 Modbus drop cable **VW3 A8 306 D30**

Connections via screw terminals

In this case, use a **VW3 A8 306 D30 Modbus** drop cable and **VW3 A8 306 DRC** line terminators.

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(1) Please consult our "Modicon Premium and PL7 software" catalogue.

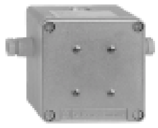
Starters, drives and communication

Communication via Modbus bus

520976

VW3 A68303

521423



TSX SCA 50

521423

TSX SCA 52

Communication module

Description	Reference	Weight kg
Communication module for ATV 68 fitted with an RJ45 connector and a female 9-way SUB-D connector	**VW3 A68303**	1.400

Connection accessories

Description			Unit reference	Weight kg
Junction box 3 screw terminals, RC line terminator			**TSX SCA 50**	0.520
Subscriber sockets 2 female 15-way SUB-D connectors and 2 screw terminals, RC line terminator			**TSX SCA 62**	0.570
Modbus splitter block 10 RJ45 type connectors and 1 screw terminal			**LU9 GC3**	0.500
Line terminators (1)	For RJ45 connector	R = 120 Ω, C = 1 nF	**VW3 A8 306 RC**	0.200
		R = 150 Ω	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nF	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	**VW3 A8 306 DR**	0.200
Modbus T-junction boxes		With integrated cable (0.3 m)	**VW3 A8 306 TF03**	–
		With integrated cable (1 m)	**VW3 A8 306 TF10**	–

Connecting cables *(2)*

Description	Length m	Connectors	Reference	Weight kg
Cables for Modbus bus	3	1 RJ45 connector and one end stripped	**VW3 A8 306 D30**	0.150
	3	1 RJ45 connector and 1 male 15-way SUB-D connector for TSX SCA 62 subscriber sockets	**VW3 A8 306**	0.150
	0.3	2 RJ45 connectors	**VW3 A8 306 R03**	0.050
	1	2 RJ45 connectors	**VW3 A8 306 R10**	0.050
	3	2 RJ45 connectors	**VW3 A8 306 R30**	0.150
	3	1 male 9-way SUB-D connector and 1 male 15-way SUB-D connector for TSX SCA 62 subscriber sockets	**VW3 A68 306**	0.150
Cable for module	3	2 RJ45 connectors	**VW3 A68 313**	0.150
RS 485 double shielded twisted pair cables	100	Supplied without connector	**TSX CSA 100**	–
	200	Supplied without connector	**TSX CSA 200**	–
	500	Supplied without connector	**TSX CSA 500**	–

(1) Sold in lots of 2.

(2) Use the table below to select the appropriate connection cables:

	ATS 48 **ATV 31**	**ATV 38/58/58F** Terminal port	**ATV 38** Communication card	**ATV 68**
Junction box TSX SCA 50	Cable **VW3 A8 306 D30**	Cable **TSX CSA●●** + connector *(3)*	Cable **TSX CSA●●** + connector *(3)*	Cable **TSX CSA●●** + connector *(3)*
Subscriber sockets TSX SCA 62	Cable **VW3 A8 306**	Cable **VW3 A58 306**	Cable **VW3 A58 303** (included in the kit)	Cables **VW3 A68 313** **VW3 A68 306**
Splitter block LU9 GC3	Cable **VW3 A8 306 R●●**	Cable **VW3 A8 306 D30**	Cable **VW3 A8 306 D30**	Cables **VW3 A68 313** **VW3 A8 306 D30**

(3) Male 9-way SUB-D connector (to be ordered separately).

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Starters, drives and communication

Communication via Modbus bus

Modbus bus connection kits

Description	Used for	For protocol	Reference	Weight kg
RS485 connection kit between a TSX SCA 62 subscriber socket and the terminal port, comprising: ■ 1 cable (length 3 m) with one male 9-way SUB-D connector and one male 15-way SUB-D connector ■ 1 "RS485" user's manual ■ 1 "Communication variables" user's manual	**ATV 38/58/58F** in place of the operator terminal	Modbus RTU *(1)*	**VW3 A58306**	0.300
Communication kit comprising: ■ 1 communication card equipped with a male 9-way SUB-D connector ■ 1 x 3 m cable with: □ 1 male 9-way SUB-D connector for connection to the communication card and □ 1 male 15-way SUB-D connector for connection to a TSX SCA 62 subscriber socket	**ATV 58** with operator terminal	Uni-Telway, Modbus ASCII Modbus RTU/Jbus	**VW3 A58303**	0.300

Documentation

Description	Format	Reference	Weight kg
International technical manual (ITM) *(2)*	CD-ROM	**DCI CD 398111**	0.150

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(1) Modbus RTU only, 8 drives maximum on the network, 9600 bps fixed speed for the ATV 58, 9600/19,200 bps adjustable speed for the ATV 31.

(2) Library containing:
- manuals and quick reference guides for starters and speed drives,
- user's manuals for communication gateways.

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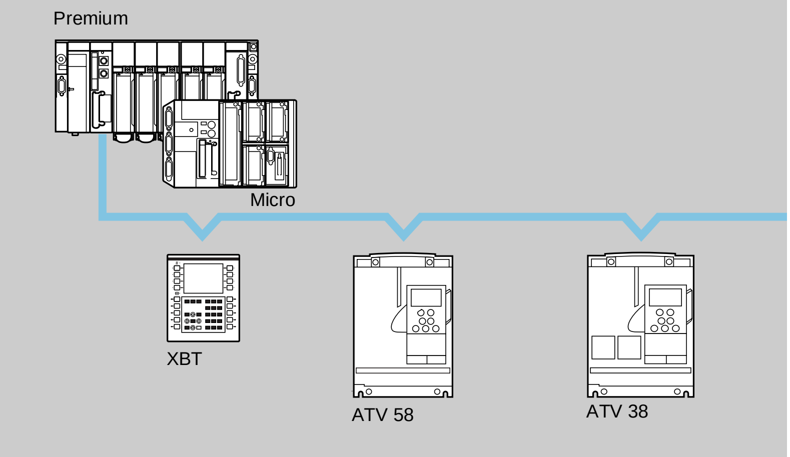
Starters, drives and communication

Communication via Uni-Telway bus

Presentation



The Uni-Telway bus is a standard means of communication between control system components (PLCs, HMI terminals, supervisors, variable speed drives, numerical controllers, etc.).

It is suitable for architectures designed to pilot control and monitoring equipment via a PLC, or architectures used for HMI (supervision, etc).

The Uni-Telway bus requires a master station (Premium, Micro) which manages the allocation of bus access rights to the various connected stations (known as slave stations) that can communicate with one another.

Characteristics

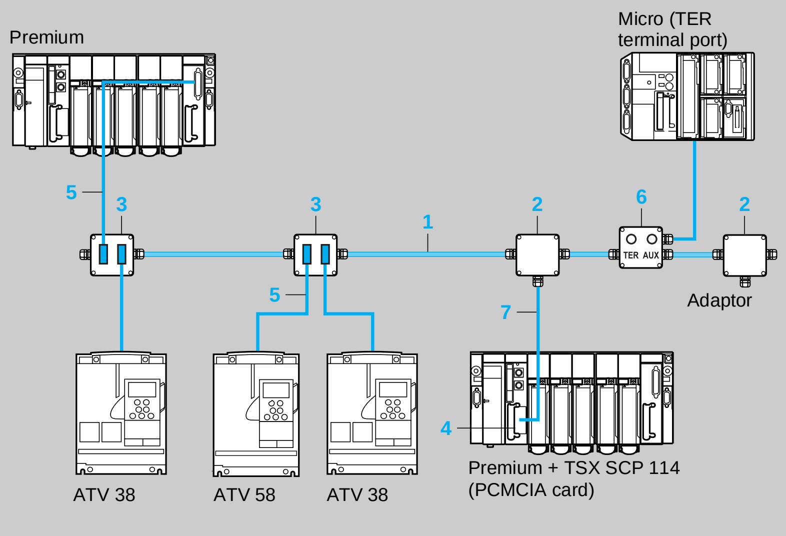
Bus type		**Uni-Telway**
For drives		**ATV 38/58/58F**
Structure	Type	Industrial bus
	Physical interface	RS 485 isolated
	Link	Multidrop
	Access method	Master/Slave type
Transmission	Mode	Asynchronous transmission in baseband
	Data rate	4.8…19.2 Kbps
	Medium	Double shielded twisted pair
Configuration	Number of devices	28 devices maximum
	Length of bus	1000 m max. excluding tap links
	Tap links	20 m maximum
Service	UNI-TE	Point-to-point requests with confirmation (question/response), of up to 240 bytes *(1)* initiated by any connected device
		Unsolicited point-to-point data without confirmation of up to 240 bytes *(1)* initiated by any connected device
		Broadcast messages of up to 240 bytes *(1)* initiated by the master device
	Other functions	Transparent communication, via the master, with any device in an X-WAY architecture
		Diagnostics, debugging, adjustment, programming of PLCs
	Security	Check character on each frame, acknowledgement and, if required, repetition of messages ensure security of transmission
	Monitoring	Bus status table, transmission error counters and device status can be accessed by program in each device

(1) Limited to 128 bytes with Micro/Premium PLC terminal port.

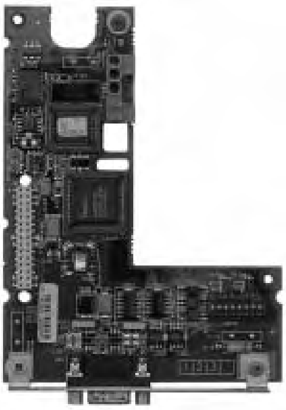
Starters, drives and communication

Communication via Uni-Telway bus

Uni-Telway bus wiring system



1	**TSX SCA ●●●**	Bus cable, double shielded twisted pair. The shielding must be connected to the earth of each device.
2	**TSX SCA 50**	Passive junction box, matches the impedance when it is installed at the end of the line.
3	**TSX SCA 62**	Passive 2-channel Uni-Telway subscriber socket, used for coding the address of two connected devices, and matching the impedance when it is installed at the end of the line.
4	**TSX SCP 114**	PCMCIA card for connecting Micro *(1)*/Premium PLCs to the Uni-Telway bus.
5	**TSX SCY CU 6530**	Uni-Telway connecting cable between the integrated channel of the TSX SCY 21601 module and the TSX SCA 62 subscriber socket.
6	**TSX P ACC 01**	Connection box, used for connecting a Micro/Premium to the Uni-Telway bus via the PLC terminal port. The connecting cable (length 1m) is integrated in the connection box. It isolates the signals (for distances >10 m) and is used to match the end of line impedance. It is also used to set the operation of the terminal port (Uni-Telway master/slave or character mode).
7	**TSX SCP CU 4030**	Uni-Telway connecting cable between the TSX SCP 114 PCMCIA card (on TSX P57 ●0M processor or TSX SCY 21601 module) and the TSX SCA 50 junction box.



VW3 A58303

TSX SCA 62

Uni-Telway bus connection elements

Description	Used with	For protocol	Reference	Weight kg
Communication kit comprising a communication card fitted with a male 9-way SUB-D connector, and one 3 m cable with 2 SUB-D connectors: ■ male 9-way for connection to the communication card ■ male 15-way for connection to a TSX SCA 62 connector *(2)* To order other cables and connection accessories, please consult our "Modicon Premium and PL7 software" catalogue.	**ATV 38** **ATV 58** **ATV 58F**	Uni-Telway, Modbus ASCII, Modbus, RTU/Jbus	**VW3 A58303**	0.300
Extension card Connection via screw terminals	**RTV 74/** **RTV 84**	Uni-Telway, Modbus	**VW1 RZD101**	0.550

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(1) With TSX 37-2122 PLC

(2) The TSX SCA 62 junction box comprises 2 female 15-way SUB-D subscriber sockets.

Starters, drives and communication

Communication gateways LUF P

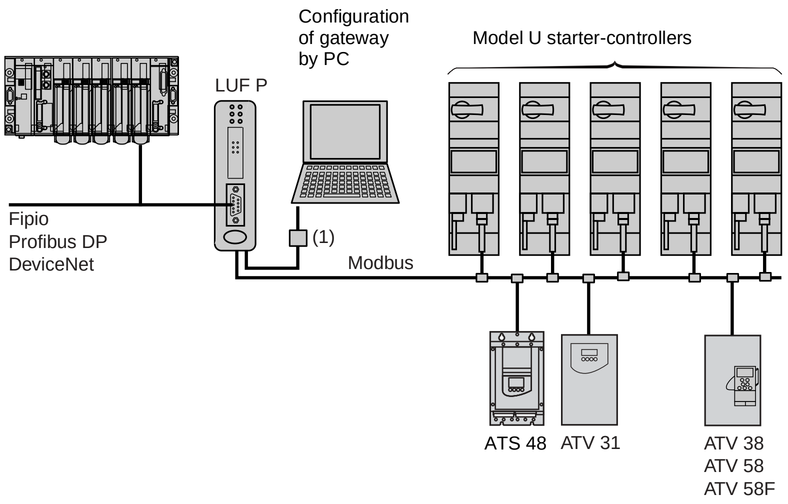
Presentation

Communication gateways LUF P allow connection between Modbus and field buses such as Fipio, Profibus DP or DeviceNet.

After configuration, these gateways manage information which can be accessed by the Modbus bus and make this information available for read/write functions (command, monitoring, configuration and adjustment) on the field buses.

An LUF P communication gateway consists of a box which can be clipped onto a 35 mm omega rail, allowing connection of up to 8 Slaves connected on the Modbus bus.

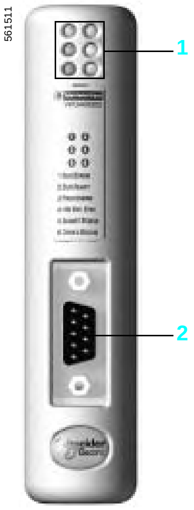
Example of architecture



(1) Connection kit for PowerSuite software workshop.

Description

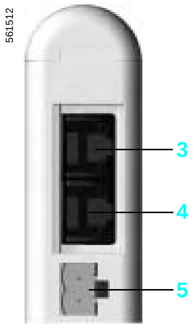
Front panel of the product



1 LED indicating :
- communication status of the Modbus buses,
- gateway status,
- communication status of the Fipio, Profibus DP or DeviceNet bus.

2 Connectors for connection to Fipio, Profibus DP or DeviceNet buses.

Underside of product



3 RJ45 connector for connection on the Modbus bus
4 RJ45 connector for link to a PC
5 ⎓ 24 V power supply

Software set-up

For the Fipio bus, software set-up of the gateway is performed using either PL7 Micro/Junior/Pro software or ABC Configurator software.
For the Profibus DP and DeviceNet buses, software set-up is performed using ABC Configurator.
This software is included:
- in the PowerSuite software workshop for PC (see page 3/3),
- in the TeSys model U user's manual.

Starters, drives and communication

Communication gateways LUF P

Characteristics

Bus type			Fipio	Profibus DP	DeviceNet
Environment	Conforming to IEC 664		Degree of pollution: 2		
Ambient air temperature	Around the device	**°C**	+ 5…+ 50		
Degree of protection			IP 20		
Electromagnetic compatibility	Emission		Conforming to IEC 50081-2: 1993		
	Immunity		Conforming to IEC 61000-6-2: 1999		
Number of Modbus slaves which can be connected			⩽ 8		
Connection	Modbus		By RJ45 connector conforming to Schneider Electric RS485 standard		
	To a PC		By RJ45 connector, with PowerSuite connection kit		
	Field bus		By SUB D9 female connector	By SUB D9 female connector	By 5-way removable screw connector
Supply		**V**	External supply, ⎓ 24 ± 10 %		
Consumption	Max.	**mA**	280		
	Typical	**mA**	100		
Indication/diagnostics			By LED on front panel		
Services	Profile		FED C32 or FED C32P	–	–
	Command		26 configurable words *(1)*	122 configurable words	256 configurable words
	Monitoring		26 configurable words *(1)*	122 configurable words	256 configurable words
	Configuration and adjustment		By gateway mini messaging facility (PKW)		

(1) If the gateway is configured using PL7 and not ABC Configurator, the I/O capacity is limited to a total of 26 words.

References

Description	For use with	With bus type	Reference	Weight kg
Communication gateways	TeSys Model U starter-controllers, Altistart 48, Altivar 31, 38, 58 and 58F	Fipio/Modbus	**LUF P1**	0.245
		Profibus DP/Modbus	**LUF P7**	0.245
		DeviceNet/Modbus	**LUF P9**	0.245

Connection accessories

TSX FP ACC 12

490 NAD 911 03

Description	For use with	Length m	Connectors	Reference	Weight kg
Connection cables	Modbus *(2)*	3	1 RJ45 type connector and one end with stripped wires	**VW3 A8 306 D30**	0.150
		0.3	2 RJ45 type connectors	**VW3 A8 306 R03**	0.050
		1	2 RJ45 type connectors	**VW3 A8 306 R10**	0.050
		3	2 RJ45 type connectors	**VW3 A8 306 R30**	0.150
Connectors	Fipio	–	1 SUB-D 9 male connector	**TSX FP ACC12**	0.040
	Profibus mid line	–	1 SUB-D 9 male connector	**490 NAD 911 04**	–
	Profibus line end	–	1 SUB-D 9 male connector	**490 NAD 911 03**	–

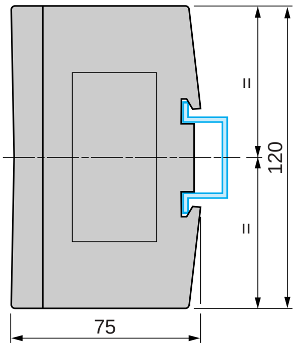
Documentation

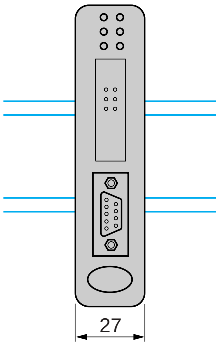
Description	Medium	Language	Reference	Weight kg
User's manual for TeSys model U range *(3)*	CD-Rom	Multilingual : English, French, German, Italian, Spanish	**LU9 CD1**	0.022

(2) See pages 4/16 and 4/17.

(3) This CD-Rom contains user's manuals for AS-Interface and Modbus communication modules, multifunction control units and gateways, as well as for the gateway programming software, ABC Configurator.

Dimensions





Starters, drives and communication

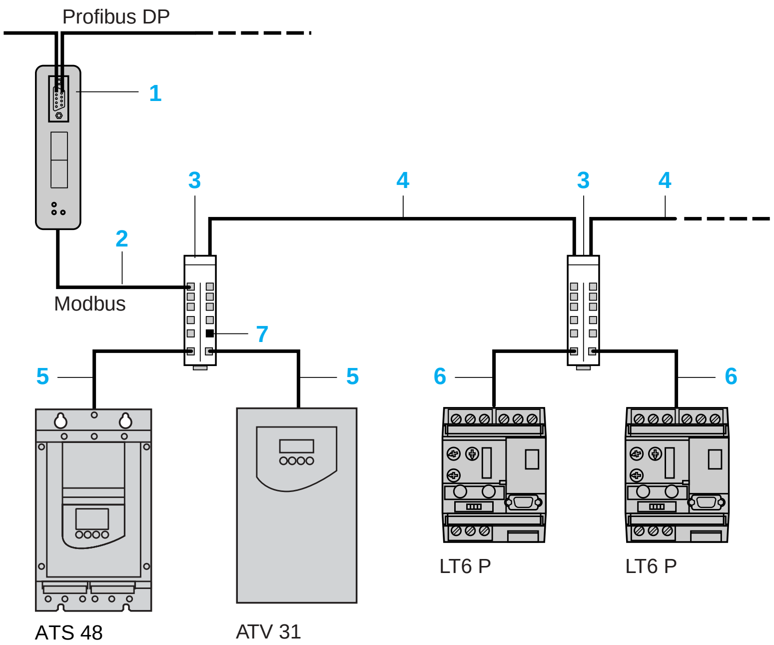
Communication gateway LA9 P307

Presentation

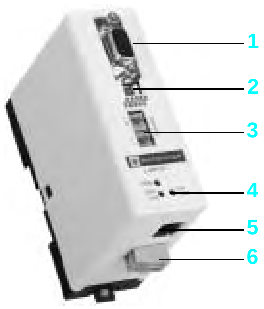
Communication gateway LA9 P307 provides connection between the Profibus DP and Modbus buses. It is a Slave on the Profibus DP bus and Master on the Modbus bus. It manages information present on the Modbus bus to make it available for read/write functions in the Master PLC on the Profibus DP bus.

Gateway LA9 P307 consists of a box which can be clipped onto a 35 mm omega rail. It manages up to15 Slaves on the Modus bus.

Example of architecture



1 Gateway LA9 P307,
2 Tap-off cable VW3 P07 306 R10,
3 Modbus splitter box LU9 GC3,
4 Cable TSX CSA ●00,
5 Tap-link cable VW3 A8 306 R●●,
6 Tap-link cable VW3 A8 306 D30,
7 Line end adapter VW3 A8 306 RC.



Description

Gateway LA9 P307 comprises :
1 A SUB-D 9-way female connector for connection to the Profibus DP bus,
2 A line end adapter on the Profibus DP bus,
3 Gateway address coding on the Profibus DP bus,
4 Status signalling LED,
5 RJ 45 female connector for connection on the Modbus bus,
6 ⎓ 24 V power supply.

Software set-up

The gateway is configured using the standard software tools for the Profibus bus.
For the Premium automation platform, use SYCON configurator software.
The user's manual (.PDF) and the gateway description file (.GSD) are supplied on diskette with the gateway.

Characteristics, references :
page 4/25

Dimensions :
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Starters, drives and communication

Communication gateway LA9 P307

Characteristics

Environment	Conforming to IEC 664		Degree of pollution: 2
Ambient air temperature	Around the device	**°C**	0...+ 50
Degree of protection			IP 20
Number of Modbus slaves which can be connected			15
Connection on	Modbus		RJ 45 connector
	Profibus		SUB-D 9-way female connector
Supply			External supply, ⎓ 24 V ± 20 %
Consumption		**mA**	150 on ⎓ 24 V
Indication/diagnostics			By LED
Services	Command		16 words
	Monitoring		16 words
	Configuration and adjustment		By gateway mini messaging facility (PKW)

References

LA9 P307

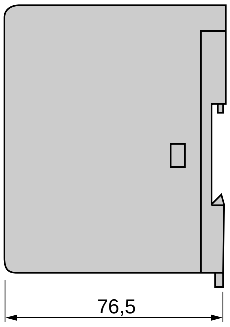
490 NAD 911 03

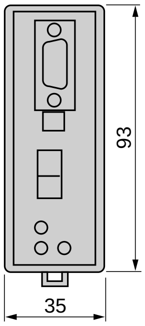
Description	For use with	Reference	Weight kg
Profibus DP/Modbus communication gateway	LT6 P ATS 48 ATV 31/38/58/58F	**LA9 P307**	0.260

Description	For use with	Length m	Reference	Weight kg
RJ 45 cable with stripped wires	**Screw terminal block** - T-junction box TSX SCA 50 - Y-junction subscriber socket TSX SCA 62 **SUB-D connector** (to be ordered separately) - LT6 P (SUB-D 9 female) - ATV 58 (SUB-D 9 male)	3	**VW3 A8 306 D30**	0.150
RJ 45-RJ 45 cable	ATS 48 ATV 31 Modbus splitter box LU9 GC3	1	**VW3 P07 306 R10**	0.050
Connectors	Profibus mid line	–	**490 NAD 911 04**	–
	Profibus line end	–	**490 NAD 911 03**	–

Dimensions

LA9 P307





Presentation, description :
page 4/24

Setting-up :
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Contents

5 - Technical appendices and substitution

Technical appendices
Speed drive
Technical and practical information

Technical and practical information

Units

International System of Units (SI): MKSA

Size - base units:

- length l in metres - (m)
- mass m in kilograms - (kg)
- time t in seconds - (s)
- electric current in amperes - (A)

Basic formulae

Kinematic

Rectilinear motion

Length: L

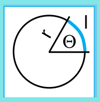
Speed: LT^{-1}

$\boxed{V = \frac{dl}{dr} = \frac{l}{t}}$ **(m/s)**

Acceleration: LT^{-2}

$\boxed{\gamma = \frac{dv}{dt}}$ **(m/s)**

Circular motion



$\boxed{\Theta = \frac{l}{r}}$ **(radian)**

Angular speed: $L^{o}T^{-1}$

$\boxed{\omega = \frac{d\Theta}{dt} = \frac{\Theta}{t}}$ **(rad/s)**

$\boxed{\omega = \frac{2\pi N}{60}}$ **(N: rpm)**

Speed: LT^{-1}

$\boxed{v = \frac{l}{t} = r\omega}$ (ω: **rad/s**)
(v: **m/s**)

Angular acceleration: $L^{0}T^{-2}$

$\boxed{\alpha = \frac{d^2\Theta}{dt^2} = \frac{d\omega}{dt}}$ **(rad/s²)**

Tangential acceleration: LT^{-2}

$\boxed{\gamma = r\alpha}$ **(m/s²)**

Dynamic

Rectilinear motion

Force: MLT^{-2}

$\boxed{F = m\gamma}$ (**N** newton)

Starting force

$\boxed{F = m\gamma}$

Work: $ML^{2}T^{-2}$

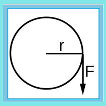
$\boxed{W = Fl}$ **(Joule)**

Power: $ML^{2}T^{-3}$

$\boxed{P = \frac{W}{t} = \frac{Fl}{t} = Fv}$ (**W** watt)

$\boxed{1 \text{ watt} = \frac{1 \text{ joule}}{1 \text{ second}}}$

Circular motion



Torque: $ML^{2}T^{-2}$

$\boxed{T = Fr}$ (**Nm** or **J/rad**) *(1)*

Starting torque

$\boxed{T = J\frac{d\omega}{dt}}$ J: moment of inertia (**kg.m²**)

Work: $ML^{2}T^{-2}$

$\boxed{W = T\Theta}$ (Joule)

Power: $ML^{2}T^{-3}$

$\boxed{P = \frac{T\Theta}{t} = T\omega}$ (**W** watt)

$\boxed{P = T\frac{2\pi N}{60}}$

Energy: the kinetic energy is determined by the speed of the object.

$\boxed{W = 1/2\ mv^2}$

$\boxed{W = 1/2\ mr^2\omega^2 = 1/2\ J\omega^2}$

---

(1) In order to avoid confusion, you are advised not to use the symbol mN.

Mechanical information

Old units

Force	1 kgp = 9.81 N = approx. 10 N = 1 daN
Work	1 kgm = 9.81 Nm = 9.81 J
Power	1 kgm/s = 9.81 Nm/s = 9.81 J/s = 9.81 W 1 ch = 75 kgm/s = 75 x 9.81 = 736 W
Torque	1 mkgp = 9.81 Nm

Other information

Moment of inertia J (kgm²)

$$J = mr^2 = \frac{mD^2}{4}$$

m = mass, in kg
r = gyration radius (m)
D = gyration diameter (m)

Inertia is sometimes expressed in mD², in which case the value of J can be obtained by dividing by 4.

The moment of inertia J1 of a mass rotating at speed N1 connected to a shaft rotating at speed N2 is calculated as follows:

$$J1 = J2\left(\frac{N1}{N2}\right)^2$$

Gyration radius

- **Solid cylinder**

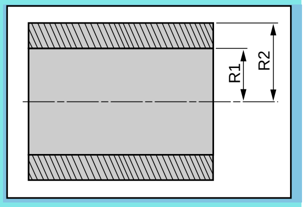
$$r^2 = \frac{R^2}{2}$$

R = cylinder radius
r = gyration radius (or r = 0.707 R)

- **Hollow cylinder**

$$r^2 = \frac{R1^2 + R2^2}{2}$$

⇨ $$J = mr^2 = m\frac{R1^2 + R2^2}{2}$$



Centrifugal force

$$F = m\,\omega^2 r$$

In circular motion at constant speed ω:
F: **N**
m: **kg**
ω: **rad/s**
r: **m**

Technical appendices

Speed drive

Conversion tables for standard units

Conversion tables for standard units

Length

Units	m	in.	ft	yd
1 metre (m)	1	39.37	3.281	1.094
1 inch (in. or ")	0.0254	1	0.0833	0.02778
1 foot (ft or ')	0.3048	12	1	0.3333
1 yard (yd)	0.9144	36	3	1

Area

Units	m^2	sq.in	sq.ft	sq.yd
1 square metre (m^2)	1	1550	10.764	1.196
1 square inch (sq.in.) (in^2)	$6.45\ 10^{-4}$	1	$6.944\ 10^{-3}$	$7.716\ 10^{-4}$
1 square foot (sq.ft.) (ft^2)	0.0929	144	1	0.111
1 square yard (sq.yd) (yd^2)	0.8361	1296	9	1

Volume

Units	m^3	dm^3	cu.in.	cu.ft	cu.yd
1 cubic metre (m^3)	1	1000	61024	35.3147	1.3079
1 cubic decimetre (dm^3) (litre)	0.001	1	61.024	0.0353	0.0013
1 cubic inch (cu.in.) (in^3)	$1.639\ 10^{-5}$	0.0164	1	$5.787\ 10^{-4}$	$2.143\ 10^{-5}$
1 cubic foot (cu.ft) (ft^3)	0.0283	28.32	1728	1	0.0370
1 cubic yard (cu.yd) (yd^3)	0.7645	764.5	46656	27	1

Mass

Units	kg	oz	lb
1 kilogram (kg)	1	35.27	2.205
1 ounce (oz)	0.028	1	0.0625
1 pound (lb)	0.454	16	1

Pressure

Units	Pa	MPa	bar	psi
1 pascal (Pa) or newton per square metre (N/m^2)	1	10^{-6}	10^{-5}	$1.45\ 10^{-4}$
1 mega pascal (MPa) or 1 newton per mm^2 (N/mm^2)	10^6	1	10	145.04
1 bar (bar)	10^5	0.1	1	14.504
1 pound weight per square inch (1 $lbf/in.^2$) (psi)	6895	$6.895\ 10^{-3}$	0.06895	1

Conversion tables for standard units (continued)

Angular speed

Units	rad/s	rpm
1 radian per second (rad/s)	1	9.549
1 revolution per minute (rpm)	0.105	1

Linear speed

Units	m/s	km/h	m/min
1 metre per second (m/s)	1	3.6	60
1 kilometre per hour (km/h)	0.2778	1	16.66
1 metre per minute	0.01667	0.06	1

Power

Units	W	ch	HP	ft-lbf/s
1 watt (W)	1	$1.36\ 10^{-3}$	$1.341\ 10^{-3}$	0.7376
1 metric horsepower (ch)	736	1	0.9863	542.5
1 horsepower (HP)	745.7	1.014	1	550
1 ft-lbf/s	1.356	$1.843\ 10^{-3}$	$1.818\ 10^{-3}$	1

Force

Units	N	kgf	lbf	pdl
1 newton (N)	1	0.102	0.225	7.233
1 kilogram force (kgf)	9.81	1	2.205	70.93
1 pound weight (lbf)	4.448	0.453	1	32.17
1 poundal (pdl)	0.138	0.0141	0.0311	1

Energy-Work-Heat

Units	J	cal	kWh	BTU
1 joule (J)	1	0.24	$2.78\ 10^{-7}$	$9.48\ 10^{-4}$
1 calorie (cal)	4.1855	1	$1.163\ 10^{-6}$	$3.967\ 10^{-3}$
1 kilowatt-hour (kWh)	$3.6\ 10^{6}$	$8.60\ 10^{5}$	1	3412
1 British thermal unit (BTU)	1055	252	$2.93\ 10^{-4}$	1

Moment of inertia

Units	$kg.m^2$	$lb.ft^2$	$lb.in^2$	$oz.in^2$
1 kilogram/square metre ($kg.m^2$)	1	23.73	3417	54675
1 pound/square foot ($lb.ft^2$)	0.042	1	144	2304
1 pound/square inch ($lb.in^2$)	$2.926\ 10^{-4}$	$6.944\ 10^{-3}$	1	16
1 ounce/square inch (oz.in2)	$1.829\ 10^{-5}$	$4.34\ 10^{-4}$	0.0625	1

Driving machines

Generally, the machine connected to the motor introduces a moment of inertia J (kg.m^2) to which the moment of inertia of the motor, which may be significant, must be added. Calculating this total inertia enables transient states (starts and stops) to be analysed although it has no effect in steady state.

Circular motion

If the machine is being driven by a gearbox at speed N1, its moment of inertia at the motor rotating at speed N2 is expressed using the formula:

$$J \text{ machine at the motor} = J \text{ machine} \left(\frac{N1}{N2}\right)^2$$

Translatory motion

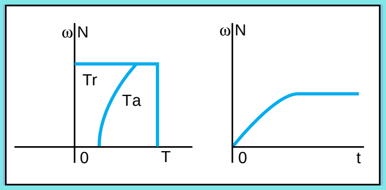
If the machine of mass m (kg) moves at linear speed V (m/s), the moment of inertia at drive shaft level for the speed of rotation w (rad/s) of the drive motor is expressed using the formula:

$$J \text{ machine} = m\frac{V^2}{\omega^2} = m\frac{V^2 3600}{4\pi^2 N^2} \quad \text{where} \quad \omega = \frac{2\pi N}{60}$$

Starting

In order to start within a specific time t (changing from stop to angular speed ω), the average accelerating torque required (Ta) can be calculated if the moment of inertia J is known.

$$Ta\ (Nm) = J\ (kg\ m)^2\ \frac{d\omega (rad/s)}{dt\ (s)} = J\ (kg\ m)^2\ \frac{2\pi N (rpm)}{60t\ (s)}$$



The average accelerating torque Ta and the average resistive torque Tr due to the mechanics determine the average motor torque required during the starting time Ts.

$$Ts = Tr + Ta$$

Conversely, if an accelerating torque Ta is fixed, the starting time, for Ta constant, is determined by:

$$t = \frac{J\omega}{Ta}$$

In practice:

- For d.c.

Ts = kTn where Tn = nominal motor torque

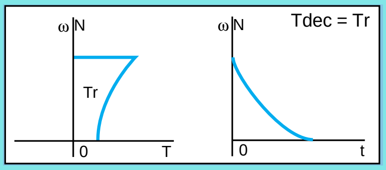
k = motor overload coefficient. It is connected to the overload time and the initial temperature. Its value is usually between 1.2 and 1.9 (see the motor manufacturer's catalogue). In this zone, the armature current and the torque may be approximately proportional.

- For a.c.

Please refer to the overtorque and overcurrent characteristics given in the motor manufacturer's catalogue and to the operating characteristics given in this catalogue.

Stopping

If the machine is left alone when the supply voltage is disconnected, the deceleration torque will be equal to the resistive torque:



$$Tdec = Tr = J\frac{d\omega}{dt}$$

The motor will stop after a period of time (t) has elapsed which is related to the moment of inertia by means of the ratio:

$$t = \frac{J}{Tr}\omega$$

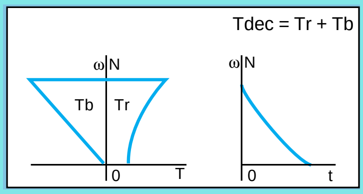
if the value of Tr is more or less constant.

Driving machines (continued)

Rheostatic braking

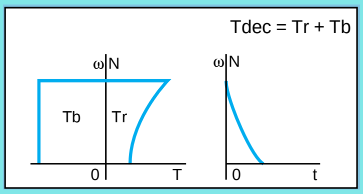
If this stopping time is not acceptable, the deceleration torque must be increased by an electrical braking torque Tb such as:

$$\boxed{Tdec = Tr + Tb = J\frac{d\omega}{dt}}$$



Braking may be rheostatic, but do remember that its effect will be proportional to the speed (Tb = kω).

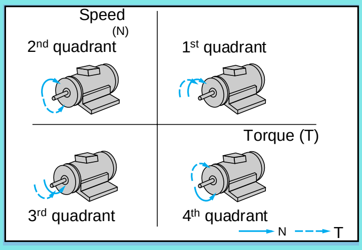
Regenerative braking



Braking may be regenerative, which requires the use of reversible drives.
If current limiting is applied, the braking torque remains constant until a stop is reached.

The machine determines the size of the motor and the equipment, which must be suitable for both continuous and intermittent operation: frequent or fast stops, repeated load surges.

Direction of operation



The illustration opposite shows the 4 operating options (4 quadrants) in the torque/speed range.
They are summarised in the table below.

Rotation	Machine operating	Torque T	Speed N	Product T x N	Quadrant
1st direction	as a motor	+	+	+	1
	as a generator	–	+	–	2
2nd direction	as a motor	–	–	+	3
	as a generator	+	–	–	4

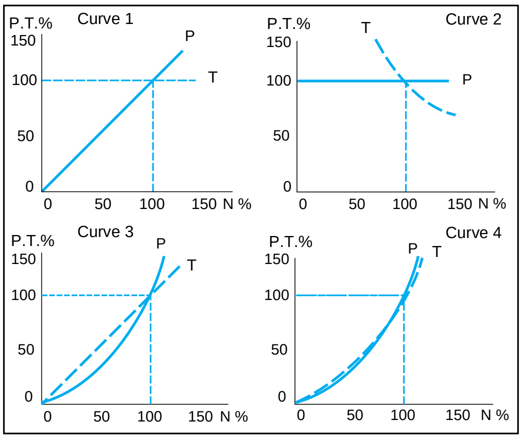
As a general rule for all our products, applying a positive reference voltage will cause the motor to rotate in a clockwise direction (1st quadrant) if the appropriate polarities are applied at the armature and at the field coil.

Torque and power

It is essential to determine the torque/speed characteristic of the various machines driven in order to select the correct motor/drive assembly.

In practice, all machines can be classified in 4 basic categories:
- constant torque (curve 1),
- constant power (curve 2),
- torque increasing linearly with the speed **T = kN**, the power P varies in accordance with the square of the speed (curve 3),
- torque increasing with the square of the speed **T = kN**^{2}, the power varies in accordance with the cube of the speed (curve 4).

Some machines may have operating characteristics which are the result of a combination of these different categories.
They are limited in number.



Driving machines (continued)

Constant torque

With the exception of pumps, 90 % of the machines used in industry are systems which operate at constant torque.
The torque required by the machine is not determined by the speed.
If the speed doubles, the power also doubles.
On starting, the starting overtorque is often much greater than the resistive torque which is introduced subsequently.

Constant power

For machines operating at constant power, the power required is not determined by the speed and the torque will vary so that it is inversely proportional to the speed.
This type of operation is most often found in machine tools and in winding systems.
Drilling, cutting, milling and turning applications are usually performed at constant power, which means that the torque must be high at low speed and low at high speed.
The motor must supply maximum torque at minimum speed, which usually requires the drive to be oversized in relation to the motor.

Torque increasing linearly with the speed

For these machines, the torque varies linearly with the speed, although the power will vary in accordance with the square of the speed.
This may be found in certain helical positive displacement pumps and mixers.

Torque increasing with the square of the speed

For these machines, the torque will vary in accordance with the square of the speed, although the power will vary in accordance with the cube of the speed.
This type of operation is found in centrifugal pumps and fans.
In some cases, the power required by a fan or an air blower will vary in accordance with the fifth power of the speed.
This characteristic must be taken into account when selecting the motor and associated drives.
In this configuration, when the speed doubles, the torque is multiplied by 4 and the power by 8.

Operating range at constant torque

The table below shows how different types of machine behave during starting and in continuous operation.

Type of machine	Starting torque or overtorque during operation	Drive selection
Machine with ball or roller bearings	110 to 125 %	Normal
Machine with axle bearings	130 to 150 %	Normal
High friction conveyor or machine	160 to 250 %	Oversize the drive and, if necessary, the motor
Machine with jerky operating cycle (press, machine with cams or connecting rod systems)	250 to 600 %	Oversize the drive and the motor
High inertia, machine with flywheel or rotating masses (centrifuge)	–	The size of the drive will depend on the time required for starting and/or braking

Driving machines (continued)

Operating range at constant torque

The power ratings given in the catalogues generally correspond to the nominal speed of the motors. The cooling of self-cooled motors is directly linked to their speed and is therefore reduced as the motor slows down.

If continuous operation at nominal torque is required at low speed, you must select a motor with auxiliary forced cooling.

Torque limiting

The drives have a configurable function for limiting the current drawn and thus the torque applied by the motor. The maximum current value is I max. continuous, except in specific operating circumstances where this value may be exceeded temporarily. This method of limiting protects the motor and the machine being driven.

Some drives have two-state limitation which permits temporary overloads on starting up to 1.3 times the nominal torque (Tn).

Overloads are permitted on high-performance (e.g. static reversible) drives.

Examples of theoretical applications

Use the following information to determine the nominal power Pn of a motor:

$PD^2 = 8\ \text{kg.m}^2$
$\Delta n = 0 \ldots 3000$ rpm in 5 s
Ts = 2 Tn
Tr = 0.1 Tn

Answer $Pn = Tn\ \omega n$

$Ts = Tr + Ta$ therefore $Ta = Ts - Tr = 2\ Tn - 0.1\ Tn = 1.9\ Tn$

therefore $Tn = \frac{Ta}{1.9}$

$$Ta = J\frac{d\omega}{dt} = \frac{PD^2}{4} \times \frac{2\pi N}{60 \times 5} = \frac{8}{4} \times \frac{2\pi 3000}{300} = 125.6\ \text{Nm}$$

therefore $Tn = \frac{125.6}{1.9} = 66.1\ \text{Nm}$

$$Pn = 66.1 \times \frac{2\pi 3000}{60} = 20757\ \text{W or 21 kW}$$

Power of motor to be controlled $= \frac{Pn}{\eta} = \frac{21}{0.85} = 24.5$ kW with efficiency $\eta = 0.85$

Use the following information to determine the starting time of a machine:

Pn on shaft = 5 kW
N = 3000 rpm
Ts = 1.6 Tn
Tr = 0.8 Tn
J machine at the motor = $0.2\ \text{kg.m}^2$
J motor = $0.063\ \text{kg m}^2$

Answer J, total inertia = 0.2 + 0.063 = $0.263\ \text{kg.m}^2$

$$\omega n = \frac{2\pi N}{60} = 314\ \text{rad/s}$$

$Pn = Tn\ \omega n$ or $Tn = \frac{Pn}{\omega n} = \frac{5000}{314} = 16\ \text{Nm}$

$$Ta = Ts - Tr = 1.6 - 0.8 = 0.8\ Tn = 0.8 \times 16 = 12.8\ \text{Nm}$$

$Ta = J\frac{d\omega}{dt}$ or $t = J\frac{\omega n}{Ta} = 0.263 \times \frac{314}{12.8} = 6.5\ \text{s}$

Driving machines (continued)

Examples of theoretical applications (continued)

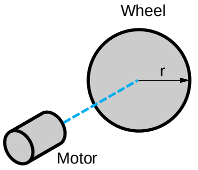
Determine the starting time of a wheel driven by a motor (assume that the entire mass is concentrated on the rim)**:**

Wheel:	r = 60 cm	Mass: 1000 kg	Nr = 100 rpm
Motor:	Pn = 5 kW	N = 3000 rpm	JM = 0.063 kg.m^2
$\eta \neq 1$	Ts = 1.6 Tn	Tr = 0.2 Tn	

Answer: Total inertia $Jt = Jr + JM = mr^2 = 1000.0.6^2 = 360$ kg.m^2

$$JrM \text{ at the motor } = \frac{Jr}{K^2} = \frac{360}{900} = 0.4 \text{ kg.m}^2$$

$$\text{where } K = \frac{\Omega M}{\Omega r} = \frac{N}{Nr} = 30$$



$Jt = 0.4 + 0.063 = 0.463$ kg.m^2

$$Pn = Tn\omega \text{ or } Tn = \frac{Pn}{\omega n} \quad \text{where } \omega n = \frac{2\pi N}{60} = 314 \text{ rad/s}$$

$$Tn = \frac{5000}{314} = 16 \text{ Nm}$$

$Ta = Ts – Tn = 1.6\ Tn – 0.2\ Tn = 1.4\ Tn$

$$Ta = J\frac{d\omega}{dt} \quad \text{or } t = \frac{J\omega}{Ta} = \frac{0.463 \times 314}{1.4 \times 16} = 6.5 \text{ s}$$

Use the following information to determine the braking time and the number of stopping revolutions:

Braking time tb = 3 tM where tM = motor time
$\Theta a = tM\ \omega o$
Braking torque Tb = 3 Tn
N = 1750 rpm
Pn = 15 kW
PD^2 = 2 kg.m^2

Answer:

$$J = \frac{PD^2}{4} = \frac{2}{4} = 0.5 \text{ kg.m}^2$$

$$\omega o = \omega n = \frac{2\pi N}{60} = 183 \text{ rad/s}$$

$$Tn = \frac{Pn}{\omega n} = \frac{15000}{183} = 82 \text{ Nm}$$

$$Tb = 3\ Tn = 3 \times 82 = 246 \text{ Nm}$$

$$tM = \frac{J}{Tb} \times d\omega = \frac{0.5 \times 183}{246} = 0.37 \text{ s}$$

$ta = 3\ tM = 3 \times 0.37 \neq 1$ s where ta = stop time

Number of revolutions to stop:
$\Theta a = tM\ \omega o = 0.37 \times 183 = 67.77$ rad

$$\text{or } \frac{67.5}{2\pi} = 10 \text{ revs}$$

Use the following data to determine the Tr, Ts, Tn and Ta values of a machine:

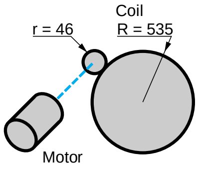
A solid coil weighing 1500 kg rotating at 500 rpm,
driven by a 2 kW motor rotating at 1800 rpm,
time to implement = 26 s
Ts = 2 Tn
Check that the data is compatible

Answer:

$$Jc = \frac{MR^2}{2} = \frac{1500 \times 0.535^2}{2} = 215 \text{ kg.m}^2$$

$$Jc \text{ at the motor } = JcM = \frac{J}{K^2} = \frac{215}{535^2} = 1.6 \text{ kg.m}^2$$

$$\text{where } K = \frac{R}{r}$$



$$Ta = J\frac{d\omega}{dt} = \frac{1.6 \times 190}{26} = 11.7 \text{ Nm}$$

$$Tn = \frac{Pn}{\omega n} = \frac{2000}{190} = 10.5 \text{ Nm} \quad \omega n = \frac{2\pi N}{60} = 190 \text{ rad/s}$$

$$Ts = 2\ Tn = 10.5 \times 2 = 21 \text{ Nm}$$

$$Tr = Ts - Ta = 21 - 11.7 = 9.3 \text{ Nm}$$

Cage asynchronous motors

Basic characteristics

Depending on the speed, the torque for an asynchronous motor will vary in accordance with the square of the voltage.

$$T = ko\frac{\phi^2 R\omega g}{R^2 + L^2\omega^2 g^2} \quad (1)$$

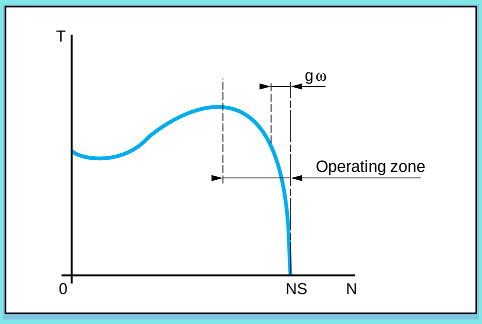
or $T = k\phi^2$ at ωg constant

$$g = \frac{\omega - \omega r}{\omega}$$

L = rotor inductance
R = rotor resistance
ϕ = flux
$\omega g = \omega - \omega r$
ωg = angular speed of field in relation to rotor
ω = synchronous angular speed
ωr = rotor angular speed
g = slip
p = number of pairs of poles

The flux Φ will be proportional to U if the frequency remains constant.

$f = \frac{\omega}{2\pi}$ therefore $T = KU^2$



The lower the stator voltage, the lower the torque for a given speed.
The torque increases, exceeds a maximum value and stops at synchronous speed NS. The maximum torque is defined based on *(1)*.

Divide the second part by R ωg:

$$T = ko\frac{\phi^2}{\frac{L^2\omega g}{R} + \frac{R}{\omega g}}$$

The product of the two expressions with the new denominator is constant. The value of the denominator is minimum and that of the torque maximum if:

$$\frac{R}{\omega g} = \frac{L^2\omega g}{R} \text{ or } R^2 = L^2\omega^2 g^2 \text{ where } \omega g = \frac{R}{L}$$

The maximum value becomes:

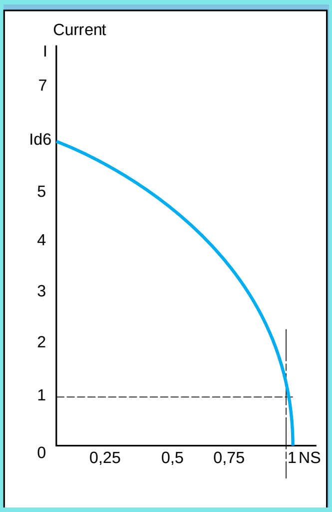
$$T = ko\frac{\phi^2}{2L}$$

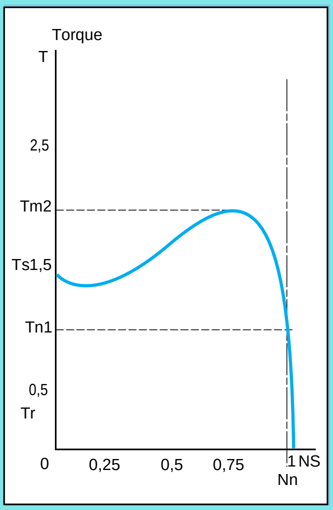
which is independent of ωg and R.

The operation of the motor is stable above the speed corresponding to the maximum torque. Below this, the motor is unable to drive the load and stalls.

Cage asynchronous motors (continued)

Basic characteristics (continued)





Current
- Is = starting current
- In = nominal current

Torque
- Ts = starting torque
- Tm = maximum torque
- Tn = nominal torque

Speed
- Ns = synchronous speed

$$\boxed{Ns = \frac{60\,f}{p}}$$

- Nn = nominal motor speed, corresponds to the speed of the rotor for the nominal motor load

gn = nominal slip

$$\boxed{gn = \frac{Ns - Nn}{Ns}}$$

$$\boxed{Nn = Ns(1 - gn)}$$

Power
- mechanical
(useful output power on shaft)

$$\boxed{PU = T\omega}$$

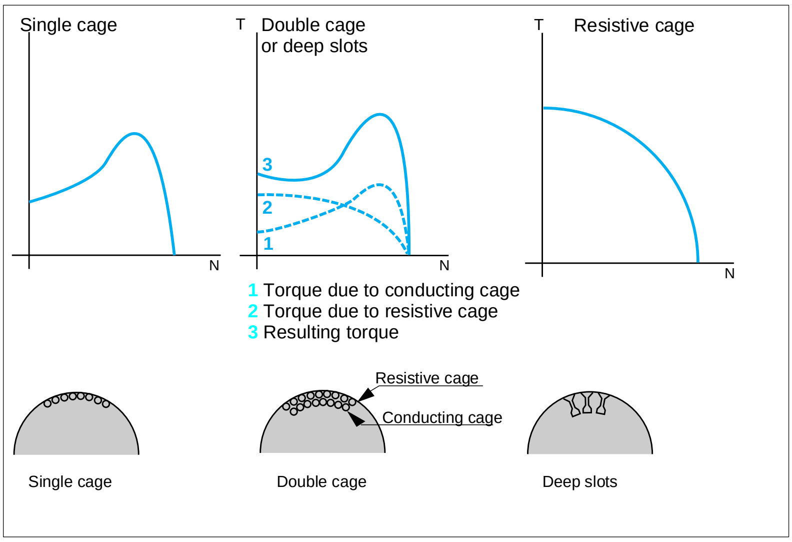
- electrical
(electrical motor power)

$$\boxed{PE = \frac{PU}{\eta}}$$

$$\boxed{PE = UI\sqrt{3}\cos\varphi}$$

U = supply voltage
I = rms current drawn by the motor
Cos φ = power factor

The torque/speed characteristic of single cage asynchronous motors (see curves below) indicates a low starting torque.

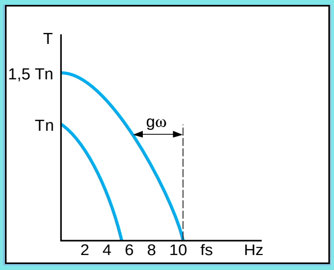


Cage asynchronous motors (continued)

To improve starting torque, modern motors have double cage or deep slot rotors. These include motors used with frequency inverters.
Resistive cage motors are sometimes used when the speed range is relatively limited and the torque increases with the square of the speed. This is the case with fans connected to grading controllers.

Operation at variable frequency

Supplied with power by a frequency inverter, the operating characteristics of a **constant load asynchronous motor** are as follows:



Below 5 Hz,
sω becomes dominant and the starting overtorque is limited naturally.

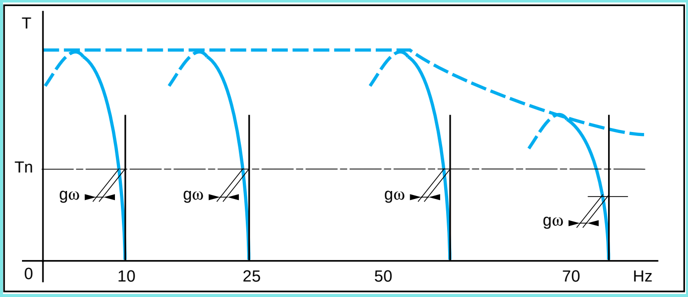
Between 5 and 50 Hz, the supply voltage has a ratio U = kf.
Therefore, the flux remains constant for the same number of slipped revolutions ωg and the torque does not change. It follows that the torque characteristics for all frequencies will remain parallel with those at 50 Hz.

Above 50 Hz, the voltage U ceases to increase and the flux decreases by: $\frac{50}{f}$

This has two consequences:
- At constant slip g, the number of “slipped revolutions” gω increases by: $\frac{f}{50}$

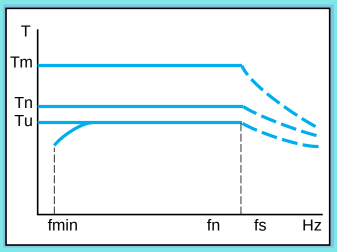
In comparison, the motor torque falls by: $\frac{50}{f}$

- The maximum torque decreases by: $\left(\frac{50}{f}\right)^2$



Operating conditions

The drive or frequency inverter has been designed to continuously supply the nominal current of the standardised power motor to which it is connected. The curve provides a typical illustration of the useful torque (Tu) which a self-cooled motor can supply continuously for the various display speeds between fmin and fn.



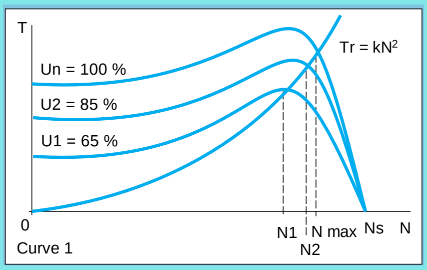
fmin = between 1 and 5 Hz depending on the type of drive
fn = nominal output frequency: 50/60 Hz
Tm = maximum torque
Tn = nominal motor torque
Tu = continuous useful torque

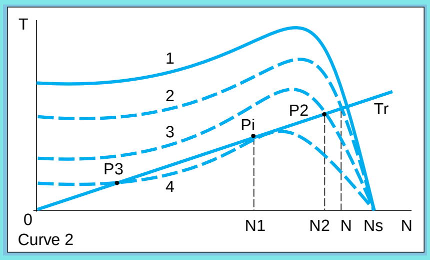
For operation in continuous operation, the recommended torque Tu may vary between 0.8 and 0.95 Tn depending on the type of drive.
For operation in transient operation, the maximum torque Tm may vary between 1.3 and 1.75 Tn depending on the type of drive.
In both cases, observe the operating guidelines for each product, which can be found in the catalogue.

Cage asynchronous motors (continued)

Operation at variable voltage

Squirrel cage asynchronous motor





Application on a load whose resistive torque is parabolic (ventilation).

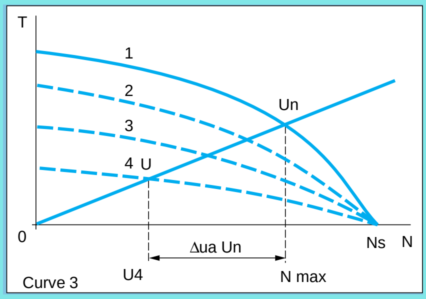
Reducing the stator voltage reduces the available torque and operation continues based on the characteristics for decreasing torque (curve 1).

For example, when changing from 1 to 3, the speed drops from N maximum to N2 (curve 2).

Above this, there is a risk of stalling because in 4, operation possible at Pi reaches the instability limit.

Even a slight increase in the value of Tr will cause the speed to drop. The motor torque Tm will fall below the resistive torque Tr, which will cause the speed drop to increase up to P3. At this point, Tm will return to a value equal to Tr and the motor will stabilise.

Resistive cage motor



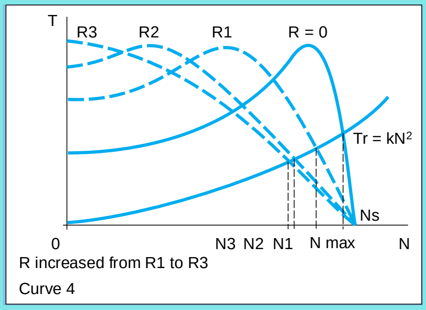
The possible operating conditions described above can be avoided by using tricks to obtain the maximum torque at a very low frequency.

For example, T max can be obtained for: $\boxed{\omega g = \frac{R}{L}}$

In order to increase ωs, the angular speed of the fields in relation to the rotor, simply increase the rotor resistance R. This will cause an increase in slip at maximum torque, thus increasing the operational stability zone of the motor.

The most common methods are:
- using a resistive cage motor (curve 3),
- using an appropriately ventilated wound rotor motor (curve 4) with external rotor resistors.

Wound rotor asynchronous motor

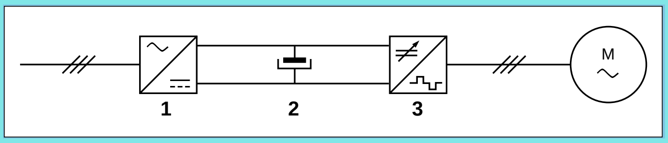


Curves Tm = f (N) as a function of the resistance R introduced into the rotor circuit and at constant stator voltage.

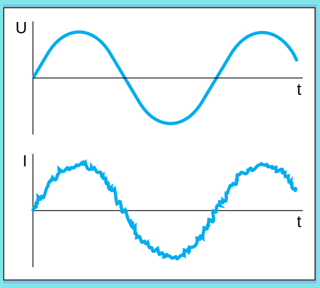
Power circuits

Pulse width modulator (PWM)

The motor is supplied with power by a variable amplitude and frequency voltage wave. Every half-wave comprises a series of pulses of fixed amplitude and variable width.



1 Fixed a.c./d.c. converter generally comprising one diode bridge
2 Filter comprising one capacitor bank
3 a.c./d.c. pulse width modulator which can be used as:
- a transistor commutator,
- a GTO commutator (thyristor with built-in extinction circuit),
- a thyristor commutator with an extinction circuit.



The shape of the voltage and current signals in the motor phases is illustrated in the diagrams opposite.

This principle is used in Altivar drives, whose operating characteristics are described below by way of example.

In the drive, the PWM sinewave commutator comprises 6 transistors and 6 "freewheel" diodes.

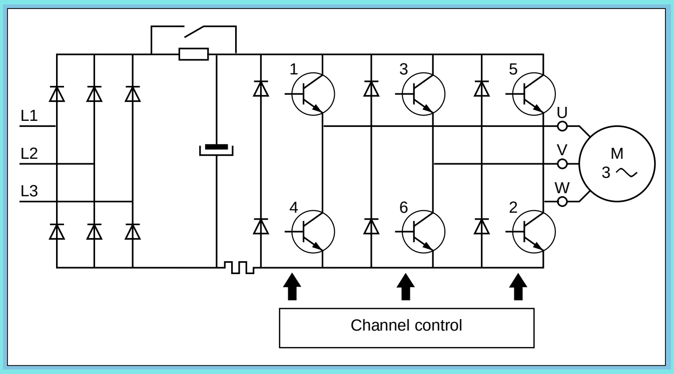
Today, these components are IGBTs.

This inverter bridge has been designed to supply the motor with a variable amplitude and frequency three-phase a.c. voltage system.

The frequency variation in the voltage applied to the motor is obtained by varying the frequency of the control signals of transistors 1 to 6.

In order to eliminate torque transients, a special type of transistor control can be used to eliminate very low order harmonics. The resulting current is close to the sine wave.

The voltage variation principle consists of modulating each base peak in order to obtain a voltage with an average value lower than that of the filtered d.c. voltage on each of the peaks.



Application examples

Selecting a drive on a conveyor belt

A conveyor belt whose load is more or less constant must operate in a speed range between 1 and 3, which corresponds to a motor speed of 480 to 1440 rpm. The resistive torque at the motor is 7 Nm.

Answer

$$\text{P useful required by the conveyor} = T\omega n = \frac{T2\pi N}{60} = \frac{7 \times 6.28 \times 1440}{60} = 1055\ \text{W}$$

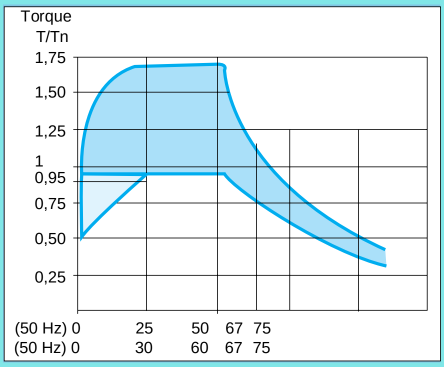
$$\text{P useful to be supplied by the motor} = \frac{\text{P motor}}{\text{n gearbox}} = \frac{1055}{0.9} = 1180\ \text{W}$$

Determining the frequency at low speed

$$\text{For 480 rpm,}\quad f = \frac{50}{3} = 17\ \text{Hz}$$

On the torque curve (below), the derating to be taken into account is 0.8.

$$\textbf{Motor power} = \frac{\mathbf{1180}}{\mathbf{0.8}} = \mathbf{1475\ W}$$



The motor to be selected is a standard motor with a power rating that is immediately above 1.5 kW and supplied with power by a 1.5 kW Altivar drive.

Selecting a drive on a fan

Control of a fan at variable speed with a maximum flow rate of 50,000 m^3/h at a pressure of 245 pascals and a speed of 3000 rpm with efficiency of 0.68.

Defining the motor

Maximum useful output power drawn by the fan:

$$Pu = \frac{Q \times M \times P}{\eta}$$

$$Pu = \frac{50\,000 \times 1.293 \times 245}{3600 \times 0.68} = 6470\ \text{W}$$

Q = air flow in m^3/s
M = air mass in kg/m^3
P = pressure in pascal or N/m^2

Defining the drive

Using an Altivar frequency inverter to power the motor requires the intended speed to be derated by 0.9.

$$Pm = \frac{Pu}{0.9} = \frac{6470}{0.9} = 7188\ \text{W}$$

or a standardised 7.5 kW motor.

The drive selected should be the next highest rating, or, in this example, a 7.5 kW Altivar drive.

Technical appendices

Electronic speed drive

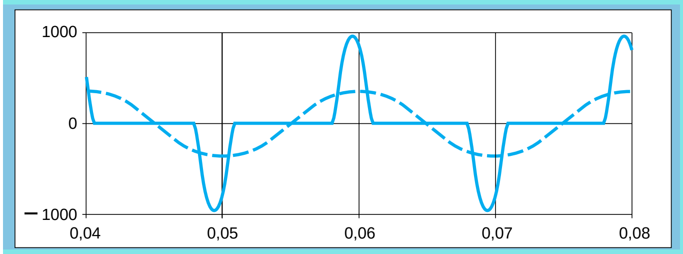
Harmonics

Harmonics

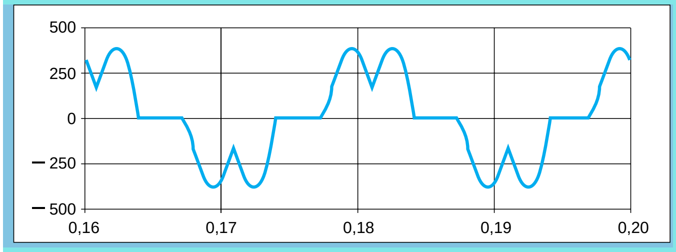
Types of current drawn by the drives

The currents drawn by the variable speed drives are not sinusoidal. The shape of these currents is illustrated in the curves below for different types of drive.

Single phase Altivar drive



Three-phase Altivar drive (with additional line choke)



These currents are therefore the result of the superimposition of a fundamental current (at the line frequency) and harmonic currents.

Technical appendices
Electronic speed drive
Harmonics

Harmonics (continued)

Disturbance caused by harmonics

The presence of harmonics in supply systems can cause numerous problems:

- Overloading and aging of reactive power compensation capacitors
- Overloading of neutral conductors due to the accumulation of third order harmonics generated by single phase loads
- Distortion of the supply voltage which may disturb sensitive loads
- Overloading of distribution networks due to an increase in the rms current
- Overloading, vibration and aging of alternators, transformers, motors
- Interference on telephone lines

These types of disturbance may have serious consequences:

- Premature aging of and irreparable damage to equipment
- Oversizing of installations
- Accidental tripping and downtime of installations

All of these consequences have a considerable economic impact: costs incurred due to the oversizing of equipment or reduced service life, additional energy losses and loss of productivity.

Standards and recommendations

The most important documents are as follows:

- **IEC 61000-3-2**

Electromagnetic compatibility; limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
This standard applies to electrical and electronic devices designed to be connected to low-voltage public distribution supplies.
Limits for equipment with power ratings > 1 kW used in professional applications are currently being developed.
Variable speed drives are therefore not generally subject to the requirements of this standard.

- **IEC 61000-3-4 technical report**

Electromagnetic compatibility; limitation of emissions of harmonic currents in low-voltage power supply systems for equipment with a rated current greater than 16 A.
The recommendations contained in this document are valid for electrical or electronic equipment with a nominal current greater than 16 A designed to be connected to 50 or 60 Hz public supplies with a maximum voltage equal to 240 V (single phase) or 600 V (three-phase).
The purpose of this technical report is to provide recommendations for the connection of equipment which generates harmonics.
Variable speed drives, when used with line chokes, generally comply with the limits prescribed in this document. If they do not, means of reducing harmonics must be used throughout the installation or a special agreement must be reached with the electricity supplier.

Harmonics (reduction of harmonic currents)

Line chokes

Line chokes are an inexpensive solution which can be applied to each device individually in order to reduce the harmonics emitted by Altivar drives.

The inductances are calculated so that the value of the rms current drawn by the drive will not exceed that of the nominal current of the motor connected to the line supply.

The inductance values are defined to create a voltage drop between 3 % and 5 % of the nominal line voltage. Values higher than this will cause loss of torque at 50 Hz.

The use of chokes is also recommended in particular under the following circumstances:

- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage unbalance between phases > 1.8 % of the nominal voltage
- Drive supplied with power by a line with very low impedance (in the vicinity of power transformers 10 times more powerful than the drive rating)
- Installation of a large number of frequency inverters on the same line
- Reduction of overload in capacitors, if the installation has a bank to correct the power factor
- Total power of all drives greater than 10 % of the power of the installation

Filter solutions

The use of line chokes alone to reduce harmonic current emissions may not be enough to ensure the correct operation of the installation or to conform to strict harmonic distortion limits.

Filter solutions must also be provided if the power of all drives exceeds 20 % to 30 % of the subscribed demand of the installation.

A filter may be installed for a drive, a group of drives or an entire installation. Three types of filter are available:

- Passive filters
- Active sinewave compensators
- Hybrid filters

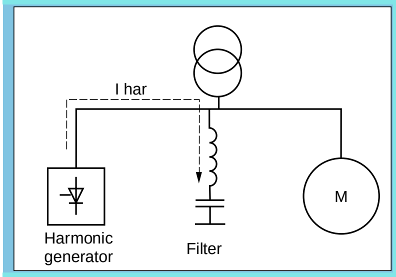
Harmonics (continued)

Passive filters

The principle is based on "trapping" the harmonic currents in the L-C circuits connected on the harmonic orders to be eliminated. The filter is "stepped" - each step corresponds to a harmonic order. The fifth to seventh orders are most often filtered.

The filter is selected on the basis of the harmonics generated and the line characteristics.

This type of filter can also be used to reduce harmonic distortion already present in the electrical supply provided by the utility.



Technical appendices

Electronic speed drive

Harmonics

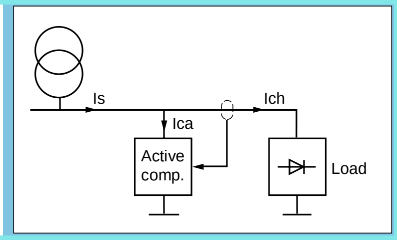
Harmonics (continued)

Active Sinewave™ compensators

Connected in parallel to the load and the line, these compensators measure the harmonic currents emitted by the load and generate opposing harmonic currents (Ica).

The advantages are:

- No dependency on the load or line characteristics
- Auto-adaptation



$Is = Ich + Ica$

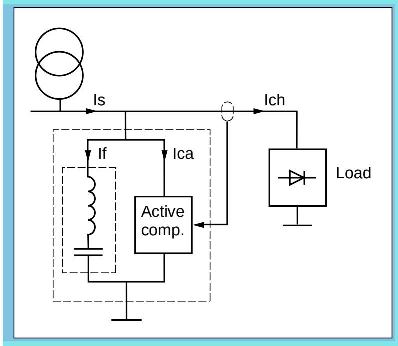
Harmonics (continued)

Hybrid filters

The two previous types of device can be combined within a single device, creating a hybrid filter. This new filter solution enables the benefits of existing solutions to be combined in order to cover a wide range of power and performance.

- Passive filter:
  - ☐ reactive power compensation,
  - ☐ high current filtering capacity.

- Active compensator:
  - ☐ filtering on a broad frequency band.

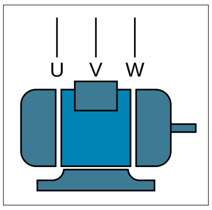


Technical appendices

Electronic speed drive

Nominal load currents of cage asynchronous motors

Nominal load current of cage asynchronous motors



4-pole 50/60 Hz three-phase motors

Power		**200/ 208 V**	**220 V**	**230 V** *(1)*	**380 V**	**400 V**	**415 V**	**433/ 440 V**	**460 V** *(1)*	**500/ 525 V**	**575 V** *(1)*	**660 V**	**690 V**	**750 V**	**1000 V**
KW	*HP*	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
0.37	*0.5*	2	1.8	2	1.03	0.98	–	0.99	1	1	0.8	0.6	–	–	0.4
0.55	*0.75*	3	2.75	2.8	1.6	1.5	–	1.36	1.4	1.21	1.1	0.9	–	–	0.6
0.75	*1*	3.8	3.5	3.6	2	1.9	2	1.68	1.8	1.5	1.4	1.1	–	–	0.75
1.1	*1.5*	5	4.4	5.2	2.6	2.5	2.5	2.37	2.6	2	2.1	1.5	–	–	1
1.5	*2*	6.8	6.1	6.8	3.5	3.4	3.5	3.06	3.4	2.6	2.7	2	–	–	1.3
2.2	*3*	9.6	8.7	9.6	5	4.8	5	4.42	4.8	3.8	3.9	2.8	–	–	1.9
3	–	12.6	11.5	–	6.6	6.3	6.5	5.77	–	5	–	3.8	3.5	–	2.5
–	*5*	–	–	15.2	–	–	–	–	7.6	–	6.1	–	–	–	3
4	–	16.2	14.5	–	8.5	8.1	8.4	7.9	–	6.5	–	4.9	4.9	–	3.3
5.5	*7.5*	22	20	22	11.5	11	11	10.4	11	9	9	6.6	6.7	–	4.5
7.5	*10*	28.8	27	28	15.5	14.8	14	13.7	14	12	11	6.9	9	–	6
9	–	36	32	–	18.5	18.1	17	16.9	–	13.9	–	10.6	10.5	–	7
11	*15*	42	39	42	22	21	21	20.1	21	18.4	17	14	12.1	11	9
15	*20*	57	52	54	30	28.5	28	26.5	27	23	22	17.3	16.5	15	12
18.5	*25*	70	64	68	37	35	35	32.8	34	28.5	27	21.9	20.2	18.5	14.5
22	*30*	84	75	80	44	42	40	39	40	33	32	25.4	24.2	22	17
30	*40*	114	103	104	60	57	55	51.5	52	45	41	54.6	33	30	23
37	*50*	138	126	130	72	69	66	64	65	55	52	42	40	36	28
45	*60*	162	150	154	85	81	80	76	77	65	62	49	46.8	42	33
55	*75*	200	182	192	105	100	100	90	96	80	77	61	58	52	40
75	*100*	270	240	248	138	131	135	125	124	105	99	82	75.7	69	53
90	*125*	330	295	312	170	162	165	146	156	129	125	98	94	85	65
110	*150*	400	356	360	205	195	200	178	180	156	144	118	113	103	78
132	–	480	425	–	245	233	240	215	–	187	–	140	135	123	90
–	*200*	520	472	480	273	222	260	236	240	207	192	152	–	136	100
160	–	560	520	–	300	285	280	256	–	220	–	170	165	150	115
–	*250*	–	–	600	–	–	–	–	300	–	240	200	–	–	138
200	–	680	626	–	370	352	340	321	–	281	–	215	203	185	150
220	*300*	770	700	720	408	388	385	353	360	310	288	235	224	204	160
250	*350*	850	800	840	460	437	425	401	420	360	336	274	253	230	200
280	–	–	–	–	528	–	–	–	–	–	–	–	–	–	220
315	–	1070	990	–	584	555	535	505	–	445	–	337	321	292	239
–	*450*	–	–	1080	–	–	–	–	540	–	432	–	–	–	250
355	–	–	1150	–	635	605	580	549	–	500	–	370	350	318	262
–	*500*	–	–	1200	–	–	–	–	600	–	480	–	–	–	273
400	–	–	1250	–	710	675	650	611	–	540	–	410	390	356	288
450	*600*	–	–	1440	–	–	–	–	720	–	576	–	–	–	320
500	–	–	1570	–	900	855	820	780	–	680	–	515	494	450	350
560	–	–	1760	–	1000	950	920	870	–	760	–	575	549	500	380
630	–	–	1980	–	1100	1045	1020	965	–	850	–	645	605	550	425
710	–	–	–	–	1260	1200	1140	1075	–	960	–	725	694	630	480
800	*1090*	–	–	–	1450	–	1320	1250	–	1100	–	830	790	–	550
900	*1220*	–	–	–	1610	–	1470	1390	–	1220	–	925	880	–	610

(1) NEC-compliant values (NEC - National Electrical Code).

These values have been provided by way of example and will vary depending on the type of motor, its polarity and the manufacturer.

Substituting starters

ATS 23, ATS 23P

Old/new equivalence tables *(1)*

These tables of equivalence can be used:
- to substitute devices on the basis of line voltage and motor power,
- to check the dimensions and position of connection terminals.

The solutions offered are based on the equivalence between simple applications. For complex applications, check compatibility in the corresponding catalogue.

ATS 23

ATS 48

Old starters / Replaced by

Old starters: Reference	Dimensions H x L x D mm	Position of the connection terminals	Replaced by: Reference	Dimensions H x L x D mm	Position of the connection terminals
ATS 23 or ATS 23P starters			**ATS 48 starters**		
Line voltage 230...415 V, 3-phase			**Line voltage 230..415 V, 3-phase**		
ATS 23 **or** **ATS 23P**					
U70N	202 x 171 x 142	top and bottom	**ATS 48D17Q**	275 x 160 x 190	top and bottom
D12N	227 x 171 x 142	top and bottom	**ATS 48D17Q**	275 x 160 x 190	top and bottom
D16N	252 x 171 x 162	top and bottom	**ATS 48D17Q**	275 x 160 x 190	top and bottom
D30N	302 x 171 x 162	top and bottom	**ATS 48D32Q**	275 x 160 x 190	top and bottom
D44N	340 x 238 x 254	top and bottom	**ATS 48D47Q**	275 x 160 x 190	top and bottom
D72N	340 x 238 x 254	top and bottom	**ATS 48D75Q**	290 x 190 x 235	top and bottom
C10N	390 x 238 x 254	top and bottom	**ATS 48C11Q**	290 x 190 x 235	top and bottom
C15N	440 x 238 x 254	top and bottom	**ATS 48C14Q**	340 x 200 x 265	top and bottom
C24N	685 x 374 x 269	bottom	**ATS 48C25Q**	380 x 320 x 265	bottom
C30N	685 x 374 x 269	bottom	**ATS 48C32Q**	380 x 320 x 265	bottom
C41N	950 x 401 x 353	bottom	**ATS 48C41Q**	670 x 400 x 300	bottom
C58N	950 x 401 x 353	bottom	**ATS 48C59Q**	670 x 400 x 300	bottom
C82N	1012 x 766 x 353	bottom	**ATS 48M10Q**	890 x 770 x 315	bottom
M12N	1012 x 766 x 353	bottom	**ATS 48M12Q**	890 x 770 x 315	bottom
Line voltage 208..0.500 V, 3-phase			**Line voltage 208..690 V, 3-phase**		
U70N	202 x 171 x 142	top and bottom	**ATS 48D17Y**	275 x 160 x 190	top and bottom
D12N	227 x 171 x 142	top and bottom	**ATS 48D17Y**	275 x 160 x 190	top and bottom
D16N	252 x 171 x 162	top and bottom	**ATS 48D22Y**	275 x 160 x 190	top and bottom
D30N	302 x 171 x 162	top and bottom	**ATS 48D32Y**	275 x 160 x 190	top and bottom
D44N	340 x 238 x 254	top and bottom	**ATS 48D47Y**	275 x 160 x 190	top and bottom
D72N	340 x 238 x 254	top and bottom	**ATS 48D75Y**	290 x 190 x 235	top and bottom
C10N	390 x 238 x 254	top and bottom	**ATS 48C11Y**	290 x 190 x 235	top and bottom
C15N	440 x 238 x 254	top and bottom	**ATS 48C17Y**	340 x 200 x 265	top and bottom
C24N	685 x 374 x 269	bottom	**ATS 48C25Y**	380 x 320 x 265	bottom
C30N	685 x 374 x 269	bottom	**ATS 48C32Y**	380 x 320 x 265	bottom
C41N	950 x 401 x 353	bottom	**ATS 48C48Y**	670 x 400 x 300	bottom
C58N	950 x 401 x 353	bottom	**ATS 48C66Y**	670 x 400 x 300	bottom
C82N	1012 x 766 x 353	bottom	**ATS 48M10Y**	890 x 770 x 315	bottom
M12N	1012 x 766 x 353	bottom	**ATS 48M12Y**	890 x 770 x 315	bottom

(1) For additional information, please consult your Regional Sales Office.

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pages 1/2 and 1/3

Substituting starters

ATS 46

Old/new equivalence tables (1)

ATS 46

ATS 48

Old starters			Replaced by		
Reference	Dimensions H x L x D mm	Position of the connection terminals	Reference	Dimensions H x L x D mm	Position of the connection terminals
ATS 46 starters			**ATS 48 starters**		
Line voltage 230..415 V, 3-phase			**Line voltage 230..415 V, 3-phase**		
ATS 46D17N	326 x 170 x 151	top and bottom	**ATS 48D17Q**	275 x 160 x 190	top and bottom
ATS 46D22N	326 x 170 x 151	top and bottom	**ATS 48D22Q**	275 x 160 x 190	top and bottom
ATS 46D32N	376 x 170 x 151	top and bottom	**ATS 48D32Q**	275 x 160 x 190	top and bottom
ATS 46D38N	376 x 170 x 151	top and bottom	**ATS 48D38Q**	275 x 160 x 190	top and bottom
ATS 46D47N	330 x 240 x 167	top and bottom	**ATS 48D47Q**	275 x 160 x 190	top and bottom
ATS 46D62N	330 x 240 x 167	top and bottom	**ATS 48D62Q**	290 x 190 x 235	top and bottom
ATS 46D75N	340 x 240 x 244	top and bottom	**ATS 48D75Q**	290 x 190 x 235	top and bottom
ATS 46D88N	340 x 240 x 244	top and bottom	**ATS 48D88Q**	290 x 190 x 235	top and bottom
ATS 46C11N	390 x 240 x 244	top and bottom	**ATS 48C11Q**	290 x 190 x 235	top and bottom
ATS 46C14N	440 x 240 x 244	top and bottom	**ATS 48C14Q**	340 x 200 x 265	top and bottom
ATS 46C17N	685 x 374 x 269	bottom	**ATS 48C17Q**	340 x 200 x 265	top and bottom
ATS 46C21N	685 x 374 x 269	bottom	**ATS 48C21Q**	380 x 320 x 265	top and bottom
ATS 46C25N	685 x 374 x 269	bottom	**ATS 48C25Q**	380 x 320 x 265	top and bottom
ATS 46C32N	685 x 374 x 269	bottom	**ATS 48C32Q**	380 x 320 x 265	top and bottom
ATS 46C41N	950 x 401 x 353	bottom	**ATS 48C41Q**	670 x 400 x 300	top and bottom
ATS 46C48N	950 x 401 x 353	bottom	**ATS 48C48Q**	670 x 400 x 300	top and bottom
ATS 46C59N	950 x 401 x 353	bottom	**ATS 48C59Q**	670 x 400 x 300	top and bottom
ATS 46C66N	950 x 401 x 353	bottom	**ATS 48C66Q**	670 x 400 x 300	top and bottom
ATS 46C79N	1012 x 766 x 353	bottom	**ATS 48C79Q**	890 x 770 x 315	top and bottom
ATS 46M10N	1012 x 766 x 353	bottom	**ATS 48M10Q**	890 x 770 x 315	top and bottom
ATS 46M12N	1012 x 766 x 353	bottom	**ATS 48M12Q**	890 x 770 x 315	top and bottom
Line voltage 208..500 V, 3-phase			**Line voltage 208..690 V, 3-phase**		
ATS 46D17N	326 x 170 x 151	top and bottom	**ATS 48D17Y**	275 x 160 x 190	top and bottom
ATS 46D22N	326 x 170 x 151	top and bottom	**ATS 48D22Y**	275 x 160 x 190	top and bottom
ATS 46D32N	376 x 170 x 151	top and bottom	**ATS 48D32Y**	275 x 160 x 190	top and bottom
ATS 46D38N	376 x 170 x 151	top and bottom	**ATS 48D38Y**	275 x 160 x 190	top and bottom
ATS 46D47N	330 x 240 x 167	top and bottom	**ATS 48D47Y**	275 x 160 x 190	top and bottom
ATS 46D62N	330 x 240 x 167	top and bottom	**ATS 48D62Y**	290 x 190 x 235	top and bottom
ATS 46D75N	340 x 240 x 244	top and bottom	**ATS 48D75Y**	290 x 190 x 235	top and bottom
ATS 46D88N	340 x 240 x 244	top and bottom	**ATS 48D88Y**	290 x 190 x 235	top and bottom
ATS 46C11N	390 x 240 x 244	top and bottom	**ATS 48C11Y**	290 x 190 x 235	top and bottom
ATS 46C14N	440 x 240 x 244	top and bottom	**ATS 48C14Y**	340 x 200 x 265	top and bottom
ATS 46C17N	685 x 374 x 269	bottom	**ATS 48C17Y**	340 x 200 x 265	top and bottom
ATS 46C21N	685 x 374 x 269	bottom	**ATS 48C21Y**	380 x 320 x 265	top and bottom
ATS 46C25N	685 x 374 x 269	bottom	**ATS 48C25Y**	380 x 320 x 265	top and bottom
ATS 46C32N	685 x 374 x 269	bottom	**ATS 48C32Y**	380 x 320 x 265	top and bottom
ATS 46C41N	950 x 401 x 353	bottom	**ATS 48C41Y**	670 x 400 x 300	top and bottom
ATS 46C48N	950 x 401 x 353	bottom	**ATS 48C48Y**	670 x 400 x 300	top and bottom
ATS 46C59N	950 x 401 x 353	bottom	**ATS 48C59Y**	670 x 400 x 300	top and bottom
ATS 46C66N	950 x 401 x 353	bottom	**ATS 48C66Y**	670 x 400 x 300	top and bottom
ATS 46C79N	1012 x 766 x 353	bottom	**ATS 48C79Y**	890 x 770 x 315	top and bottom
ATS 46M10N	1012 x 766 x 353	bottom	**ATS 48M10Y**	890 x 770 x 315	top and bottom
ATS 46M12N	1012 x 766 x 353	bottom	**ATS 48M12Y**	890 x 770 x 315	top and bottom

(1) For additional information, please consult your Regional Sales Office.

Selection guide:
pages 1/2 and 1/3

Substituting variable speed drives

ATV 08, ATV 16

Old/new equivalence tables *(1)*

These tables of equivalence can be used:
- to substitute devices on the basis of line voltage and motor power,
- to check the dimensions and position of connection terminals.

The solutions offered are based on the equivalence between simple applications (Forward, Reverse, Speed reference for 0…10 V). For complex applications, check compatibility in the corresponding catalogue.

ATV 08

ATV 11

ATV 16

ATV 58

Old drives				**Replaced by**			
Reference	**P motor kW**	**Dimensions H x L x D mm**	**Position of the connection terminals**	**Reference**	**P motor kW**	**Dimensions H x L x D mm**	**Position of the connection terminals**
ATV 08 drives				**ATV 11 drives**			
Line voltage 200…240 V, single phase				**Line voltage 200…240 V, single phase**			
ATV 08HU05M2	0.18	130 x 72 x 119	top and bottom	**ATV 11HU05M2E**	0.18	142 x 72 x 101	top and bottom
ATV 58HU09M2	0.37	130 x 72 x 119	top and bottom	**ATV 11HU09M2E**	0.37	142 x 72 x 125	top and bottom
ATV 08HU18M2	0.75	130 x 72 x 132	top and bottom	**ATV 11HU18M2E**	0.75	142 x 72 x 138	top and bottom
ATV 08PU05M2	0.18	130 x 72 x 87	top and bottom	**ATV 11HU05M2E**	0.18	142 x 72 x 101	top and bottom
ATV 08PU09M2	0.37	130 x 72 x 87	top and bottom	**ATV 11PU09M2E**	0.37	142 x 72 x 101	top and bottom
ATV 08PU18M2	0.75	130 x 72 x 87	top and bottom	**ATV 11PU18M2E**	0.75	142 x 72 x 101	top and bottom
ATV 08HU05M2X	0.18	130 x 72 x 119	top and bottom	**ATV 11HU05M2U**	0.18	142 x 72 x 101	top and bottom
ATV 08HU09M2X	0.37	130 x 72 x 119	top and bottom	**ATV 11HU09M2U**	0.37	142 x 72 x 125	top and bottom
ATV 08HU18M2X	0.75	130 x 72 x 132	top and bottom	**ATV 11HU18M2U** *(2)*	0.75	142 x 72 x 138	top and bottom
ATV 08PU05M2X	0.18	130 x 72 x 87	top and bottom	**ATV 11PU05M2U**	0.18	142 x 72 x 101	top and bottom
ATV 08PU09M2X	0.37	130 x 72 x 87	top and bottom	**ATV 11PU09M2U**	0.37	142 x 72 x 101	top and bottom
ATV 08PU18M2X	0.75	130 x 72 x 87	top and bottom	**ATV 11PU18M2U**	0.75	142 x 72 x 101	top and bottom
ATV 16 drives (without application-specific option card)				**ATV 31 or ATV 58 drives** *(3)*			
Line voltage 230 V, single phase				**Line voltage 200…240 V, single phase**			
ATV 16U09M2	0.37	160 x 150 x 120	bottom	**ATV 31HO37M2**	0,37	145 x 72 x 130	bottom
ATV 16U18M2	0.75	160 x 150 x 120	bottom	**ATV 31HO75M2**	0,75	145 x 72 x 140	bottom
ATV 16U29M2	1.5	200 x 180 x 144	bottom	**ATV 31HU15M2**	1,5	143 x 105 x 150	bottom
ATV 16U41M2	2.2	230 x 200 x 152	bottom	**ATV 31HU22M2**	2,2	184 x 140 x 150	bottom
Line voltage 230 V, 3-phase				**Line voltage 200…240 V, 3-phase** *(4)*			
ATV 16U29M2	0.37	160 x 150 x 120	bottom	**ATV 31HO37M3X**	0,37	145 x 72 x 120	bottom
ATV 16U41M2	0.75	160 x 150 x 120	bottom	**ATV 31HO75M3X**	0,75	145 x 72 x 130	bottom
Line voltage 400 V, 3-phase				**Line voltage 380…500 V, 3-phase**			
ATV 16U18N4	0.75	200 x 180 x 144	bottom	**ATV 31HO75N4**	0,75	143 x 105 x 150	bottom
ATV 16U29N4	1.5	200 x 180 x 144	bottom	**ATV 31HU15N4**	1,5	143 x 105 x 150	bottom
ATV 16U41N4	2.2	230 x 200 x 152	bottom	**ATV 31HU22N4**	2,2	184 x 140 x 150	bottom
ATV 16U54N4	3	230 x 200 x 152	bottom	**ATV 31HU30N4**	3	184 x 140 x 150	bottom
ATV 16U72N4	4	230 x 200 x 152	bottom	**ATV 31HU40N4**	4	184 x 140 x 150	bottom
ATV 16U90N4	5.5	230 x 200 x 152	bottom	**ATV 31HU55N4**	5,5	232 x 180 x 170	bottom
ATV 16 drives (with application-specific option card)				**ATV 58 drives** *(2)*			
Line voltage 230 V, single phase				**Line voltage 200…240 V, single phase**			
ATV 16U09M2	0.37	160 x 150 x 120	bottom	**ATV 58HU09M2**	0.37	206 x 113 x 167	bottom
ATV 16U18M2	0.75	160 x 150 x 120	bottom	**ATV 58HU18M2**	0.75	206 x 113 x 167	bottom
ATV 16U29M2	1.5	200 x 180 x 144	bottom	**ATV 58HU29M2**	1.5	230 x 150 x 184	bottom
ATV 16U41M2	2.2	230 x 200 x 152	bottom	**ATV 58HU41M2**	2.2	230 x 150 x 184	bottom
Line voltage 400 V, 3-phase				**Line voltage 380…500 V, 3-phase**			
ATV 16U18N4	0.75	200 x 180 x 144	bottom	**ATV 58HU18N4**	0.75	230 x 130 x 184	bottom
ATV 16U29N4	1.5	200 x 180 x 144	bottom	**ATV 58HU29N4**	1.5	230 x 130 x 184	bottom
ATV 16U41N4	2.2	230 x 200 x 152	bottom	**ATV 58HU41N4**	2.2	230 x 140 x 184	bottom
ATV 16U54N4	3	230 x 200 x 152	bottom	**ATV 58HU54N4**	3	286 x 140 x 184	bottom
ATV 16U72N4	4	230 x 200 x 152	bottom	**ATV 58HU72N4**	4	286 x 140 x 184	bottom
ATV 16U90N4	5.5	230 x 200 x 152	bottom	**ATV 58HU90N4**	5.5	286 x 200 x 184	bottom

(1) For additional information, please consult your Regional Sales Office.
(2) Drive supplied with fan.
(3) ATV 31 and ATV 58 drives do not have a separate control power supply.
(4) Additional EMC input filters, see page 2/47.

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pages 2/2 and 2/3

Substituting variable speed drives

ATV 18, ATV 66

Old/new equivalence tables *(1)*

ATV 18

ATV 66

ATV 58

Old drives				**Replaced by**			
Reference	**P motor kW**	**Dimensions H x L x D mm**	**Position of the connection terminals**	**Reference**	**P motor kW**	**Dimensions H x L x D mm**	**Position of the connection terminals**
ATV 18 drives				**ATV 11 or ATV 31 drives** *(2)*			
Line voltage 230 V, single phase				**Line voltage 200…240 V, single phase**			
ATV 18U09M2	0.37	182 x 112 x 121	bottom	**ATV 11HU09M2E** **ATV 31HO37M2**	0,37 0,37	142 x 72 x 125 145 x 72 x 130	top and bottom bottom
ATV 18U18M2	0.75	182 x 112 x 121	bottom	**ATV 11HU18M2E** **ATV 31HO75M2**	0,75 0,75	142 x 72 x 138 145 x 72 x 140	top and bottom bottom
ATV 18U29M2	1.5	184 x 149 x 145	bottom	**ATV 11HU29M2E** **ATV 31HU15M2**	1,5 1,5	142 x 117 x 156 143 x 105 x 150	top and bottom bottom
ATV 18U41M2	2.2	215 x 185 x 158	bottom	**ATV 11HU41M2E** **ATV 31HU22M2**	2,2 2,2	142 x 117 x 156 184 x 140 x 150	top and bottom bottom
Line voltage 230 V, 3-phase				**Line voltage 200…240 V, 3-phase** *(3)*			
ATV 18U54M2	3	215 x 185 x 158	bottom	**ATV 31HU30M3X**	3	184 x 140 x 150	bottom
ATV 18U72M2	4	215 x 185 x 158	bottom	**ATV 31HU40M3X**	4	184 x 140 x 150	bottom
ATV 18U90M2	5.5	300 x 210 x 170	bottom	**ATV 31HU55M3X**	5,5	232 x 180 x 170	bottom
ATV 18D12M2	7.5	300 x 210 x 170	bottom	**ATV 31HU75M3X**	7,5	232 x 180 x 170	bottom
Line voltage 400 V, 3-phase				**Line voltage 380…500 V, 3-phase**			
ATV 18U18N4	0.75	184 x 149 x 157	bottom	**ATV 31HO75N4**	0,75	143 x 105 x 150	bottom
ATV 18U29N4	1.5	184 x 149 x 157	bottom	**ATV 31HU15N4**	1,5	143 x 105 x 150	bottom
ATV 18U41N4	2.2	215 x 185 x 158	bottom	**ATV 31HU22N4**	2,2	184 x 140 x 150	bottom
ATV 18U54N4	3	215 x 185 x 158	bottom	**ATV 31HU30N4**	3	184 x 140 x 150	bottom
ATV 18U72N4	4	215 x 185 x 158	bottom	**ATV 31HU40N4**	4	184 x 140 x 150	bottom
ATV 18U90N4	5.5	300 x 210 x 170	bottom	**ATV 31HU55N4**	5,5	232 x 180 x 170	bottom
ATV 18D12N4	7.5	300 x 210 x 170	bottom	**ATV 31HU75N4**	7,5	232 x 180 x 170	bottom
ATV 18D16N4	11	390 x 245 x 190	bottom	**ATV 31HD11N4**	11	330 x 245 x 190	bottom
ATV 18D23N4	15	390 x 245 x 190	bottom	**ATV 31HD15N4**	15	330 x 245 x 190	bottom
ATV 66 drives				**ATV 58** *(2)* **and ATV 68 drives**			
Line voltage 230 V, 3-phase Constant torque application (high torque)				**Line voltage 200…240 V, 3-phase High torque application**			
ATV 66U41M2	0.75	295 x 200 x 165	bottom	**ATV 58HU29M2**	1.5	230 x 150 x 184	bottom
ATV 66U41M2	1.5	295 x 200 x 165	bottom	**ATV 58HU29M2**	1.5	230 x 150 x 184	bottom
ATV 66U41M2	2.2	295 x 200 x 165	bottom	**ATV 58HU41M2**	2.2	230 x 150 x 184	bottom
ATV 66U72M2	4	325 x 234 x 195	bottom	**ATV 58HU72M2**	4	286 x 175 x 184	bottom
ATV 66U90M2	5.5	325 x 234 x 195	bottom	**ATV 58HU90M2**	5.5	325 x 230 x 210	bottom
ATV 66D12M2	7.5	415 x 234 x 245	bottom	**ATV 58HD12M2**	7.5	325 x 230 x 210	bottom
ATV 66D16M2	11	415 x 234 x 245	bottom	**ATV 58HD16M2X**	11	550 x 240 x 283	bottom
ATV 66D23M2	15	600 x 240 x 280	bottom	**ATV 58HD23M2X**	15	550 x 240 x 283	bottom
ATV 66D33M2	22	600 x 240 x 280	bottom	**ATV 58HD33M2X**	22	650 x 350 x 304	bottom
ATV 66D46M2	30	650 x 350 x 300	bottom	**ATV 58HD46M2X**	30	650 x 350 x 304	bottom
Line voltage 400 V, 3-phase Constant torque application (high torque)				**Line voltage 380…500 V, 3-phase High torque application**			
ATV 66U41N4	0.75	295 x 200 x 165	bottom	**ATV 58HU18N4**	0.75	230 x 150 x 184	bottom
ATV 66U41N4	1.5	295 x 200 x 165	bottom	**ATV 58HU29N4**	1.5	230 x 150 x 184	bottom
ATV 66U41N4	2.2	295 x 200 x 165	bottom	**ATV 58HU41N4**	2.2	230 x 150 x 184	bottom
ATV 66U54N4	3	295 x 200 x 165	bottom	**ATV 58HU54N4**	3	286 x 175 x 184	bottom
ATV 66U72N4	4	295 x 200 x 165	bottom	**ATV 58HU72N4**	4	286 x 175 x 184	bottom
ATV 66U90N4	5.5	325 x 234 x 195	bottom	**ATV 58HU90N4**	5.5	286 x 175 x 184	bottom
ATV 66D12N4	7.5	325 x 234 x 195	bottom	**ATV 58HD12N4**	7.5	325 x 230 x 210	bottom
ATV 66D16N4	11	415 x 234 x 245	bottom	**ATV 58HD16N4**	11	325 x 230 x 210	bottom
ATV 66D23N4	15	415 x 234 x 245	bottom	**ATV 58HD23N4**	15	415 x 230 x 210	bottom
ATV 66D33N4	22	600 x 240 x 280	bottom	**ATV 58HD33N4**	22	550 x 240 x 283	bottom
ATV 66D46N4	30	600 x 240 x 280	bottom	**ATV 58HD46N4**	30	550 x 240 x 283	bottom
ATV 66D54N4	37	650 x 350 x 300	bottom	**ATV 58HD54N4**	37	650 x 350 x 304	bottom
ATV 66D64N4	45	650 x 350 x 300	bottom	**ATV 58HD64N4**	45	650 x 350 x 304	bottom
ATV 66D79N4	55	650 x 350 x 300	bottom	**ATV 58HD79N4**	55	650 x 350 x 304	bottom
ATV 66C10N4	75	980 x 585 x 392	bottom	**ATV 68C10N4**	75	600 x 346 x 355	bottom
ATV 66C13N4	90	980 x 585 x 392	bottom	**ATV 68C13N4**	90	1200 x 396 x 425	bottom
ATV 66C15N4	110	980 x 585 x 392	bottom	**ATV 68C15N4**	110	1200 x 396 x 425	bottom
ATV 66C19N4	132	980 x 585 x 392	bottom	**ATV 68C19N4**	132	1200 x 396 x 425	bottom
ATV 66C23N4	160	1127 x 960 x 507	bottom	**ATV 68C23N4**	160	1300 x 705 x 425	bottom
ATV 66C28N4	200	1127 x 960 x 507	bottom	**ATV 68C28N4**	200	1300 x 705 x 425	bottom
ATV 66C31N4	220	1127 x 960 x 207	bottom	**ATV 68C33N4**	250	1300 x 705 x 425	bottom

(1) For additional information, please consult your Regional Sales Office.
(2) ATV 31 and ATV 58 drives do not have a separate control power supply.
(3) Additional EMC input filters, see page 2/47.

Selection guide:
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Substituting variable speed drives

ATV 66

Old/new equivalence tables *(1)*

These tables of equivalence can be used:
- to substitute devices on the basis of line voltage and motor power,
- to check the dimensions and position of connection terminals.

The solutions offered are based on the equivalence between simple applications (Forward, Reverse, Speed reference for 0…10 V). For complex applications, check compatibility in the corresponding catalogue.

ATV 66

ATV 38

ATV 68

Old drives				**Replaced by**			
Reference	**P motor kW**	**Dimensions H x L x D mm**	**Position of the connection terminals**	**Reference**	**P motor kW**	**Dimensions H x L x D mm**	**Position of the connection terminals**
ATV 66 drives				**ATV 38 and ATV 68 drives**			
Line voltage 230 V, 3-phase Variable torque application				**Line voltage 200…240 V, 3-phase Variable torque application**			
ATV 66U41M2	0.75	295 x 200 x 165	bottom	**ATV 38HU29M2**	0.75	230 x 150 x 184	bottom
ATV 66U41M2	1.5	295 x 200 x 165	bottom	**ATV 38HU29M2**	1.5	230 x 150 x 184	bottom
ATV 66U41M2	2.2	295 x 200 x 165	bottom	**ATV 38HU41M2**	2.2	230 x 150 x 184	bottom
ATV 66U41M2	3	295 x 200 x 165	bottom	**ATV 38HU72M2**	3	286 x 175 x 184	bottom
ATV 66U72M2	5.5	325 x 234 x 195	bottom	**ATV 38HU90M2**	5.5	286 x 175 x 184	bottom
ATV 66U90M2	7.5	325 x 234 x 195	bottom	**ATV 38HD12M2**	7.5	325 x 230 x 210	bottom
ATV 66D12M2	11	415 x 234 x 245	bottom	**ATV 38HD16M2X**	11	550 x 240 x 283	bottom
ATV 66D23M2	15	600 x 240 x 280	bottom	**ATV 38HD16M2X**	15	550 x 240 x 283	bottom
ATV 66D23M2	18.5	600 x 240 x 280	bottom	**ATV 38HD28M2X**	18.5	550 x 350 x 304	bottom
ATV 66D33M2	30	600 x 240 x 280	bottom	**ATV 38HD33M2X**	30	650 x 350 x 304	bottom
ATV 66D46M2	37	650 x 350 x 300	bottom	**ATV 38HD46M2X**	37	650 x 350 x 304	bottom
Line voltage 400 V, 3-phase Variable torque application				**Line voltage 380…500 V, 3-phase Variable torque application**			
ATV 66U41N4	0.75	295 x 200 x 165	bottom	**ATV 38HU18N4**	0.75	230 x 150 x 184	bottom
ATV 66U41N4	1.5	295 x 200 x 165	bottom	**ATV 38HU29N4**	1.5	230 x 150 x 184	bottom
ATV 66U41N4	2.2	295 x 200 x 165	bottom	**ATV 38HU41N4**	2.2	230 x 150 x 184	bottom
ATV 66U41N4	3	295 x 200 x 165	bottom	**ATV 38HU54N4**	3	286 x 175 x 184	bottom
ATV 66U54N4	4	295 x 200 x 165	bottom	**ATV 38HU72N4**	4	286 x 175 x 184	bottom
ATV 66U72N4	5.5	295 x 200 x 165	bottom	**ATV 38HU90N4**	5.5	286 x 175 x 184	bottom
ATV 66U90N4	7.5	325 x 234 x 195	bottom	**ATV 38HD12N4**	7.5	325 x 230 x 210	bottom
ATV 66D12N4	11	325 x 234 x 195	bottom	**ATV 38HD16N4**	11	325 x 230 x 210	bottom
ATV 66D16N4	15	415 x 234 x 245	bottom	**ATV 38HD23N4**	15	415 x 230 x 210	bottom
ATV 66D23N4	18.5	415 x 234 x 245	bottom	**ATV 38HD28N4**	22	550 x 240 x 283	bottom
ATV 66D33N4	22	600 x 240 x 280	bottom	**ATV 38HD28N4**	22	550 x 240 x 283	bottom
ATV 66D33N4	30	600 x 240 x 280	bottom	**ATV 38HD33N4**	30	550 x 240 x 283	bottom
ATV 66D46N4	37	600 x 240 x 285	bottom	**ATV 38HD46N4**	37	550 x 240 x 283	bottom
ATV 66D54N4	45	650 x 350 x 300	bottom	**ATV 38HD54N4**	45	650 x 350 x 304	bottom
ATV 66D64N4	55	650 x 350 x 300	bottom	**ATV 38HD64N4**	55	650 x 350 x 304	bottom
ATV 66D79N4	75	650 x 350 x 300	bottom	**ATV 38HD79N4**	75	650 x 350 x 304	bottom
ATV 66C10N4	90	980 x 585 x 392	bottom	**ATV 68C10N4**	90	600 x 346 x 355	bottom
ATV 66C13N4	110	980 x 585 x 392	bottom	**ATV 68C13N4**	110	1200 x 396 x 425	bottom
ATV 66C15N4	132	980 x 585 x 392	bottom	**ATV 68C15N4**	132	1200 x 396 x 425	bottom
ATV 66C23N4	160	1127 x 960 x 507	bottom	**ATV 68C19N4**	160	1200 x 396 x 425	bottom
ATV 66C23N4	200	1127 x 960 x 507	bottom	**ATV 68C23N4**	200	1300 x 705 x 425	bottom
ATV 66C28N4	220	1127 x 960 x 507	bottom	**ATV 68C28N4**	250	1300 x 705 x 425	bottom
ATV 66C31N4	250	1127 x 960 x 207	bottom	**ATV 68C28N4**	250	1300 x 705 x 425	bottom

(1) For additional information, please consult your Regional Sales Office.

Selection guide:
pages 2/2 and 2/3

Substituting variable speed drives

ATV 452

Old/new equivalence tables *(1)*

540522

ATV 452

510154

ATV 38

530842

ATV 58

540254

ATV 68

Old drives				**Replaced by**			
Reference	P motor kW	Dimensions H x L x D mm	Position of the connection terminals	Reference	P motor kW	Dimensions H x L x D mm	Position of the connection terminals
ATV 452 drives				**ATV 31** *(2)*, **ATV 38, ATV 58 or ATV 68 drives**			
Line voltage 230 V, 3-phase Constant torque application				Line voltage 200…230/240 V, 3-phase			
ATV 452075M	0.75	382 x 239 x 170	top and bottom	**ATV 58HU29M2**	1,5	230 x 150 x 184	bottom
				ATV 31HU15M3X	1,5	143 x 105 x 130	
ATV 452U22M	2.2	382 x 239 x 170	top and bottom	**ATV 58HU41M2**	2,2	230 x 150 x 184	bottom
				ATV 31HU22M3X	2,2	143 x 105 x 130	
ATV 452U22M	4	402 x 239 x 192	top and bottom	**ATV 31HU40M3X**	4	184 x 140 x 150	bottom
				ATV 58HU72M2	4	286 x 175 x 184	bottom
ATV 452U22M	5.5	405 x 234 x 268	top and bottom	**ATV 31HU55M3X**	5,5	232 x 180 x 170	bottom
				ATV 58HU90M2	5,5	325 x 230 x 210	bottom
ATV 452U22M	7.5	442 x 239 x 192	top and bottom	**ATV 31HU75M3X**	7,5	232 x 180 x 170	bottom
				ATV 58HD12M2	7,5	325 x 230 x 210	bottom
ATV 452D22M	11	555 x 234 x 268	top and bottom	**ATV 31HD11M3X**	11	330 x 245 x 190	bottom
ATV 452D22M	15	595 x 234 x 268	top and bottom	**ATV 31HD15M3X**	15	330 x 245 x 190	bottom
Line voltage 400 V, 3-phase Constant torque application				Line voltage 380…500 V, 3-phase High torque application			
ATV 452075M	0.75	382 x 239 x 170	top and bottom	**ATV 31HO75N4**	0,75	143 x 105 x 150	bottom
				ATV 58HU18N4	0,75	230 x 150 x 184	bottom
ATV 452U15	1.5	382 x 239 x 170	top and bottom	**ATV 31HU15N4**	1,5	143 x 105 x 150	bottom
				ATV 58HU29N4	1,5	230 x 150 x 184	bottom
ATV 452U22	2.2	402 x 239 x 192	top and bottom	**ATV 31HU22N4**	2,2	184 x 140 x 150	bottom
				ATV 58HU41N4	2,2	230 x 150 x 184	bottom
ATV 452U30	3	402 x 239 x 192	top and bottom	**ATV 31HU30N4**	3	184 x 140 x 150	bottom
				ATV 58HU54N4	3	286 x 175 x 184	bottom
ATV 452U40	4	402 x 239 x 192	top and bottom	**ATV 31HU40N4**	4	184 x 140 x 150	bottom
				ATV 58HU72N4	4	286 x 175 x 184	bottom
ATV 452U55	5.5	442 x 239 x 192	top and bottom	**ATV 31HU55N4**	5,5	232 x 180 x 170	bottom
				ATV 58HU90N4	5,5	286 x 175 x 184	bottom
ATV 452U75	7.5	405 x 234 x 268	top and bottom	**ATV 31HU75N4**	7,5	232 x 180 x 170	bottom
				ATV 58HD12N4	7,5	325 x 230 x 210	bottom
ATV 452D11	11	555 x 234 x 268	top and bottom	**ATV 31HD11N4**	11	330 x 245 x 190	bottom
				ATV 58HD16N4	11	325 x 230 x 210	bottom
ATV 452D15	15	595 x 234 x 268	top and bottom	**ATV 31HD15N4**	15	330 x 245 x 190	bottom
				ATV 58HD23N4	15	415 x 230 x 210	bottom
ATV 452D22	22	595 x 234 x 268	top and bottom	**ATV 58HD33N4**	22	550 x 240 x 283	bottom
ATV 452D30	30	880 x 234 x 268	top and bottom	**ATV 58HD46N4**	30	550 x 240 x 283	bottom
ATV 452D37	37	860 x 484 x 365	top and bottom	**ATV 58HD54N4**	37	650 x 350 x 304	bottom
ATV 452D55	55	1040 x 484 x 365	top and bottom	**ATV 58HD79N4**	55	650 x 350 x 304	bottom
ATV 452D75	75	1188 x 595 x 365	top and bottom	**ATV 68C10N4**	75	600 x 346 x 355	bottom
ATV 452D90	90	1188 x 595 x 365	top and bottom	**ATV 68C13N4**	90	1200 x 396 x 425	bottom
Line voltage 400 V, 3-phase Variable torque application				Line voltage 380…500 V, 3-phase High torque and standard torque application (ATV 31), variable torque application (ATV 38)			
ATV 452VU11	1.1	382 x 239 x 170	top and bottom	**ATV 31HU15N4**	1,5	143 x 105 x 150	bottom
				ATV 38HU29N4	1,5	230 x 150 x 184	bottom
ATV 452VU15	1.5	382 x 239 x 170	top and bottom	**ATV 31HU15N4**	1,5	143 x 105 x 150	bottom
				ATV 38HU29N4	1,5	230 x 150 x 184	bottom
ATV 452VU30	3	402 x 239 x 192	top and bottom	**ATV 31HU30N4**	3	184 x 140 x 150	bottom
				ATV 38HU54N4	3	286 x 175 x 184	bottom
ATV 452VU40	4	402 x 239 x 192	top and bottom	**ATV 31HU40N4**	4	184 x 140 x 150	bottom
				ATV 38HU72N4	4	286 x 175 x 184	bottom
ATV 452VU55	5.5	402 x 239 x 192	top and bottom	**ATV 31HU55N4**	5,5	232 x 180 x 170	bottom
				ATV 38HU90N4	5,5	286 x 175 x 184	bottom
ATV 452VD11	11	405 x 234 x 268	top and bottom	**ATV 31HD11N4**	11	330 x 245 x 190	bottom
				ATV 38HD16N4	11	325 x 230 x 210	bottom
ATV 452VD15	15	595 x 234 x 268	top and bottom	**ATV 31HD15N4**	15	330 x 245 x 190	bottom
				ATV 38HD23N4	15	415 x 230 x 210	bottom
ATV 452VD22	22	595 x 234 x 268	top and bottom	**ATV 38HD28N4**	22	550 x 240 x 283	bottom
ATV 452VD37	37	880 x 234 x 268	top and bottom	**ATV 38HD46N4**	37	550 x 240 x 283	bottom
ATV 452VD45	45	880 x 484 x 365	top and bottom	**ATV 38HD54N4**	45	650 x 350 x 304	bottom
ATV 452VD75	75	1040 x 484 x 365	top and bottom	**ATV 38HD79N4**	75	650 x 350 x 304	bottom
ATV 452VD90	90	1188 x 595 x 365	top and bottom	**ATV 68C10N4**	90	600 x 346 x 355	bottom
ATV 452VC11	110	1188 x 595 x 365	top and bottom	**ATV 68C13N4**	110	1200 x 396 x 425	bottom

(1) For additional information, please consult your Regional Sales Office.
(2) Additional EMC input filters, see page 2/47

6 - Services

Technical information

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Schneider Electric worldwide

Technical information

Protective treatment
according to climatic environment

Depending on the climatic and environmental conditions in which the equipment is placed, Schneider Electric can offer specially adapted products to meet your requirements.

In order to make the correct choice of protective finish, two points should be remembered :

- The prevailing climate of the country is never the only criterion.
- Only the atmosphere in the immediate vicinity of the equipment need be considered.

All climates treatment “TC”

This is the standard treatment for the Telemecanique brand equipment and is suitable for the vast majority of applications.
It is the equivalent of treatments described as “Klimafest”, “Climateproof”, “Total tropicalisation” or “Super tropicalisation” and meets the same requirements, in particular :

- Publication UTE C 63-100 (method I), successive cycles of humid heat at :
  + 40 °C and 95 % relative humidity.

- DIN 50016 - Variations of ambient conditions within a climatic chamber :
  + 23 °C and 83 % relative humidity,
  + 40 °C and 92 % relative humidity.

It also meets the requirements of the following marine classification authorities : BV-LROS-GL-DNV-RINA.

Characteristics

- Steel components are usually treated with zinc chromate and, when they have a mechanical function, they may also be painted.

- Insulating materials are selected for their high electrical, dielectric and mechanical characteristics.

- Metal enclosures have a stoved paint finish, applied over a primary phosphate protective coat, or are galvanised (e.g. some prefabricated busbar trunking components).

Limits for use of “TC” (All climates) treatment

- “TC” treatment is suitable for the following temperatures and humidity :

Temperature	(°C)	20	40	50
Relative humidity	(%)	95	80	50

- It may also be used where the above limits are only exceeded accidentally or for very short periods, or where temperature variations are not sufficient or fast enough to cause heavy condensation or dripping water on the equipment.
  “TC” treatment is therefore suitable for all latitudes, including tropical and equatorial regions, where the equipment is mounted in normal, ventilated industrial locations. Being sheltered from external climatic conditions, temperature variations are small, the risk of condensation is minimised and the risk of dripping water is virtually non-existent.

Extension of use of “TC” (All climates) treatment

In cases where the humidity around the equipment exceeds the conditions described above, where the equipment, in tropical regions, is mounted outdoors, or where it is placed in a very humid location (laundries, sugar refineries, steam rooms, etc.), “TC” treatment can still be used if the following precautions are taken :

- The enclosure in which the equipment is mounted must be protected with a “TH” finish (see next page) and must be well ventilated to avoid condensation and dripping water (e.g. enclosure base plate mounted on spacers).

- Components mounted inside the enclosure must have a “TC” finish.

- If the equipment is to be switched off for long periods, a heater must be provided (0.2 to 0.5 kW per square decimetre of enclosure), switched on automatically when the equipment is turned off. This heater keeps the inside of the enclosure at a temperature slightly higher than the outside surrounding temperature, thereby avoiding any risk of condensation and dripping water (the heat produced by the equipment itself in normal running is sufficient to provide this temperature difference).

- For pilot devices, the use of “TC” treatment can be extended to outdoor use provided the enclosure is made of light alloys, zinc alloys or plastic material. In this case, it is essential to ensure that the degree of protection against penetration of liquids and solid objects is suitable for the applications involved.

Technical information

Protective treatment
according to climatic environment

“TH” treatment for hot and humid environments

This treatment is for hot and humid atmospheres where installations are subject to condensation, dripping water and the risk of fungi.

Plastic insulating components are also resistant to attacks from insects such as termites and cockroaches. These properties have led to this treatment being described as “Tropical Finish”, but this does not mean that all equipment installed in tropical and equatorial regions must systematically have undergone “TH” treatment. On the other hand, certain operating conditions in temperate climates may well require the use of “TH” treated equipment (see limitations for use of “TC” treatment).

Special characteristics of “TH” treatment

- All insulating components are made of materials which are either resistant to fungi or treated with a fungicide, and which have increased resistance to creepage (Standards IEC 112, NF C 26-220, DIN 5348).
- Metal enclosures receive a top-coat of stoved, fungicidal paint, applied over a rust inhibiting undercoat.
  Components with “TH” treatment may be subject to a surcharge (1). Please consult your Regional Sales Office.

(1) A large number of the Telemecanique brand products are “TH” treated as standard and are, therefore, not subject to a surcharge.

Protective treatment selection guide

Location	Environmental conditions	Duty cycle	Internal heating of enclosure when not in use	Type of climate	Protective treatment	
					of components	of enclosure
Indoors	No dripping water or condensation	Unimportant	Unnecessary	Unimportant	“TC”	“TC”
	Presence of dripping water or condensation	Frequent switching off for periods of more than 1 day	No	Temperate	“TC”	“TH”
				Equatorial	“TH”	“TH”
			Yes	Unimportant	“TC”	“TH”
		Continuous	Unnecessary	Unimportant	“TC”	“TH”
Outdoors (sheltered)	No dripping water or dew	Unimportant	Unnecessary	Temperate	“TC”	“TC”
				Equatorial	“TH”	“TH”
Exposed outdoors or near the sea	Frequent and regular presence of dripping water or dew	Frequent switching off for periods of more than 1 day	No	Temperate	“TC”	“TH”
				Equatorial	“TH”	“TH”
			Yes	Unimportant	“TC”	“TH”
		Continuous	Unnecessary	Unimportant	“TC”	“TH”

These treatments cover, in particular, the applications defined by methods I and II of guide UTE C 63-100.

Special precautions for electronic equipment

Electronic products always meet the requirements of “TC” treatment. A number of them are “TH” treated as standard.

Some electronic products (for example : programmable controllers, flush mountable controllers CCX and flush mountable operator terminals XBT) necessitate the use of an enclosure providing a degree of protection to at least IP 54, as defined by the standards IEC 664 and NF C 20 040, for use in industrial applications or in environmental conditions requiring a “TH” treatment.

These electronic products, including flush mountable products, must have a degree of protection to at least IP 20 (either provided by the enclosure itself or following installation) for restricted access locations where the degree of pollution does not exceed 2 (a test booth not containing machinery or other dust producing activities, for example).

Special treatments

For highly corrosive industrial environments, Schneider Electric is able to offer special protective treatments.
Please consult your Regional Sales Office.

Technical information

Product standards and approvals

Standardisation

Conformity to standards

The Telemecanique brand products satisfy, in the majority of cases, national (for example: BS in Great Britain, NF in France, DIN in Germany), European (for example: CENELEC) or international (IEC) standards. These product standards precisely define the performance of the designated products (such as IEC 60947 for low voltage equipment).
When used correctly, as designated by the manufacturer and in accordance with regulations and correct practices, these products will allow assembled equipment, machine systems or installations to conform to their appropriate standards (for example: IEC 60204, relating to electrical equipment used on industrial machines).
Schneider Electric is able to provide proof of conformity of its production to the standards it has chosen to comply with, through its quality assurance system.
On request, and depending on the situation, Schneider Electric can provide the following:

- a declaration of conformity,
- a certificate of conformity (ASEFA/LOVAG),
- an approval certificate or agreement, in the countries where this procedure is required or for particular specifications, such as those existing in the merchant navy.

Code	Standards body		Country
	Name	Abbreviation	
ANSI	American National Standards Institute	ANSI	USA
BS	British Standards Institution	BSI	Great Britain
CEI	Comitato Elettrotecnico Italiano	CEI	Italy
DIN/VDE	Verband Deutscher Electrotechniker	VDE	Germany
EN	Comité Européen de Normalisation Electrotechnique	CENELEC	Europe
GOST	Gosudarstvenne Komitet Standartov	GOST	Russia
IEC	International Electrotechnical Commission	IEC	Worldwide
JIS	Japanese Industrial Standard	JISC	Japan
NBN	Institut Belge de Normalisation	IBN	Belgium
NEN	Nederlands Normalisatie Institut	NNI	Netherlands
NF	Union Technique de l'Electricité	UTE	France
SAA	Standards Association of Australia	SAA	Australia
UNE	Asociacion Española de Normalizacion y Certificacion	AENOR	Spain

European EN standards

These are technical specifications established in conjunction with, and with approval of, the relative bodies within the various CENELEC member countries (European Union, European Free Trade Association and many central and eastern European countries having «member» or «affiliated» status). Arrived at through the principle of consensus, the European standards are the result of a weighted majority vote. Such adopted standards are then integrated into the national collection of standards, and contradictory national standards are withdrawn.
The European standards are now incorporated within the French standards and carry the prefix NF EN. Under the “Technical Union of Electricity” (UTE), the French version of the corresponding European standard carries a double notation: European reference (NF EN …) and classification (C …).
Therefore, the standard NF EN 60947-4-1 relating to motor contactors and starters, effectively constitutes the French version of the European standard EN 60947-4-1 and carries the UTE classification C 63-110.
This standard is identical to the British standard BS EN 60947-4-1 or the German standard DIN EN 60947-4-1.
Whenever reasonably practical, European standards reflect the international standards (IEC).
With regard to automation system components and distribution equipment, in addition to complying with the requirements of French NF standards, Telemecanique brand components conform to the standards of all other major industrial countries.

Regulations

European Directives

Opening up of European markets assumes harmonisation of the regulations pertaining to each member country of the European Union.
The purpose of the European Directive is to eliminate obstacles hindering the free circulation of goods within the European Union, and it applies to each member country. Member countries are obliged to transcribe each Directive into their national legislation and to simultaneously withdraw any contradictory regulations. The Directives, in particular those of a technical nature which concern us, only establish the objectives to be achieved and are referred to as “essential requirements”.
The manufacturer must take all the necessary measures to ensure that his products conform to the requirements of each Directive applicable to his production.
As a general rule, the manufacturer certifies conformity to the essential requirements of the Directive(s) for his product by affixing a CE mark.
The CE mark is affixed to Telemecanique brand products, as defined by French and European regulations.

Significance of the CE mark

- The CE mark affixed to a product signifies that the manufacturer certifies that the product conforms to the relevant European Directive(s) which concern him ; this condition must be met to allow free distrubition and circulation within the countries of the European Union of any product subject to one or move of the E.U. Directives.
- The CE mark is intended solely for national market control authorities.
- The CE mark must not be confused with a conformity marking.

European Directives (continued)

For electrical equipment, only conformity to standards signifies that the product is suitable for its designated function, and only the guarantee of an established manufacturer can provide a high level of quality assurance.
For Telemecanique brand products, one or several Directives are likely to be applicable, depending on the product, in particular:
- the Low Voltage Directive 73/23/EEC amended by Directive 93/68/EEC: the CE mark relating to this Directive has been compulsory since 1st January 1997.
- the Electromagnetic Compatibility Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC: the CE mark on products covered by this Directive has been compulsory since 1st January 1996.

ASEFA-LOVAG certification

The function of ASEFA (Association des Stations d'Essais Française d'Appareils électriques - *Association of French Testing Stations for Low Voltage Industrial Electrical Equipment*) is to carry out tests of conformity to standards and to issue certificates of conformity and test reports. ASEFA laboratories are authorised by the French authorisation committee (COFRAC).
ASEFA is now a member of the European accord group LOVAG (Low Voltage Agreement Group). This means that any certificates issued by LOVAG/ASEFA are recognised by all the authorities forming the membership of the group and carry the same validity as those issued by any of the member authorities.

Quality labels

When components can be used in domestic and similar applications, it is sometimes recommended that a “Quality label” be obtained, which is a form of certification of conformity.

Code	Quality label	Country
CEBEC	Comité Electrotechnique Belge	Belgium
KEMA-KEUR	Keuring van Electrotechnische Materialen	Netherlands
NF	Union Technique de l'Electricité	France
ÖVE	Österreichischer Verband für Electrotechnik	Austria
SEMKO	Svenska Electriska Materiel Kontrollanatalten	Sweden

Approvals

In some countries, the approval of certain electrical equipment is required by law or by the market. In this case, an approval certificate is issued by the official test authority.
Each approved component must bear the relevant quality label when this is mandatory:

Code	Approval authority	Country
CSA	Canadian Standards Association	Canada
UL	Underwriters Laboratories	USA

Note on approvals issued by the Underwriters Laboratories (UL). There are two levels of approval:

“Recognized” (ЯU)	The component is fully approved for inclusion in equipment built in a workshop, where the operating limits are known by the equipment manufacturer and where its use within such limits is acceptable by the Underwriters Laboratories. The component is not approved as a “Product for general use” because its manufacturing characteristics are incomplete or its application possibilities are limited. A “Recognized” component does not necessarily carry the approval symbol.
“Listed” (UL)	The component conforms to all the requirements of the classification applicable to it and may therefore be used both as a “Product for general use” and as a component in assembled equipment. A “Listed” component must carry the approval symbol.

Marine classification authorities

Prior approval by certain marine classification authorities is generally required for electrical equipment which is intended for use on board merchant vessels.

Code	Classification authority	Country
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
LROS	Lloyd's Register of Shipping	Great Britain
NKK	Nippon Kaiji Kyokaï	Japan
RINA	Registro Italiano Navale	Italy
RRS	Register of Shipping	Russia

Note

For further details on a specific product, please refer to the “Characteristics” pages in this catalogue or consult your Regional Sales Office.

Technical information

Degrees of protection provided by enclosures

Degrees of protection against the penetration of solid bodies, water and personnel access to live parts

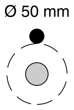
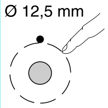
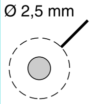
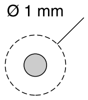
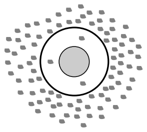
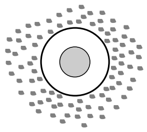
The European standard EN 60529 dated October 1991, IEC publication 529 (2nd edition - November 1989), defines a coding system (IP code) for indicating the degree of protection provided by electrical equipment enclosures against accidental direct contact with live parts and against the ingress of solid foreign objects or water.
This standard does not apply to protection against the risk of explosion or conditions such as humidity, corrosive gasses, fungi or vermin.
Certain equipment is designed to be mounted on an enclosure which will contribute towards achieving the required degree of protection (example : control devices mounted on an enclosure).
Different parts of an equipment can have different degrees of protection (example : enclosure with an opening in the base).
Standard NF C 15-100 (May 1991 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

IP ●●● code

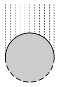
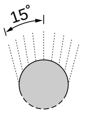
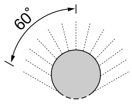
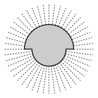
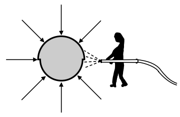
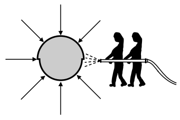
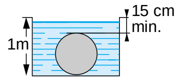
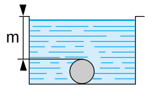
The IP code comprises **2 characteristic numerals** (e.g. **IP 55**) and may include **an additional letter** when the actual protection of personnel against direct contact with live parts is better than that indicated by the first numeral (e.g. IP 20C).

Any characteristic numeral which is unspecified is replaced by an X (e.g. IP XXB).

1st characteristic numeral : corresponds to **protection of the equipment against penetration of solid objects** and **protection of personnel against direct contact with live parts.**

		Protection of the equipment	Protection of personnel
0		Non-protected	Non-protected
1		Protected against the penetration of solid objects having a diameter greater than or equal to 50 mm.	Protected against direct contact with the back of the hand (accidental contacts).
2		Protected against the penetration of solid objects having a diameter greater than or equal to 12.5 mm.	Protected against direct finger contact.
3		Protected against the penetration of solid objects having a diameter greater than or equal to 2.5 mm.	Protected against direct contact with a Ø 2.5 mm tool.
4		Protected against the penetration of solid objects having a diameter > 1 mm.	Protected against direct contact with a Ø 1 mm wire.
5		Dust protected (no harmful deposits).	Protected against direct contact with a Ø 1 mm wire.
6		Dust tight.	Protected against direct contact with a Ø 1 mm wire.

2nd characteristic numeral : corresponds to **protection of the equipment against penetration of water with harmful effects.**

0		Non-protected
1		Protected against vertical dripping water, (condensation).
2		Protected against dripping water at an angle of up to 15°.
3		Protected against rain at an angle of up to 60°.
4		Protected against splashing water in all directions.
5		Protected against water jets in all directions.
6		Protected against powerful jets of water and waves.
7		Protected against the effects of temporary immersion.
8		Protected against the effects of prolonged immersion under specified conditions.

Degrees of protection against mechanical impact

The European standard EN 50102 dated March 1995 defines a coding system (IK code) for indicating the degree of protection provided by electrical equipment enclosures against external mechanical impact.
Standard NF C 15-100 (May 1991 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

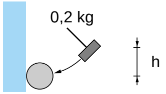
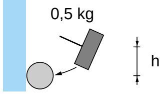
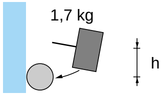
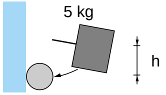
Additional letter : corresponds to **protection of personnel against direct contact with live parts**.

A	With the back of the hand.
B	With the finger.
C	With a Ø 2.5 mm tool.
D	With a Ø 1 mm wire.

IK ●● code

The IK code comprises **2 characteristic numerals** (e.g. **IK 05**).

2 characteristic numerals : corresponding to a **value of impact energy**.

		h (cm)	Energy (J)
00	Non-protected		
01		7.5	0.15
02		10	0.2
03		17.5	0.35
04		25	0.5
05		35	0.7
06		20	1
07		40	2
08		30	5
09		20	10
10		40	20

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Ireland	Schneider Electric Ireland	Maynooth Road Cellbridge - Co. Kildare	Tel.: +353+0 1 6012200 Fax: +353+0 1 6012201	**www.schneiderelectric.ie**
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Luxembourg	Schneider Electric Industrie SAS	Agence de Metz 1, Rue Graham Bell - BP n° 35190 57075 Metz cedex 3 - France	Tel.: 33 03 87 39 06 03 Fax: 33 03 87 74 25 96	**www.schneider-electric.fr**
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