Liebert HIROSS

High Performance Air Conditioning

Hiflex

Service Manual

English

code 271724 – rev. 10.10.2000

Caution

It recommends that:

- the manual is retained for the entire service life of the machine;
- the user reads the manually carefully before carrying out any operations on the machine;
- the control is used exclusively for the purpose for which it is intended; incorrect use of the control shall release the manufacturer from any liability.

This manual has been prepared to enable the end−user to carry out only the operations that can be made with the panels closed. Any operations that require the opening of doors or equipment panels must be carried out only by qualified personnel. Each machine is equipped with an Electric Insulating device which allows the operator to work in conditions of safety. This device must always be used to eliminate risks during maintenance (electric shocks, scalds, automatic restarting, moving parts and remote control).
The panel key supplied with the unit must be kept by the person responsible for maintenance.
For identification of the unit (model and serial no.) in case of the necessity for assistance or spare parts, locate the identification label on the outside of the unit.

1 – Preliminary operations

1.1 – Inspection

On receiving the equipment immediately check its condition; report any damage to the transport company at once.

1.2 – Handling

1.3 – Operating limits

The units are designed to operate within working ranges (see Tab. 1).

These limits are referred to new machines or to those that have been correctly installed and serviced.
The warranty clauses are no longer valid for any possible damage or malfunction that may occur during or due to operation outside the application values.

1.4 – Identification

The air conditioner can be identified according to the following nomenclature:

4LOA

is the numeric value identifying the size of the unit (4–9)
Models 5–7–9 are double.

M Small type – R22
S Small size – R22
L Large size – R22
P Small size – R407C
G Large size – R407C

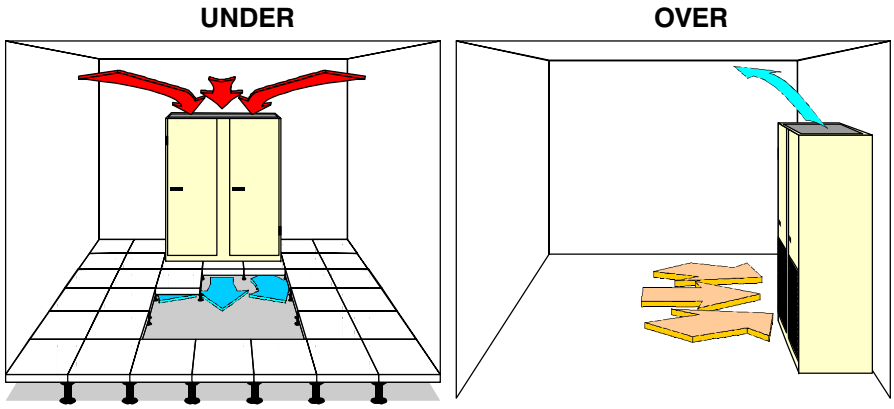
U underfloor air flow (Under)
O upward air flow (Over)
C constant

A Direct expansion unit with external air cooled condenser
C Chilled water unit
D Direct expansion unit and chilled water unit (DUALFLUID) with external air cooled condenser
F Direct expansion unit and chilled water unit (FREECOOLER) with water cooled condenser – one water circuit.
H Direct expansion unit and chilled water unit (DUALFLUID) with water cooled condenser
W Direct expansion unit with water cooled condenser

Tab. 1 – Operating limits

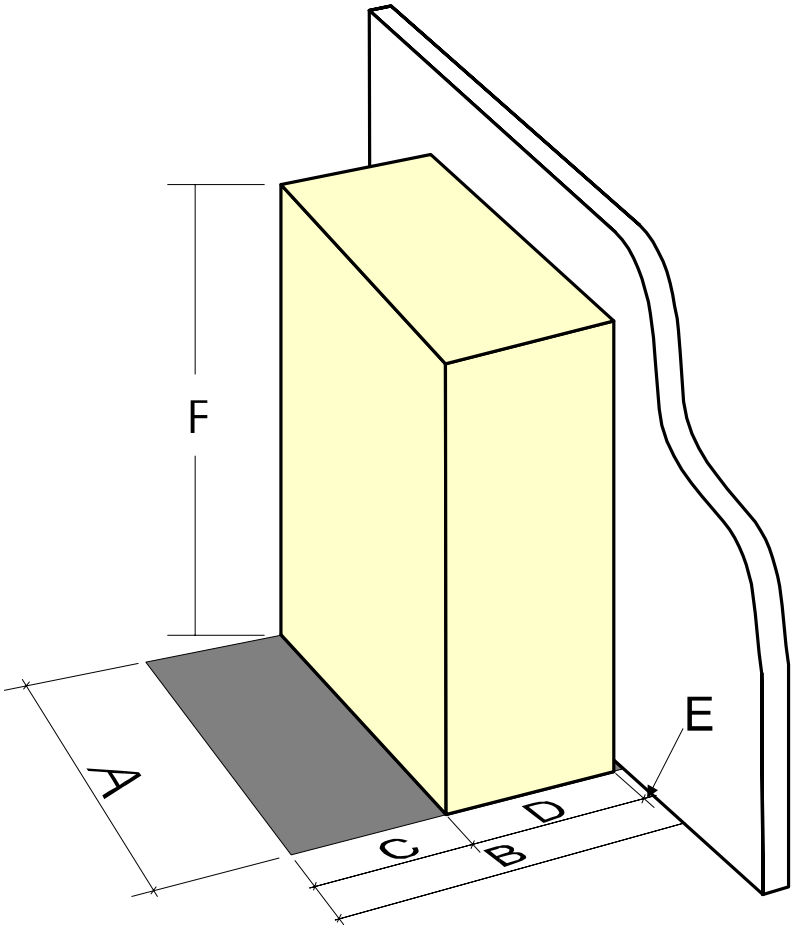
Room conditions	from:	18°C, 45% R.H.	Hot water heating coil	inlet water temperature	max. 100°C
	to:	27°C, 55% R.H		water pressure	max. 8.5 bar
Ambient conditions: lower limit (+)(*)		–10°C (– 25°C with Variex on condenser)	Chilled water coil	inlet water temperature	min. 5°C
Voltage tolerances	standard	400V± 10%/3/50		water pressure	max. 10 bar
	optional	230V± 10%/3/50	Storage conditions	from:	– 20°C
Max unit to condenser distance (+)		30 m (20 m for 4M)		to:	55°C
Max condenser to unit geodetic height (+) (#)		3 m			

(*) Exceeding these limits will cause a compressor lock, reset to normal operation can only be carried out manually.
(#) If the condenser is installed below the room unit. If the condenser is installed above the unit at a height of over 6 m, a trap must be fitted every 6 m.
(+) Only units with air–cooled condensers.



2 – Positioning

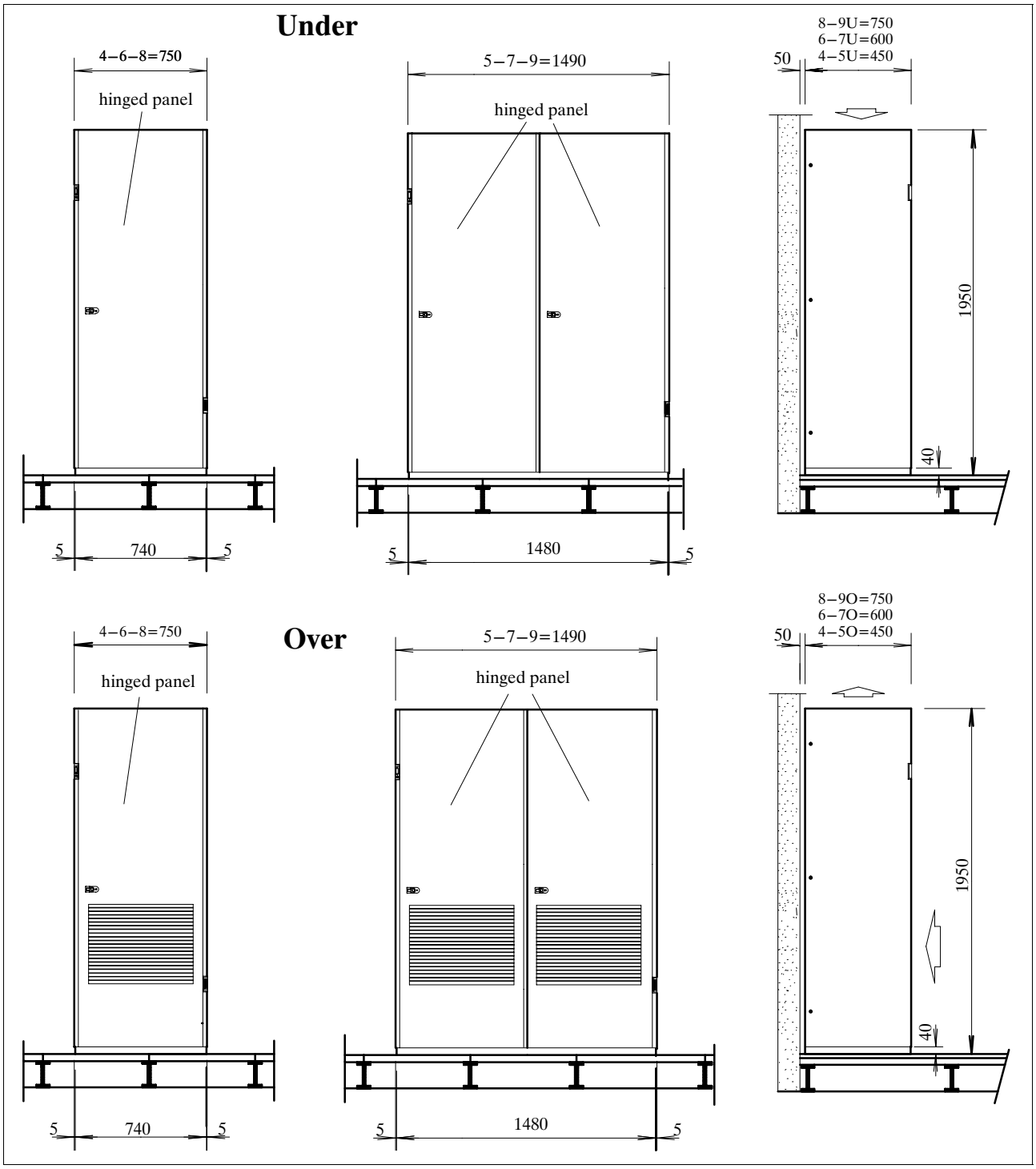
2.1 – Clearance areas and main dimensions



	4	6	8	5	7	9
A [mm]	750	750	750	1490	1490	1490
B [mm]	1300	1450	1600	1300	1450	1600
C [mm]	800	800	800	800	800	800
D [mm]	450	600	750	450	600	750
E [mm]	50	50	50	50	50	50
F [mm]	1950	1950	1950	1950	1950	1950

MODEL	WEIGHT (kg) – standard unit					
	(A)	(W)	(C)	(F)	(D)	(H)
4	180	195	145	–	–	–
6	205	210	175	–	–	–
8	280	295	200	305	290	305
5	340	370	–	–	–	–
7	390	400	–	–	–	–
9	540	570	–	590	560	590

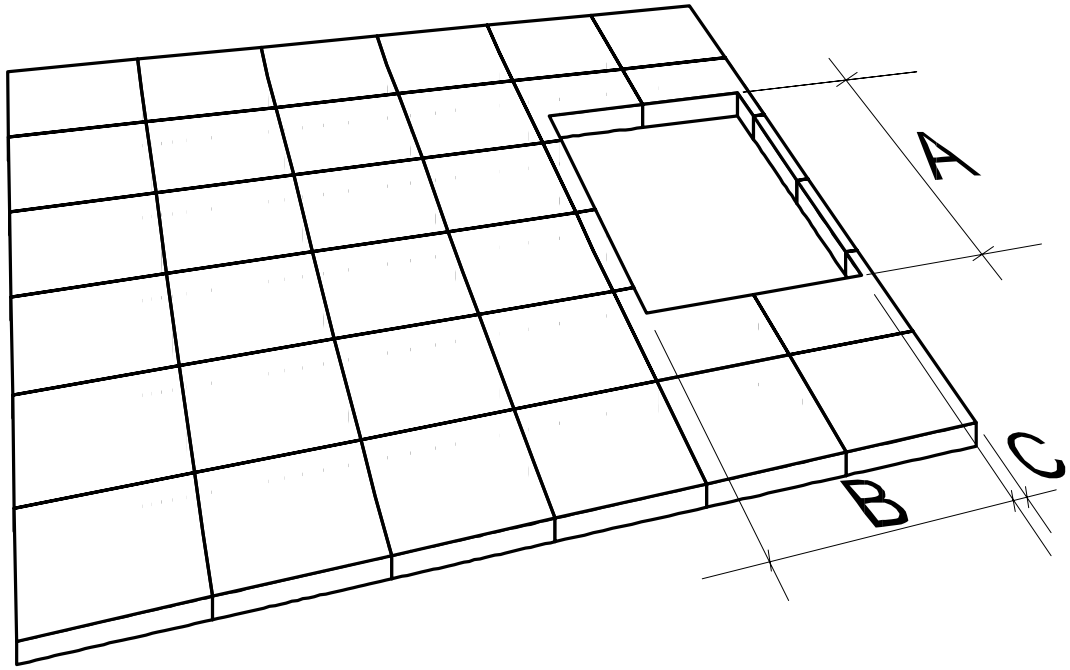
2.2 – Overall dimensions



3 – Installation

ATTENTION: The conditioner must never be installed out of doors.

3.1 – Hole in raised floor

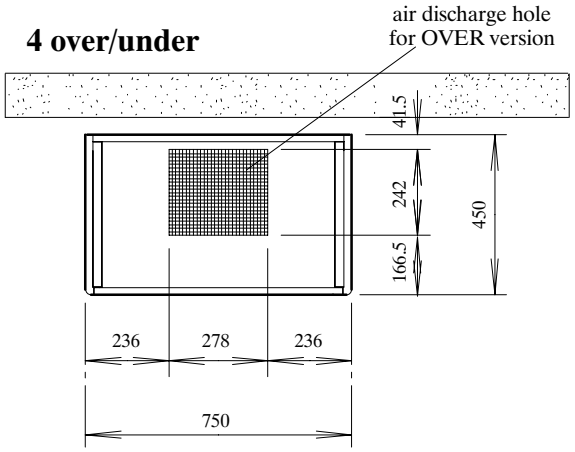


	4		6		8		5		7		9	
	without base frame	with base frame	without base frame	with base frame	without base frame	with base frame	without base frame	with base frame	without base frame	with base frame	without base frame	with base frame
A [mm]	660	750	660	750	660	750	1340	1490	1340	1490	1340	1490
B [mm]	370	455	520	605	670	755	370	455	520	605	670	755
C [mm]	93	48	93	48	93	48	93	48	93	48	93	48

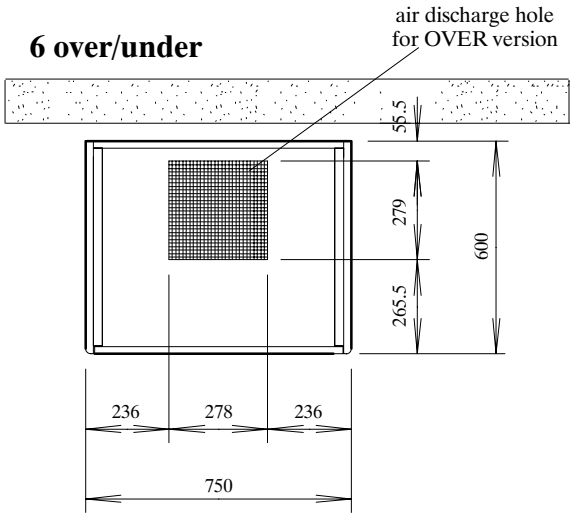
3.2 – Top and base view dimensions

TOP VIEWS

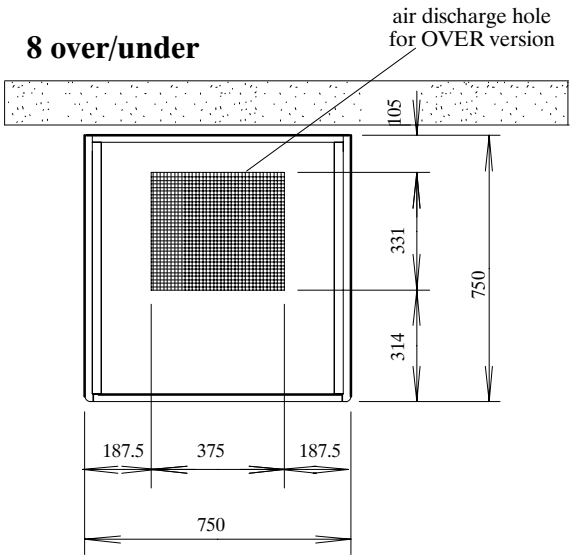
4 over/under



6 over/under

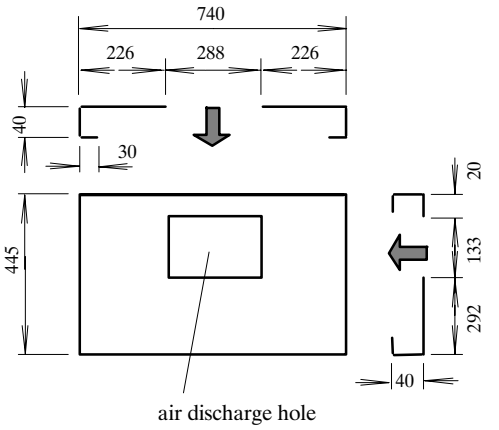


8 over/under

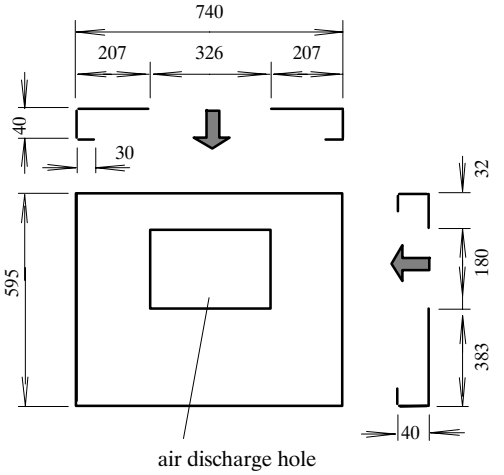


BASE CABINET VIEWS

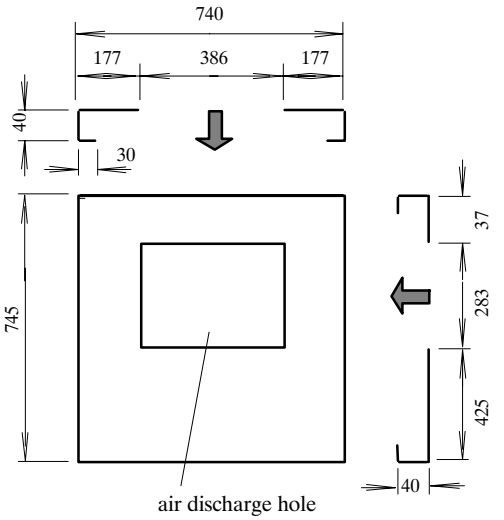
4 under



6 under

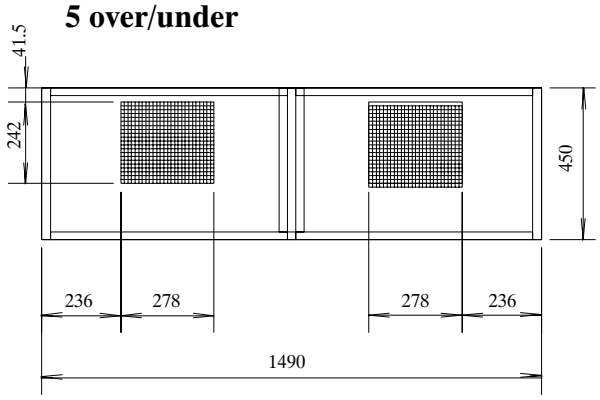


8 under

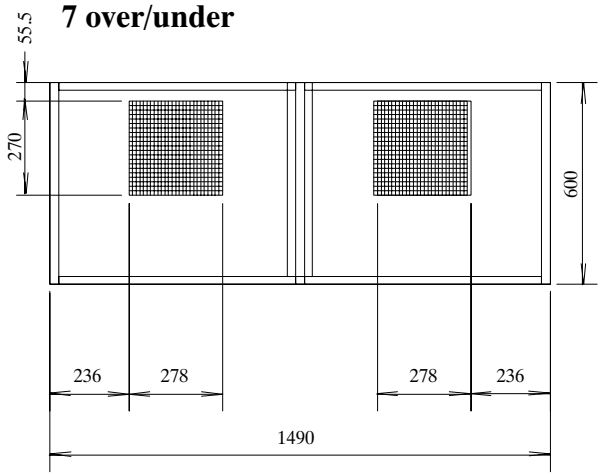


TOP VIEWS

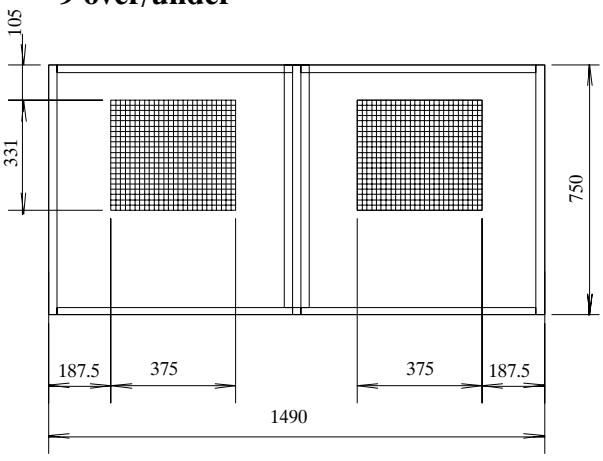
5 over/under



7 over/under

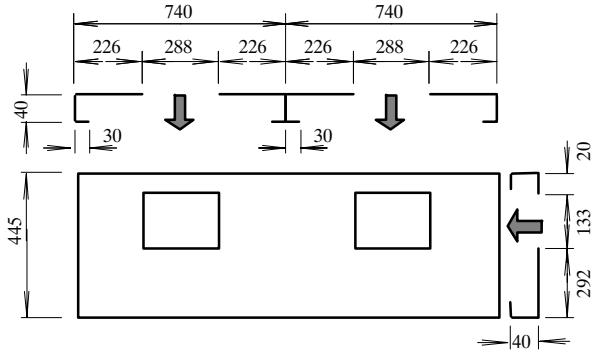


9 over/under

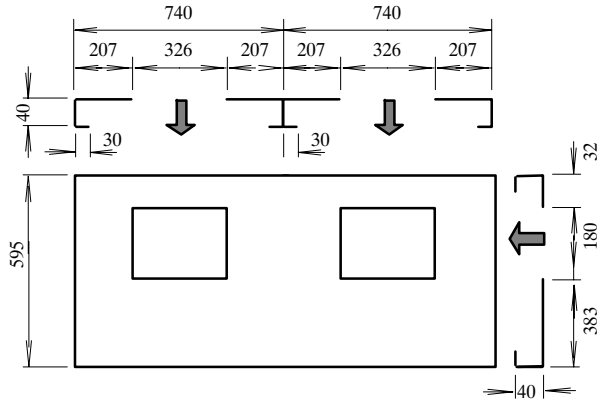


BASE CABINET VIEW

5 under



7 under



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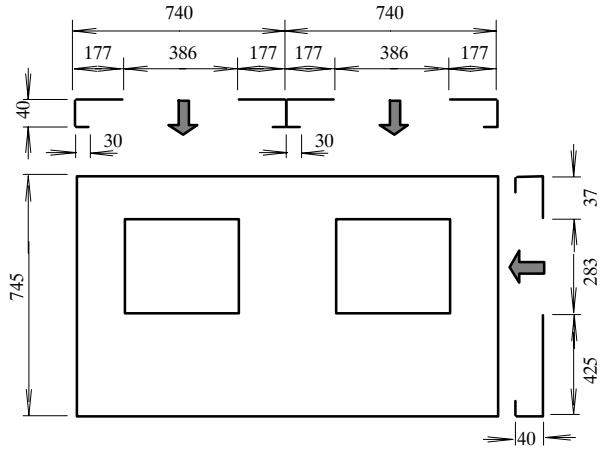
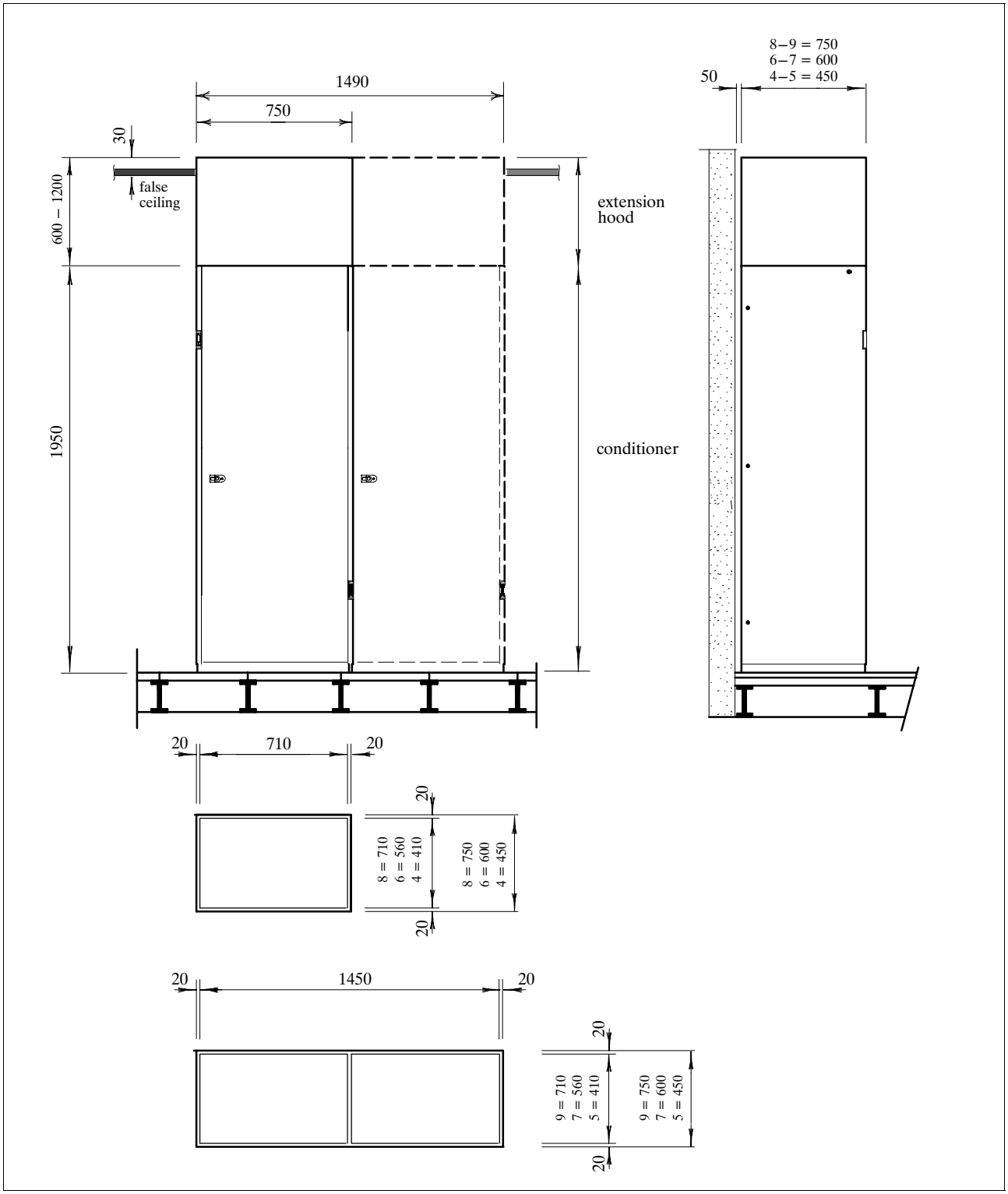
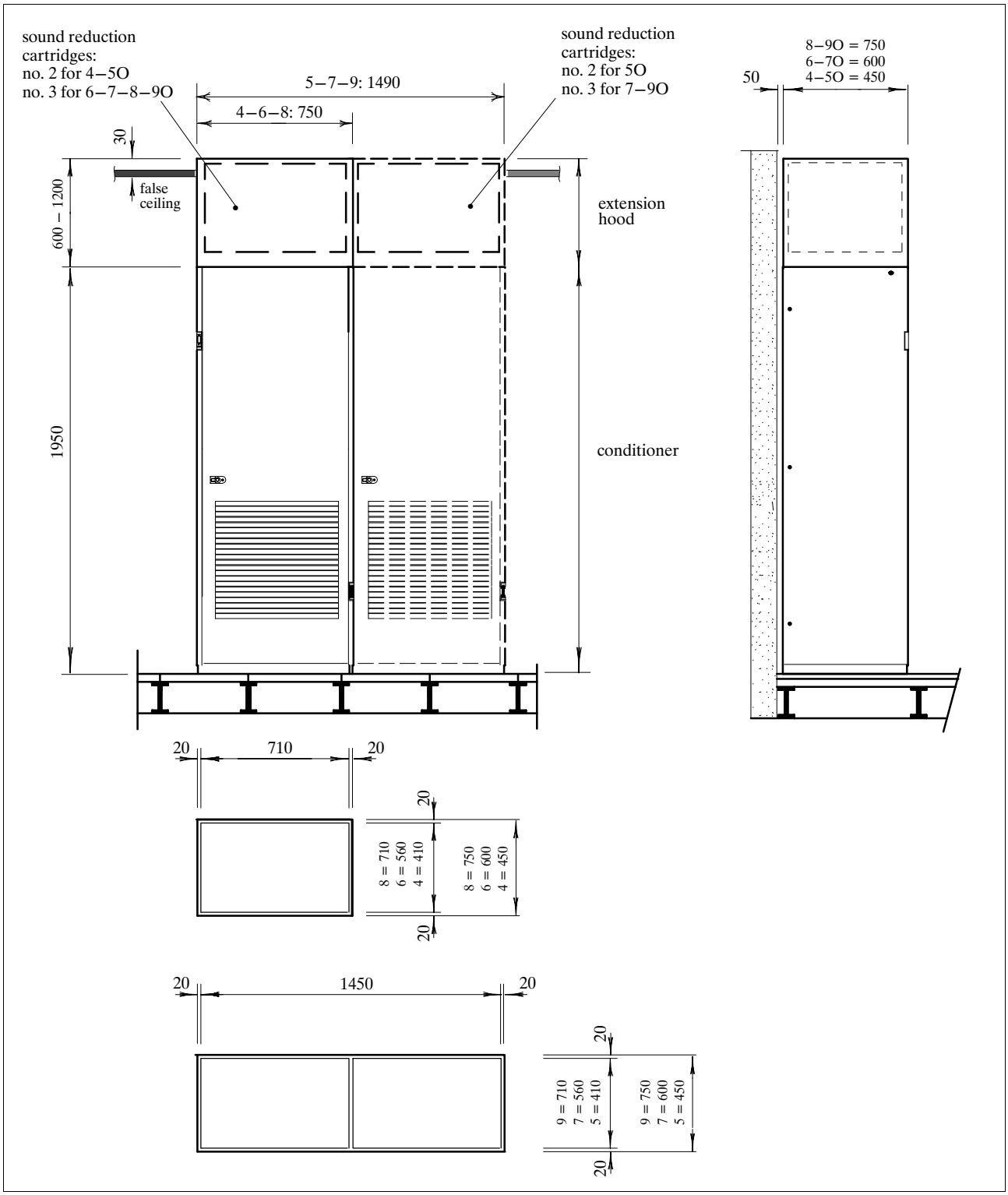


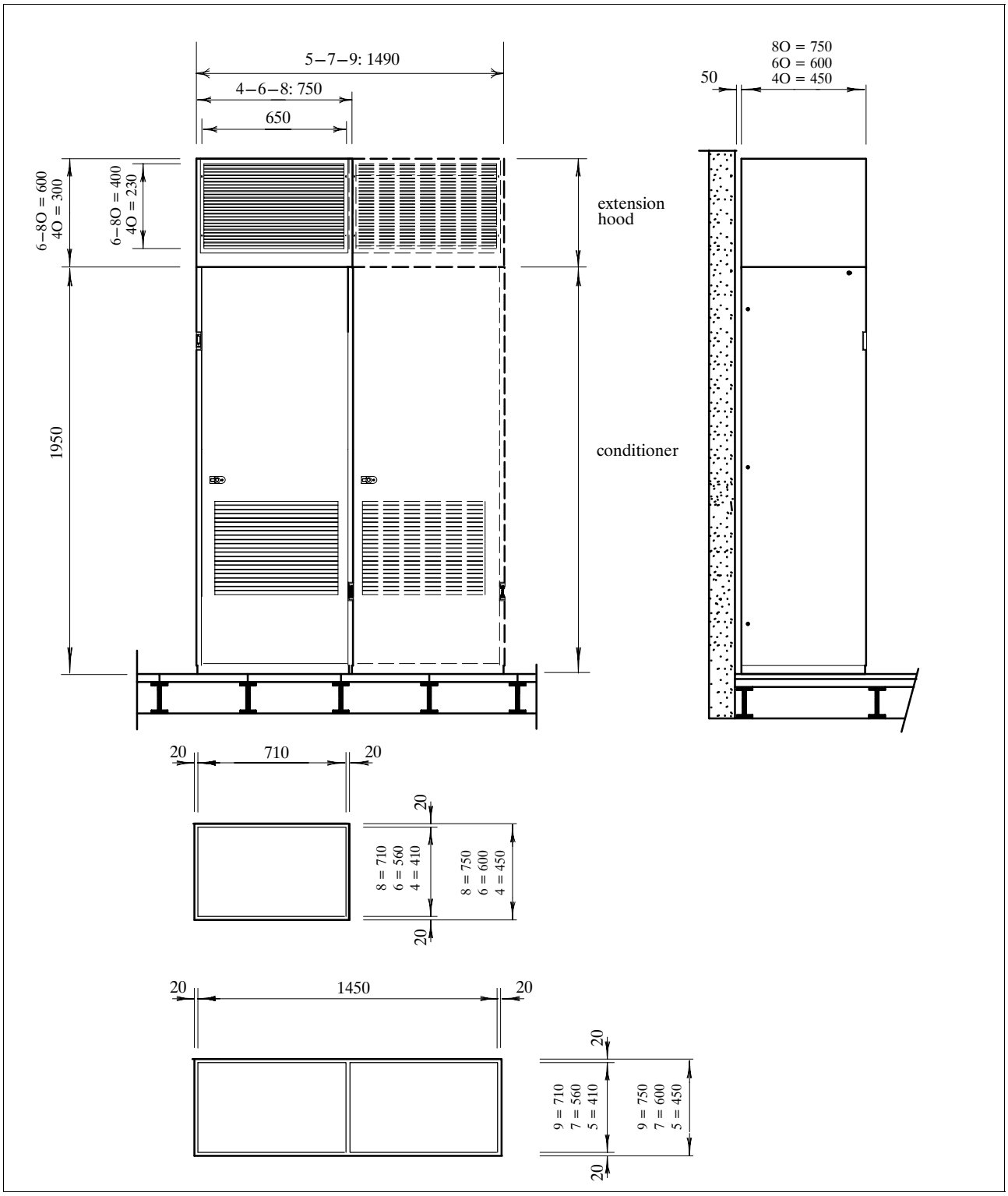
3.3 – Extension hood



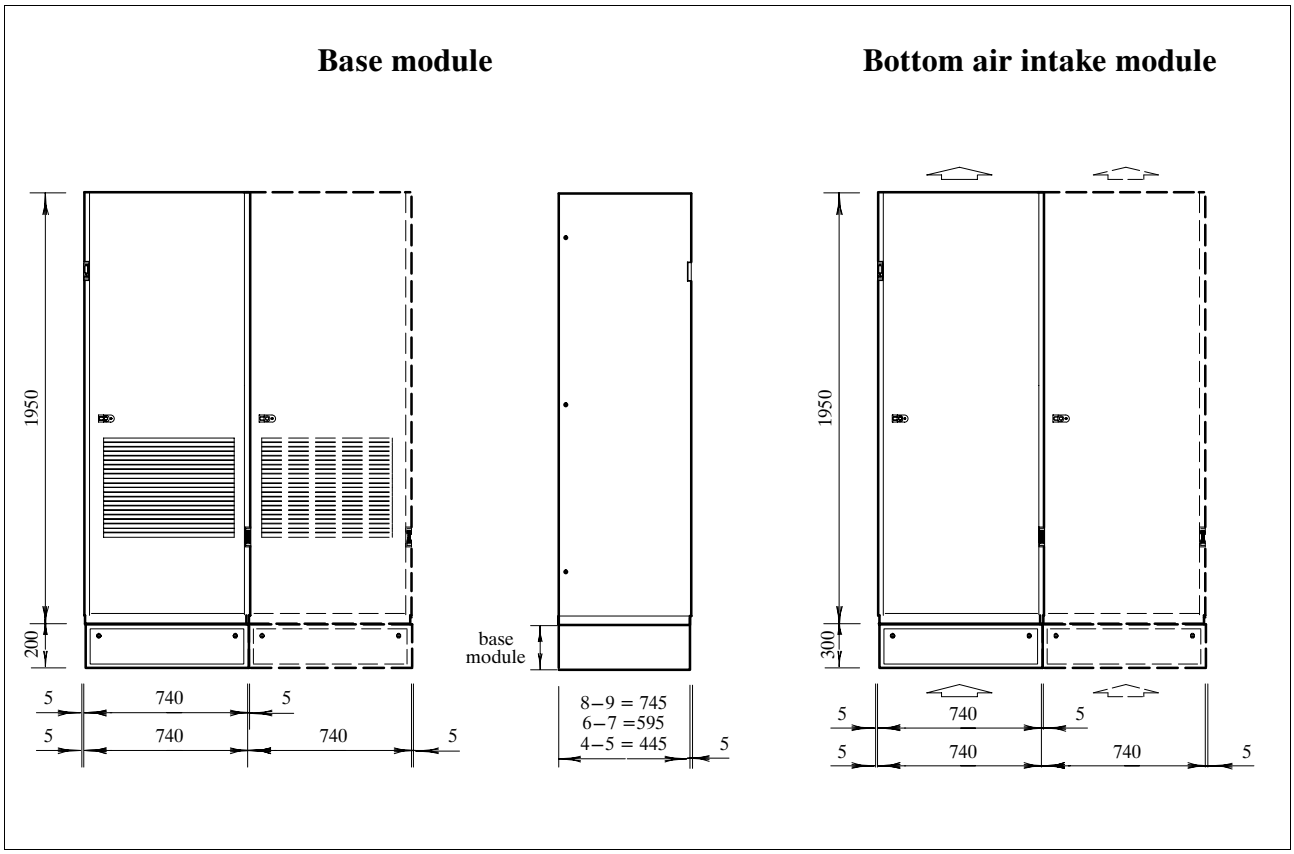
3.4 – Extension hood with sound reduction cartridges (Over unit)

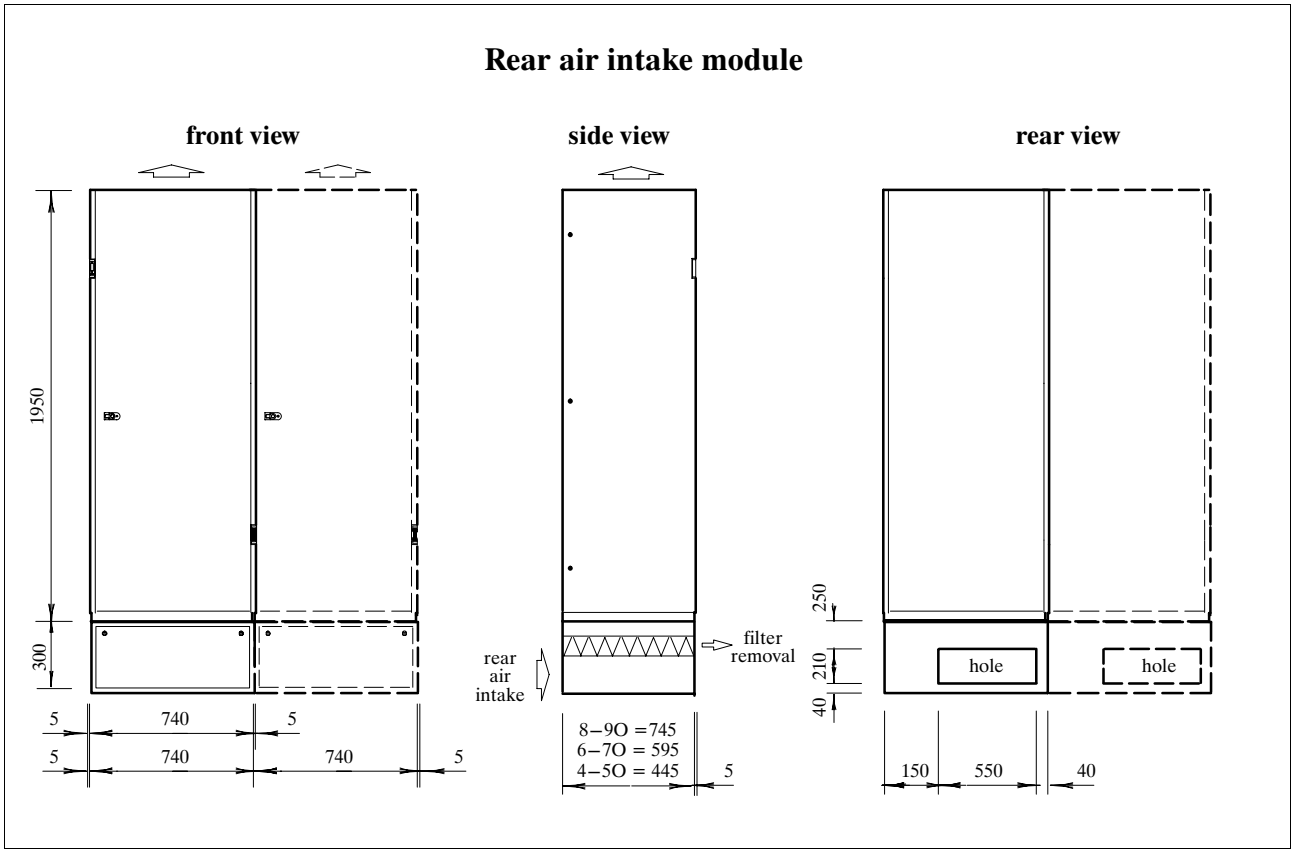


3.5 – Horizontal discharge hood (Over unit)



3.6 – Base / air intake module





4 – Refrigeration connections

4.1 – Refrigeration pipeline connections

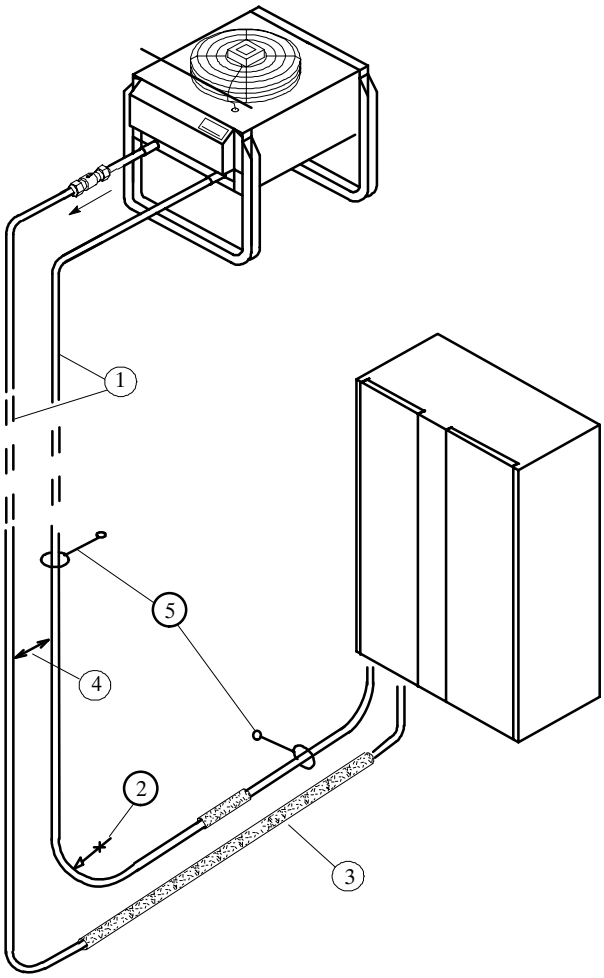
The air–cooled units are supplied pressurized with 3 bar of dry nitrogen.

> **The opening of the cut–off cocks of the ambient unit pressurized with nitrogen must occur last while making vacuum in the whole system.**

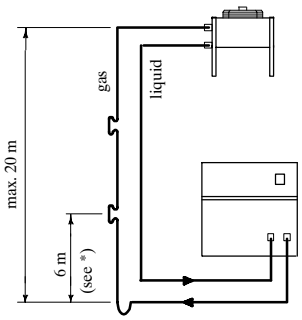
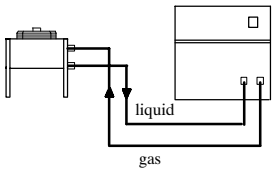
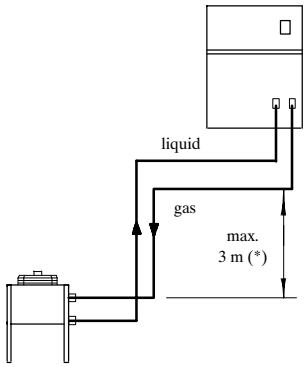
4.1.1 – General layout (Fig. 1)

1) In soft or hard copper.
   The diameter required is stated in Tab. 4.
   If the installer intends to use pipes of a larger diameter (e.g. for long winding runs) then first apply to the Technical Support Department.
   Use as short refrigeration pipelines as possible to minimize the total charge of refrigerant and the pressure drops. For long runs (over 30 equivalent m) contact the Technical Support Department.
   Lay the horizontal gas pipes with 1% downward gradient towards the refrigerant flow.
2) Reduce the number of bends, which must be of large radius, to a minimum.
3) Insulate the piping as specified in Tab. 2. If the pipes are put next to electrical cables it is advised to insulate them to avoid induced currents and damage to cable insulation.
4) There must be a minimum separation of 20 mm between the gas and liquid pipelines.
   If this is not possible insulate both lines.
5) Support both horizontal and vertical pipes with vibration–damping clamps (which include rubber gaskets). Place these every 1.5 – 2 m.

Fig. 1 Ideal pipe layout



Tab. 2 – Condenser positioning

CONDENSER POSITION			CONDITIONER BELOW CONDENSER	CONDITIONER AND CONDENSER AT SAME LEVEL	CONDITIONER ABOVE CONDENSER (not recommended)
INSULATION	gas	int.	necessary	necessary	necessary
		ext.	only for aesthetic reasons	only for aesthetic reasons	only for aesthetic reasons
	liq.	int.	absolutely not	not necessary	no (expose to cold underfloor air)
		ext.	only for aesthetic reasons	only if exposed to sun	only if exposed to sun
LAYOUT			 (*) The gas line must have an oil trap for every 6 m of vertical piping (plus one at the base). N.B. If necessary, to favour oil migration, reduce vertical gas piping in diameter, even if this leads to an increased pressure drop (consult the Technical Support Department).		 (*) For height differences of over 3 m the system must be designed so as to guarantee additional subcooling (consult the Technical Support Department).

Tab. 3 – Weight of refrigerant contained in piping during operation

PIPE DIAMETER (mm)	gas (*)	liquid (+), at different condensing temperatures							
		R22 (kg/m)					R407C (kg/m)		
		35.0 °C	40.5 °C	46.0 °C	51.5 °C	57.0 °C	35.0 °C	46.0 °C	57.0 °C
ø 12 x 1	0.0049	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.08
ø 14 x 1	0.0068	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.10
ø 16 x 1	0.0085	0.18	0.17	0.17	0.16	0.16	0.17	0.16	0.15
ø 18 x 1	0.012	0.24	0.23	0.23	0.22	0.21	0.23	0.22	0.20
ø 22 x 1	0.019	0.36	0.35	0.34	0.34	0.33	0.34	0.32	0.31
ø 28 x 1	0.033	0.61	0.59	0.58	0.57	0.55	0.58	0.55	0.52

(*) Gas refers to superheated vapour temp. = 65 °C (press. = 15.5 bar), density = 0.062 kg/l, spec. vol. = 0.016 m3/kg).
These weights can be considered correct for all superheated vapour temperatures as the difference is negligible.

(+) Liquid pressure and density varies according to condensing temperature (see refrigerant tables).

4.1.2 – Installing pipelines

THE FOLLOWING OPERATIONS MUST BE CARRIED OUT BY AN EXPERIENCED REFRIGERATION TECHNICIAN.

> ***The opening of the compressor cocks and of the cut–off cocks of the ambient unit pressurized with nitrogen must occur last while making vacuum in the whole system. This precaution will allow the filter dryer and the oil in the compressor not to become saturated with moisture.***

1) Lay the piping, taking note of the following:
   - Welding:
     - All joints must be braze–welded.
     - Avoid butt welds by using sleeves or enlarging one of the pipes using a pipe opener.
     - Use silver–based solders and the correct apparatus.
     - Guarantee a correct weld as a refrigerant leak, or a faulty weld which leads to a leak later on, can seriously damage the air conditioner.
   - Always use large–radius curves (bending radius at least equal to pipe diameter). Bend the pipes as follows:
     - soft copper: by hand or bending device.
     - hard copper: use preformed curves. Do not overheat the pipes when welding so as to minimize oxidation.

2) Connect the pipes to the condenser:
   - Condensers with butt–welded pipe connections (e.g. condensers): cut the pipe, enlarge it and weld it to the pipeline.
   - Condensers with threaded tap connections: flange the pipes and connect.

   RESPECT THE DIRECTION OF REFRIGERANT FLOW (SEE LABELS ON FREON CONNECTIONS).

3) Wash out the pipelines as follows:
   a) Plug up the free ends of the pipes.
   b) Connect a dry nitrogen cylinder, fitted with a reducer (max. pressure 10 bar), to the ¼" SAE Schrader valve of the condenser.
   c) Pressurize the pipes with dry nitrogen.
   d) Unplug the pipes instantaneously.
   e) Repeat a) – d) several times.

THIS OPERATION IS ESPECIALLY IMPORTANT WHEN HARD COPPER PIPING IS USED.

> ***When the pipes are more than 30 m long, contact the Technical Support Department***

4) Fix (weld) the pipes to the connections on the air conditioner.
5) **Connect the refrigerant safety valve to the outdoor with a Ø 16 copper pipe.**

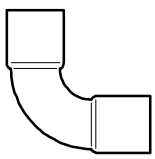
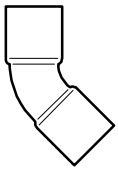
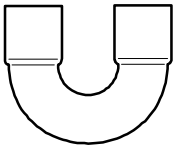
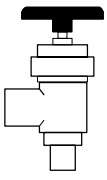
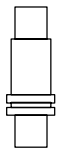
4.1.3 – Pipe diameter

The diameters of the connecting pipes between the conditioner and the condensing unit listed in Tab. 4 must be respected, otherwise the guarantee becomes invalid.

Tab. 4 – Pipe diameters (room unit – remote condenser)

MOD.	STANDARD PIPE DIAMETERS (Valid for equivalent lengths up to 30 m)			
	gas copper tube external diametre x thickness (mm)		liquid copper tube external diametre x thickness (mm)	
	R22	R407C	R22	R407C
4M	12× 1	–	10 × 1	–
4/6/8S–L	18× 1	–	18 × 1	–
4P	–	12× 1	–	10 × 1
4G–6P	–	14× 1	–	12 × 1
6G/8P–G	–	16× 1	–	14 × 1
5/7/9S–L	2×18×1	–	2×18×1	–
5P	–	2×12×1	–	2×12×1
5G/7P	–	2×14×1	–	2×12×1
7G/9P–G	–	2×16×1	–	2×14×1

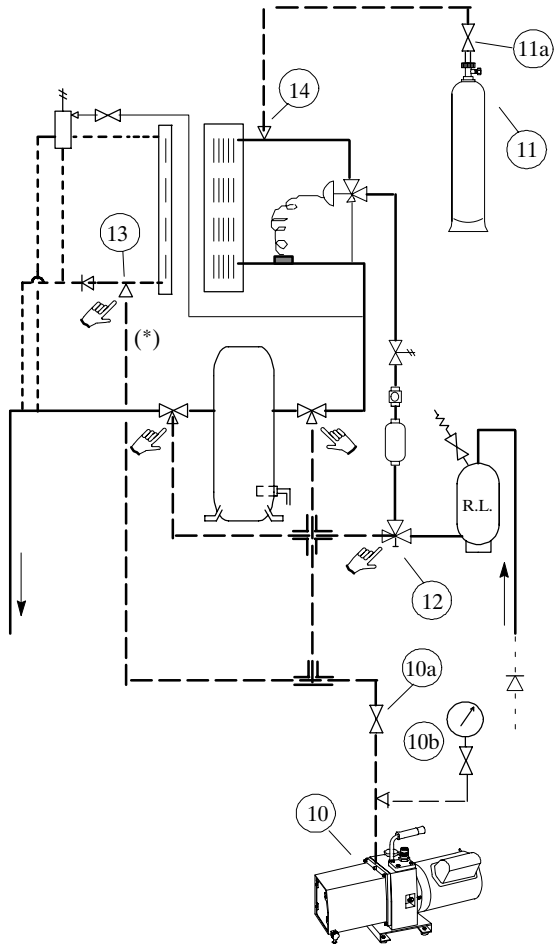
Tab. 5 – Equivalent lengths in meters of: curves, shut–off and non–return valves

Nominal diameter (mm)	 90°	 45°	 180°	 90°	
12	0.50	0.25	0.75	2.10	1.90
14	0.53	0.26	0.80	2.20	2.00
16	0.55	0.27	0.85	2.40	2.10
18	0.60	0.30	0.95	2.70	2.40
22	0.70	0.35	1.10	3.20	2.80
28	0.80	0.45	1.30	4.00	3.30

4.2 – Vacuum creation and refrigerant charge

Check the refrigerant type to be used on the data plate of the air conditioner and on the refrigerating compressor.

Fig. 2 – Pump and refrigerant charging cylinder connection for vacuum creation and refrigerant charge



(*) only with reheating coil (optional)

4.2.1 – R22 precharge

1) ***Open all cocks of the system including those used by the factory for pressurizing*** (ambient unit and condensing unit).
   By this operation all the components of the refrigerating circuit must be subject to vacuum.
2) Connect a proper, high efficiency vacuum pump (10) to the couplings for:
   – ***compressor intake and delivery*** by using, if available, the three–way Rotalock cocks, coupling 1/4" SAE (make sure that all the three ways are open), otherwise the Schrader valves welded on the pipings.
   – ***Three–way Rotalock cock, coupling 1/4" SAE of the liquid receiver (12)*** (make sure that all three ways are open).
   – ***Schrader coupling (13)*** fit on the compressor or fan space, if the reheating coil option is available.
3) **Provide for a connection with refrigerant cylinder before making vacuum**.
4) Make the system vacuum up to a residual pressure of 0.7 absolute mbar, then go on for 30 minutes.
   The pressure must be measured by means of a vacuum pressure gauge (10 b) on the system side.
   If the complete vacuum is not possible, this means that there are some leaks (to be removed according to the instructions given in 6 below).

NEVER USE THE COMPRESSOR TO CREATE A VACUUM (THIS INVALIDATES ITS GUARANTEE).

5) Break the vacuum as follows:
   a) Close the cock (10a) of the vacuum pump (10).
   b) Open the cock (11a) of the refrigerant cylinder kept vertically **to load only gaseous refrigerant**.
   c) **Pre–charge is complete** when the pressure of the gaseous refrigerant contained in the lines, condenser and Liquid Receiver (L.R.) balances that of the cylinder.
   d) At this point both the vacuum pump and the refrigerant cylinder can be disconnected as follows:
      d1) close the cylinder cock (11a)
      d2) close the way 1/4" SAE of the Rotalock cocks and of the connected Schrader valves.
6) Inspect all connections/joints using a leak detector. If a leak is found empty the pipes and the condenser, seal the leak and repeat the instructions in 3) – 6).

4.2.2 – R407C precharge

1) ***Open all cocks of the system including those used by the factory for pressurizing*** (ambient unit and condensing unit).
   By this operation all the components of the refrigerating circuit must be subject to vacuum.
2) Connect a proper, high efficiency vacuum pump (10) ***suitable for polyester oils*** to the couplings:
   – ***Compressor intake and delivery*** using, if available, the three–way Rotalock cocks, coupling 1/4" SAE (make sure that all three ways are open), otherwise the Schrader valves welded on the pipings.
   – ***Three–way Rotalock cock, coupling 1/4" SAE of the liquid receiver (12)*** (make sure that all three ways are open).
   – ***Schrader coupling (13)*** fit on the compressor or fan space, if the reheating coil option is available.
3) **Provide for a connection with refrigerant cylinder before making vacuum**.
4) Make the system vacuum up to 0.3 absolute mbar and after 3 hours check if 1.3 absolute mbar have not been exceeded. This condition warrants a humidity lower than 50 ppm inside the system.
   If the complete vacuum is not possible, this means that there are some leaks (to be removed according to the instructions in 6 below).

NEVER USE THE COMPRESSOR TO CREATE A VACUUM (THIS INVALIDATES ITS GUARANTEE).

5) Break the vacuum as follows:
   a) Close the pump cock (10) for the vacuum (10).
   b) Open the cock of the refrigerant cylinder (11a) until the system reaches a pressure value of about 3 bar.

The refrigerant must be introduced and charged by taking only liquid fluid from the cylinder.

c) At this point both the vacuum pump and the refrigerant cylinder can be disconnected as follows:
   c1) close the cylinder cock (11a)
   c2) close the way 1/4" SAE of the Rotalock cocks and of the connected Schrader valves.

6) Inspect all connections/joints using a leak detector. If a leak is found, empty the pipes and the condenser, seal the leak and repeat the instructions in 3) – 6).

7) Now the machine is ready for completing the charge and the start–up.

8) Charge the refrigerant by means of the charge valve (15) placed at the evaporator inlet.

CAUTION: the refrigerant must be introduced and charged by taking only liquid fluid from the cylinder through the cock communicating with the bottom of the charge cylinder (possible check by means of a sight glass fit on the charge pipe).

4.2.3 – Refrigerant charge *(A and D)*

1) Start the unit as described in para. 7.1.
2) Manually start the compressor (ensure the unit is not in the dehumidification phase).
3) Guarantee a constant condensation temperature (preferably 42–45°C); if necessary, partially obstruct the condenser coil surface or limit its ventilating power to obtain these conditions.
4) Charge the unit until the bubbles in the sight glass have disappeared and the working conditions of the entire refrigeration circuit have become normal.
5) Verify that the superheat is 7–8 °C (to do this refer to para. 8.1).

Fig. 3 – Refrigeration connections

Hiflex 4/6/8S–L/A 8D
Hiflex 5/7/9S–L/A 9D
under/over

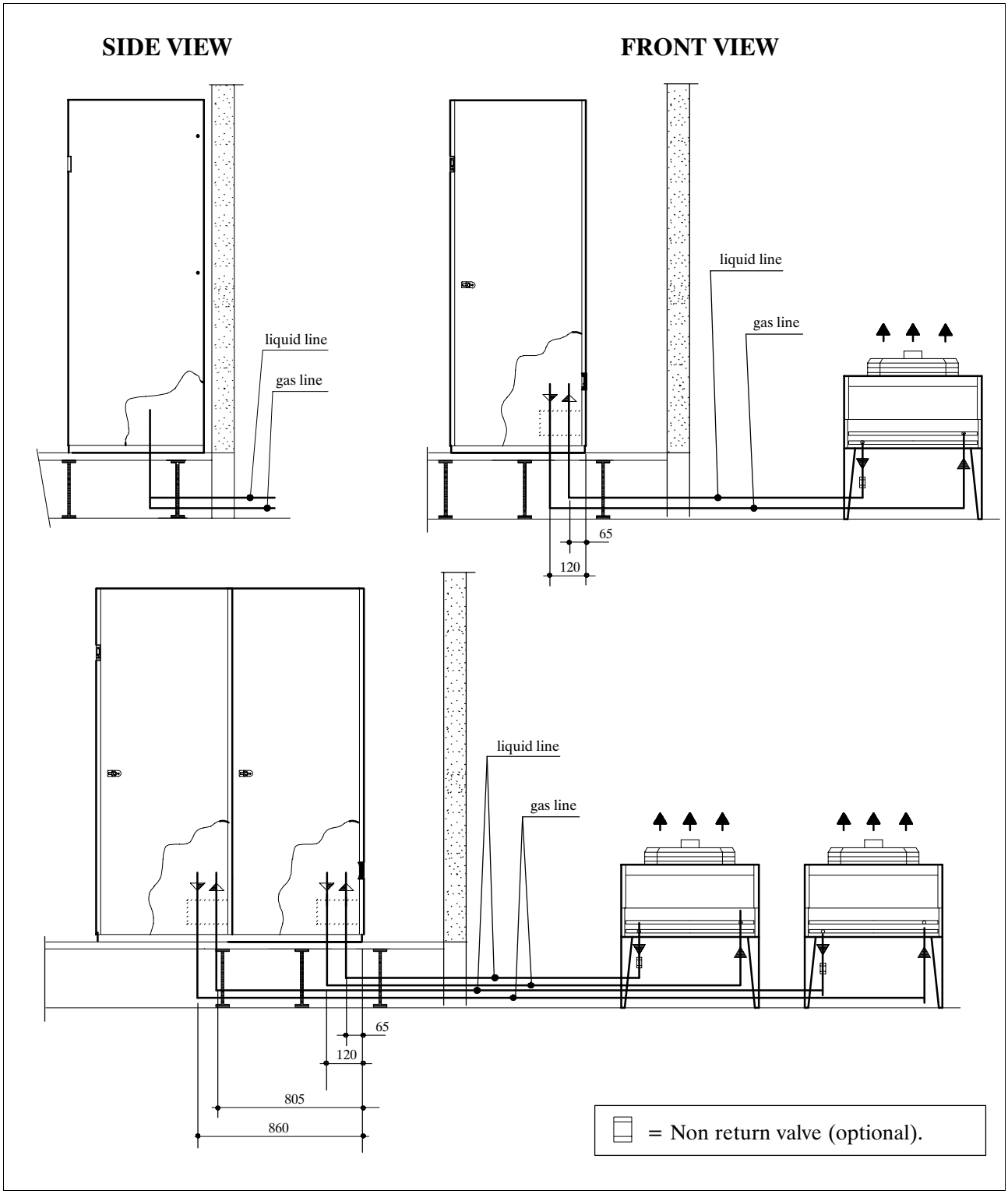
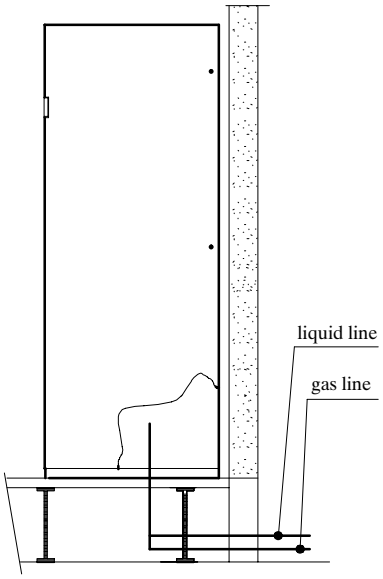


Fig. 4 – Refrigeration connections	Hiflex 4M/A under/over

SIDE VIEW



FRONT VIEW

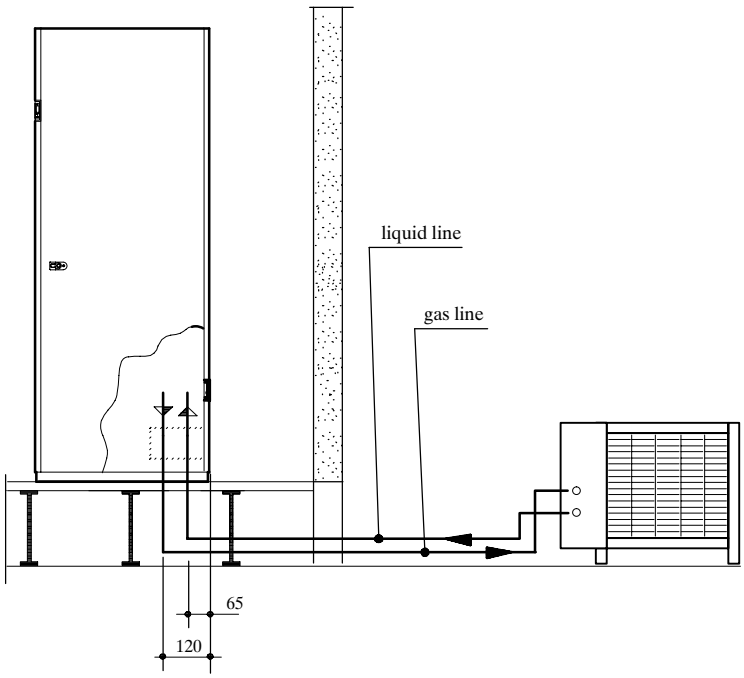
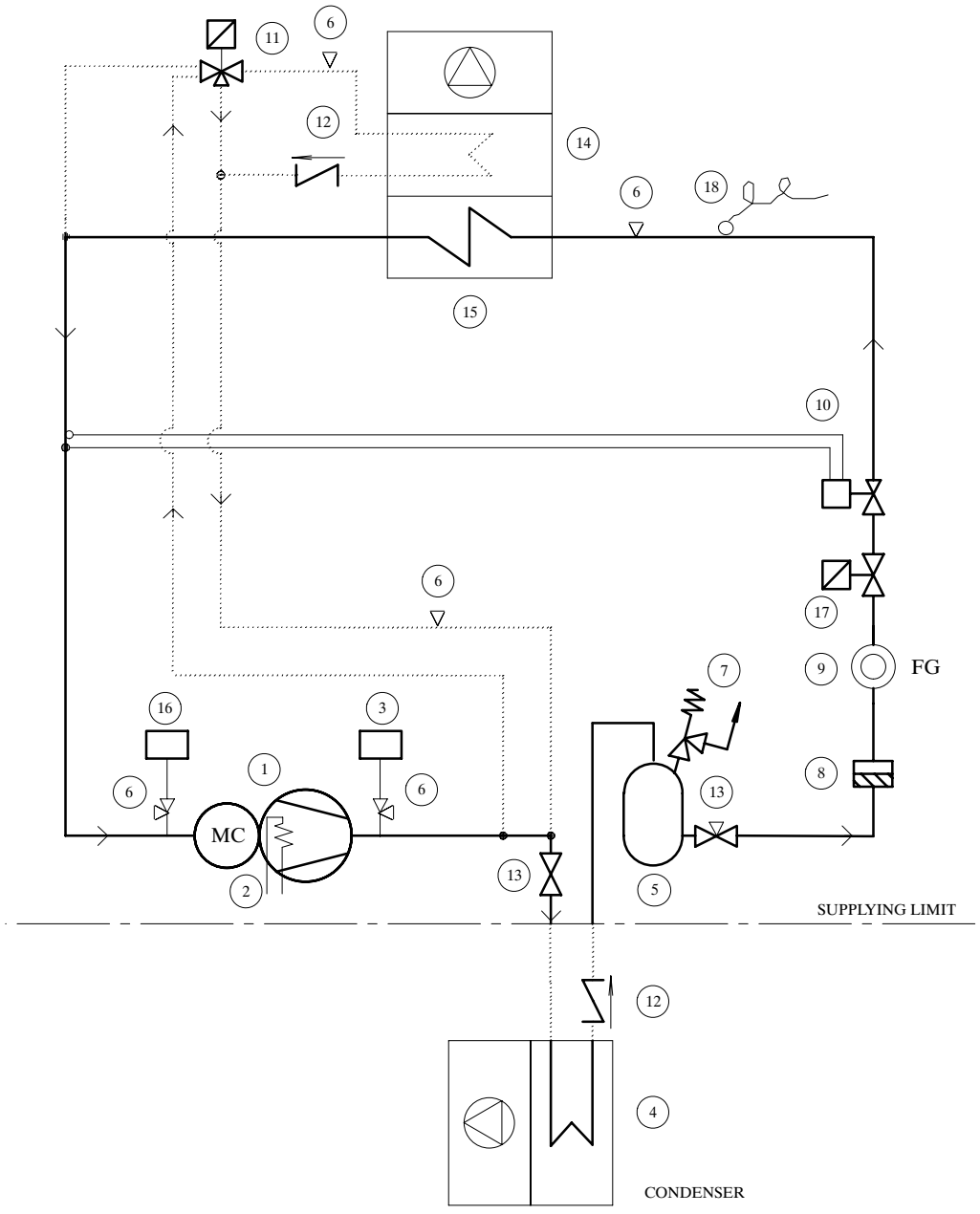


Fig. 5 – Refrigeration circuit (with thermostatic valve)	Hiflex 4/6/8S–L/A under/over

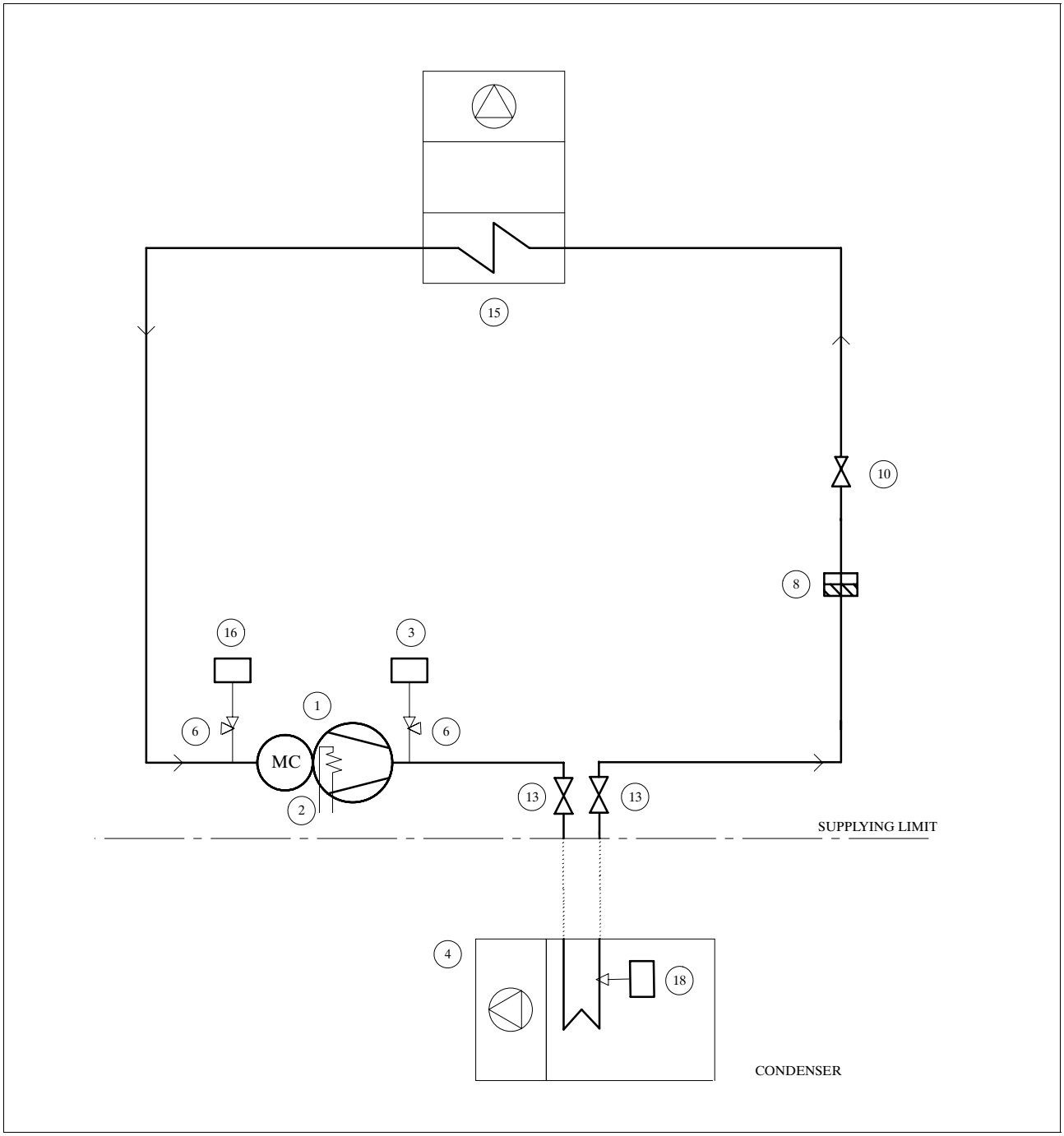
2 x models 5–7–9



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air–cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass

POS.	DESCRIPTION
10	Thermostatic valve
11	Hot gas solenoid valve (optional)
12	Non–return valve (by customer)
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	NTC sensor (optional)

Fig. 6 – Refrigeration circuit (with capillary tube)	Hiflex 4 M/A under/over



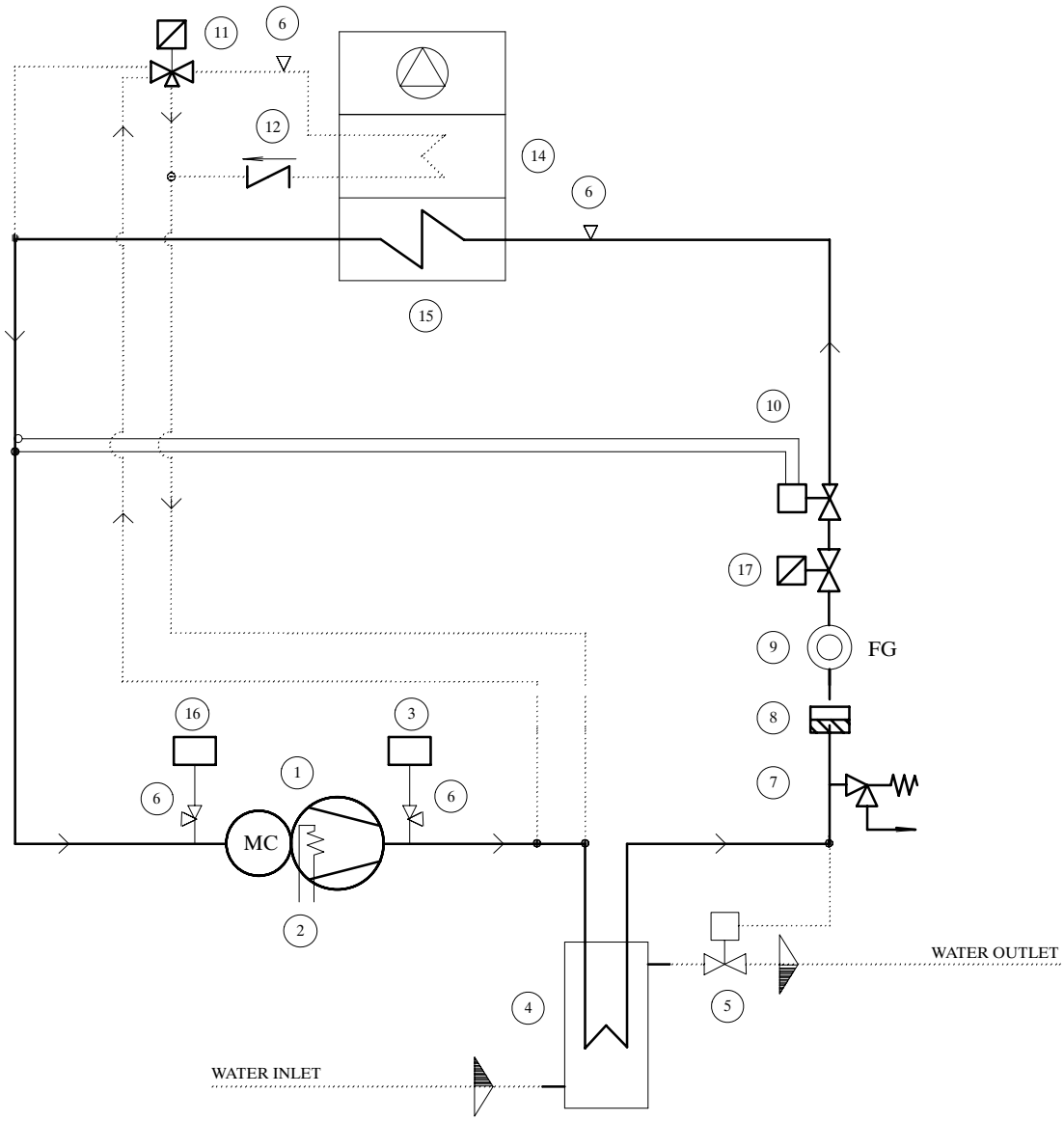
POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air–cooled condenser
6	Access valve
8	Filter dryer

POS.	DESCRIPTION
10	Expansion capillary
13	Shut–off valve
15	Evaporator
16	Low pressure switch (LP)
18	Fan pressaure switch

Fig. 7 – Refrigeration circuit

Hiflex W
under/over

2 x models 5–7–9



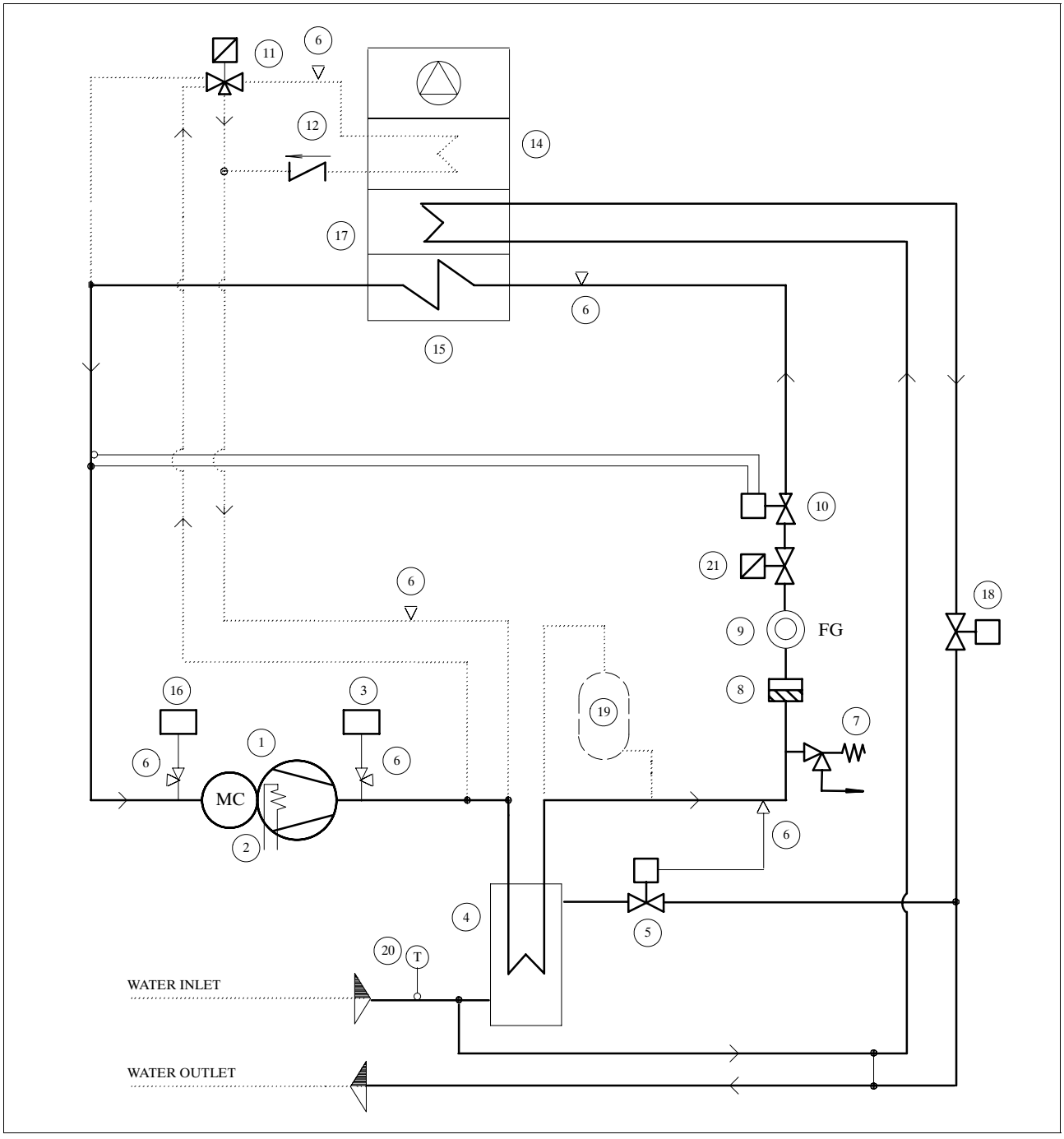
POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water condenser
5	Pressostatic valve
6	Access valve
7	Safety valve
8	Filter dryer

POS.	DESCRIPTION
9	Sight glass
10	Thermostatic valve
11	Hot gas solenoid valve (optional)
12	Non–return valve (by customer)
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve

Fig. 8 – Refrigeration circuit

Hiflex F
under/over

2 x model 9



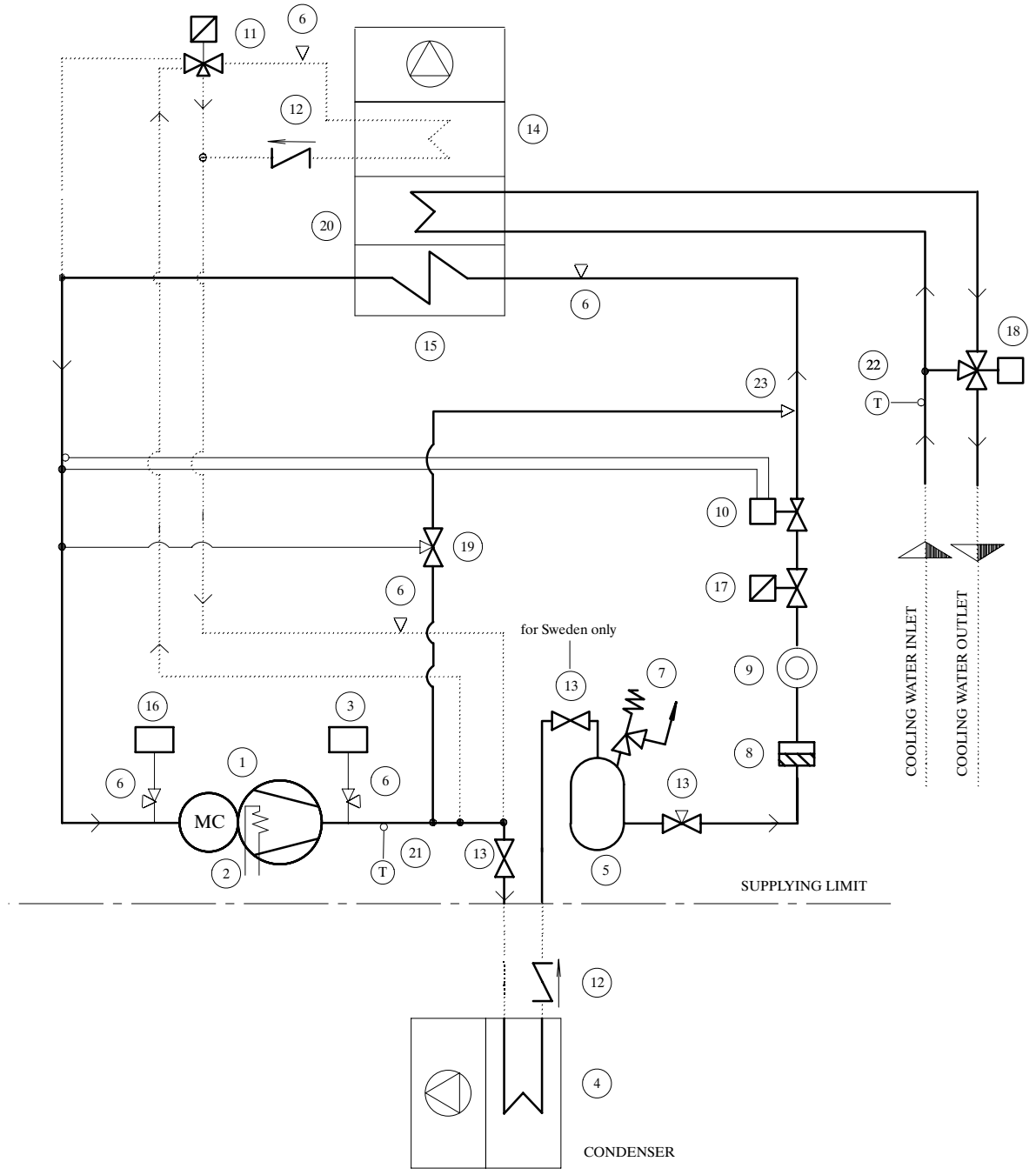
POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water condenser
5	Pressostatic valve
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic valve

POS.	DESCRIPTION
11	Hot gas solenoid valve (optional)
12	Non−return valve (optional)
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Chilled water coil
18	2−way chilled water valve
19	Liquid receiver (only with reheating coil − optional)
20	Inlet water sensor
21	Shut−off solenoid valve

Fig. 9 – Refrigeration circuit

Hiflex D
under/over

2 x model 9



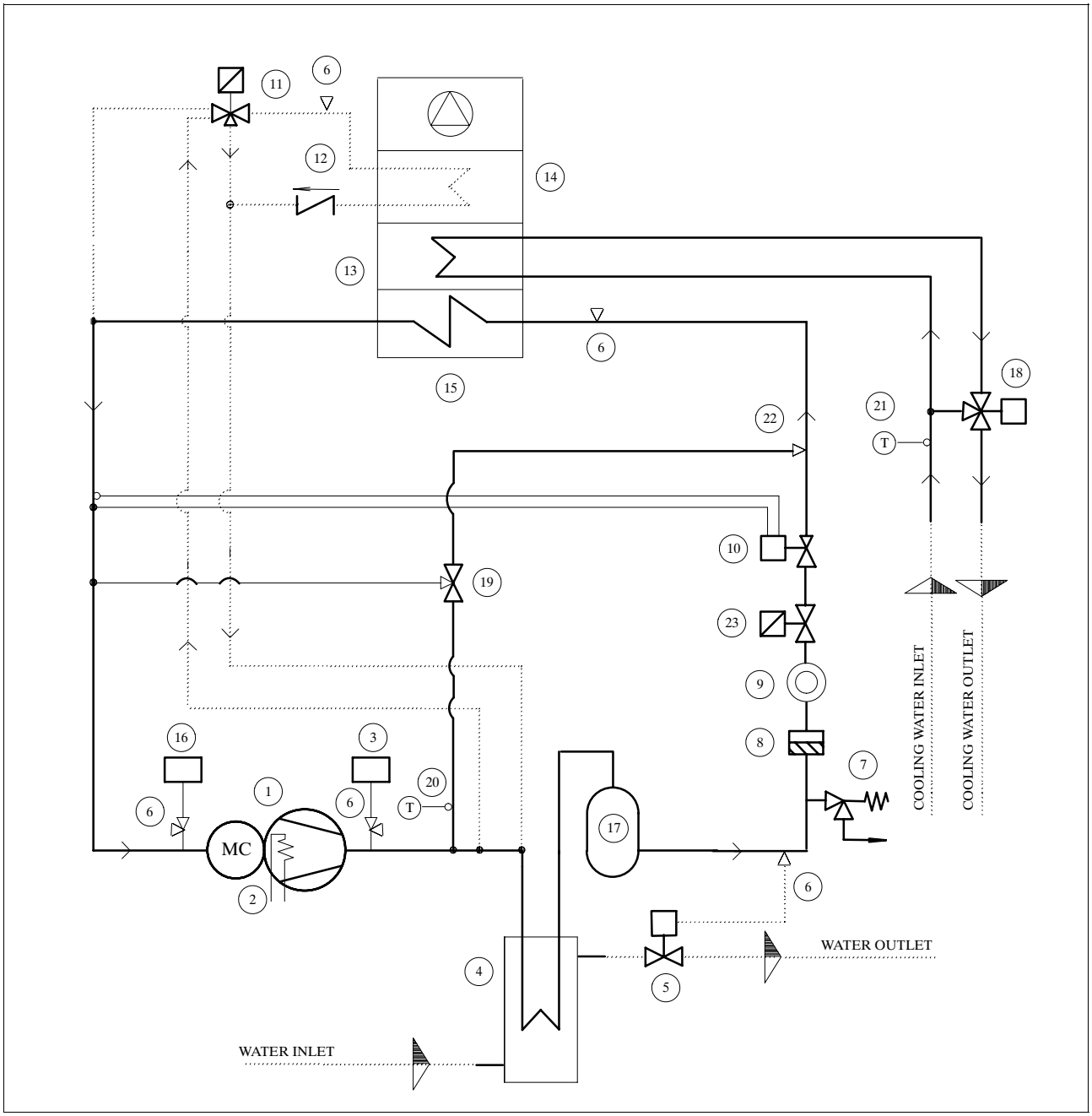
POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic valve
11	Hot gas solenoid valve (optional)
12	Non–return valve (optional)

POS.	DESCRIPTION
13	Shut–off valve (* with reheating coil only – optional)
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	3–way chilled water valve
19	Hot gas valve
20	Chilled water coil
21	Safety thermostat
22	Inlet water thermostat
23	Hot gas injector

Fig. 10 – Refrigeration circuit

Hiflex H
under/over

2 x model 9

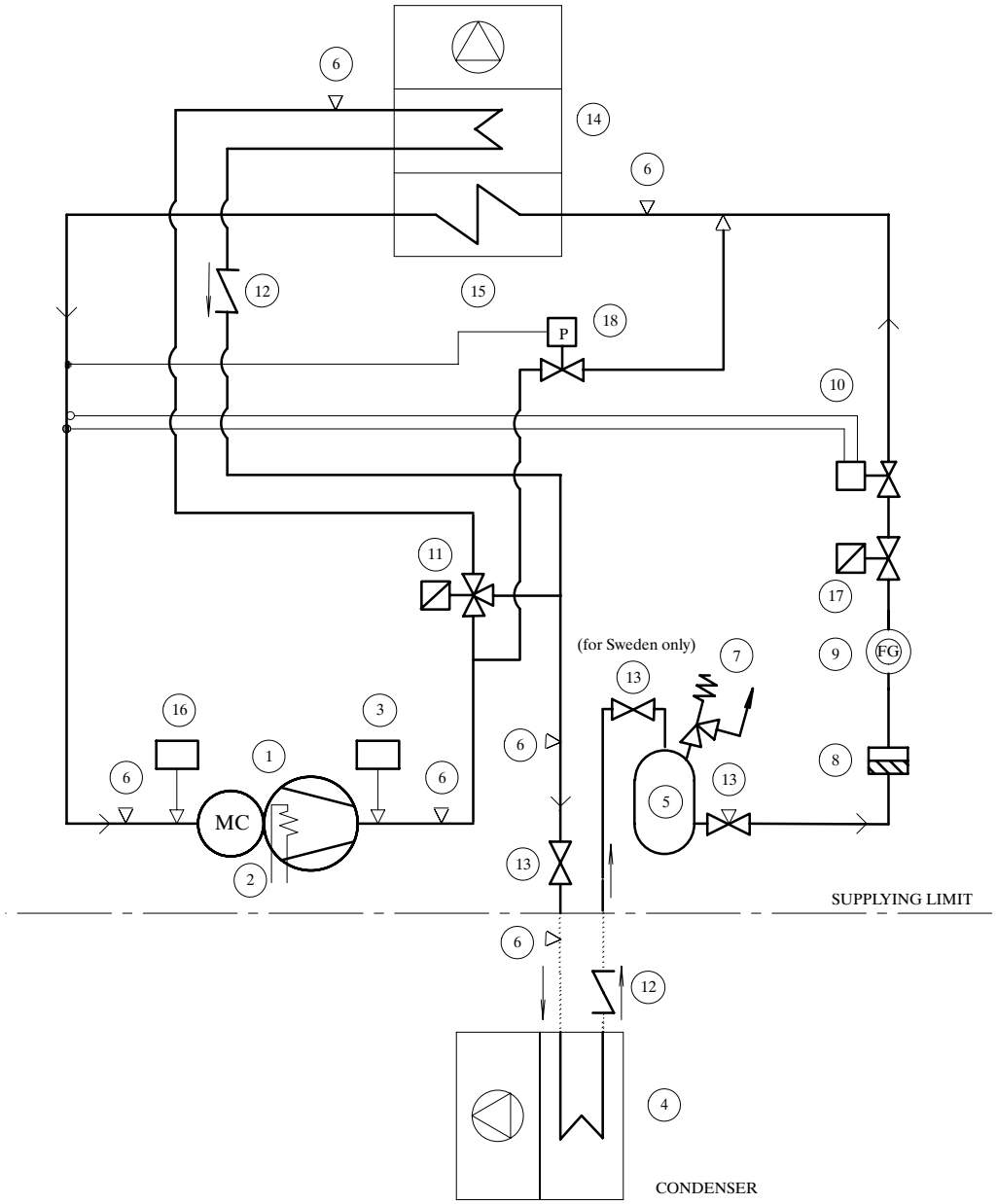


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water condenser
5	Pressostatic valve
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic valve
11	Hot gas solenoid valve (optional)

POS.	DESCRIPTION
12	Non return valve (optional)
13	Chilled water coil
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Liquid receiver
18	3–way chilled water valve
19	Hot gas valve
20	Safety thermostat
21	Inlet water thermostat
22	Hot gas injector
23	Shut–off solenoid valve

Fig. 11 – Refrigeration circuit

Hiflex Constant A over

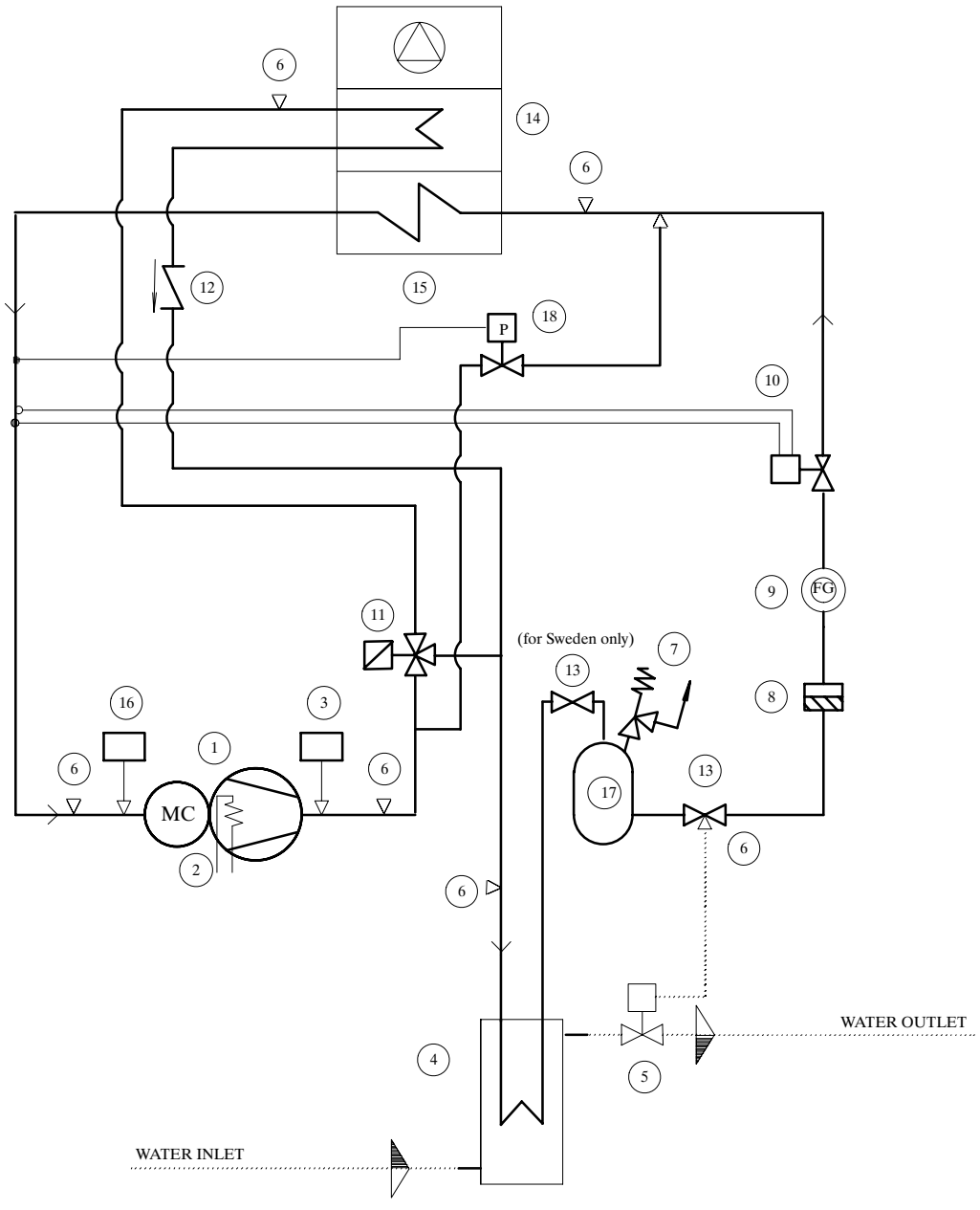


POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass

POS.	DESCRIPTION
10	Thermostatic valve
11	3–way modulating valve
12	Non return valve
13	Shut–off valve (optional)
14	Reheating coil
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Hot–gas injection by–pass valve

Fig. 12 – Refrigeration circuit

Hiflex Constant W over



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water condenser
5	Pressostatic valve (optional)
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass

POS.	DESCRIPTION
10	Thermostatic valve
11	3–way modulating valve
12	Non return valve
13	Shut–off valve (optional)
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Liquid receiver
18	Hot–gas injection by–pass valve

5 – Water connections

5.1 – General warnings

ENSURE THAT THE TUBING DOES NOT OBSTRUCT THE AIR FLOW*(Under only)*.

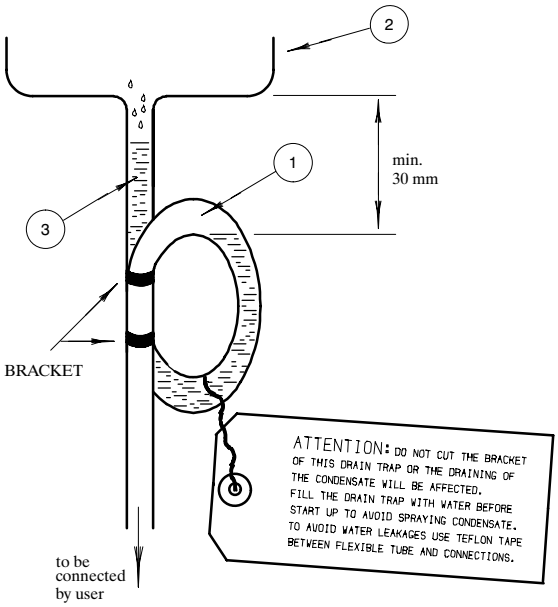
IF THE TUBING IS TO RUN OUTDOORS, ADD ETHYLENE GLYCOL TO THE CIRCUIT AS DESCRIBED IN PARA. 5.5.

5.2 – Auxiliary water connections

– Condensate drain (Fig. 13)**:**

- Use galvanized steel, PVC or flexible polythene tubing.
- Allow a 2% gradient towards the drain outlet.
- There must be a drain trap (1) placed at least 30 mm below the drain tray (2).
- Fill the drain trap with water (3).

Fig. 13 – Condensate drain



– Humidifier *(optional)*: See App. A.

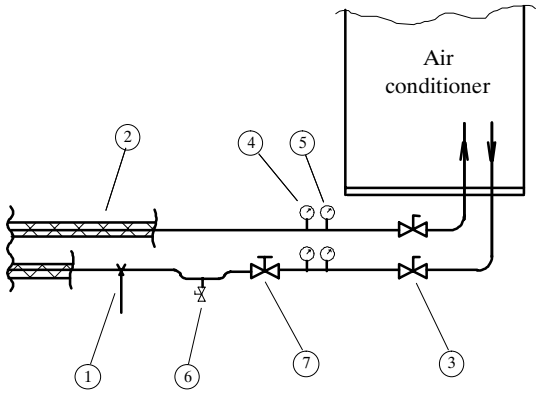
– Hot water *(optional)*:

- Use copper or steel (Mannesmann) tubing.
- Insulate both tubes using Armaflex insulation.

5.3 – Chilled water connections *(C, D and H only)* – (Fig. 14)

- Use copper or steel (Mannesmann) tubing.
- Place the tubing on supporting saddles (1).
- Insulate both tubes using Armaflex insulation (2).
- Place shut–off ball valves (3) at the conditioner inlet and outlet to allow easy maintenance.
- It is useful to install a thermometer (4) and a manometer (5) at the conditioner inlet and outlet.
- Install a water drain tap (6) at the lowest point in the circuit.
- Place a control valve (7) in the outlet water tubing.
- Fill the circuit with water/glycol (see below), up to a maximum pressure of 7 bar.

Fig. 14 – Chilled water circuit



5.4 – Coooling water connections *(W, F and H only)*

The unit must receive cooling water as follows:

a) from an external cooling water source, in open circuit (para. 5.4.1).

b) using a Dry cooler, in closed circuit (para. 5.4.2).

- Connect the piping as shown in Fig. 16 ÷ Fig. 18.
- It is advisable to use hoses to be connected, with 3–piece joints, to the condenser water inlet and outlet couplings.
- IMPORTANT: fit a standard strainer on the inlet water piping.
- Place shut–off ball valves at the conditioner inlet and outlet to allow easy maintenance.
- It is advisable to install a water drain system at the lowest point in the circuit.
- Fully drain the piping before connecting it to the air conditioner.

Caution

To prevent the refrigerating fluid from migrating towards the condenser when the compressor is at a standstill, and to avoid any intervention of the high pressure switch when the compressor starts up again, it is necessary to proceed as follows:

1) ***provide for a water temperature at the refrigerating condenser inlet higher than the temperature of the air–conditioned room.***
   Or, as an alternative,
2) ***interrupt water circulation and install the water pressure valve (WV) on board of the refrigerating condenser when the circulation pump is not interlocked with the compressor operation.***

5.4.1 – Extra notes for open circuit applications

- Use the unit with mains or well water.
  DO NOT USE WATER FROM AN EVAPORATIVE COOLING TOWER UNLESS THE FILLING WATER HARDNESS IS CONTROLLED.
- The water pressure must be 2 – 10 bar (if this is not so, contact the Technical Support Department).
- The required water flow at different temperatures is given in our catalogues or on request.
- If necessary (very low water temperature) insulate both pipes using Armaflex insulation.
- ***Calibrate the water pressostatic valve (WV) as described in CHAP. 9.***

5.4.2 – Extra notes for closed circuit applications

- The installation in Fig. 15 is indicative only; for individual installations follow the project diagram.
- ***Install a pump system*** calculated, for the flow rate required, on the basis of the flow and total head of the system (see project data), ***and controlled by the compressor running*** (see label on the unit).
- Insulate both pipes using Armaflex insulation.
- VERY IMPORTANT: Add water and ethylene glycol to the circuit, when the ambient temperature is below zero (referring also to para. 5.5). Do not exceed the nominal operating pressure of the circuit components.
- Bleed air out of the circuit.

5.5 – Adding ethylene glycol

Tab. 6 – Ethylene glycol to be added to water

freezing temperature (°C)	0	−5	−11	−18	−27	−39
ethylene glycol to add to water (% in weight of total mixture)	0	10	20	30	40	50

N.B. Values are for Shell antifreeze 402. For different brands check manufacturer's data.

NOTES:

- To avoid stratification run the circulation pump for at least 30 min. after adding any glycol.
- After adding water to the water circuit, **disconnect the unit from the sanitary water piping system;** in this way the water mixed with glycol won't return into the same piping system.
- After any topping−up of water check the glycol concentration and add any glycol if necessary.
- The hydraulic features of the system vary by adding glycol. Therefore check the head and the flow rate of the pump to be used.

Fig. 15 – Advised Dry cooler Installation

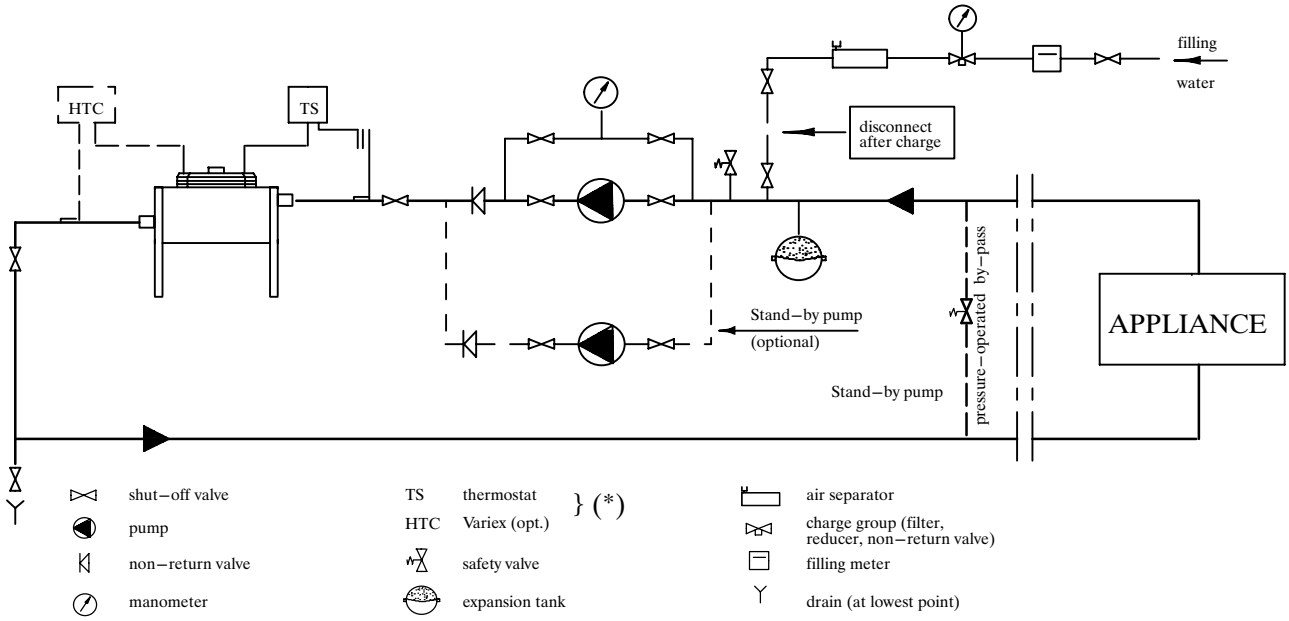
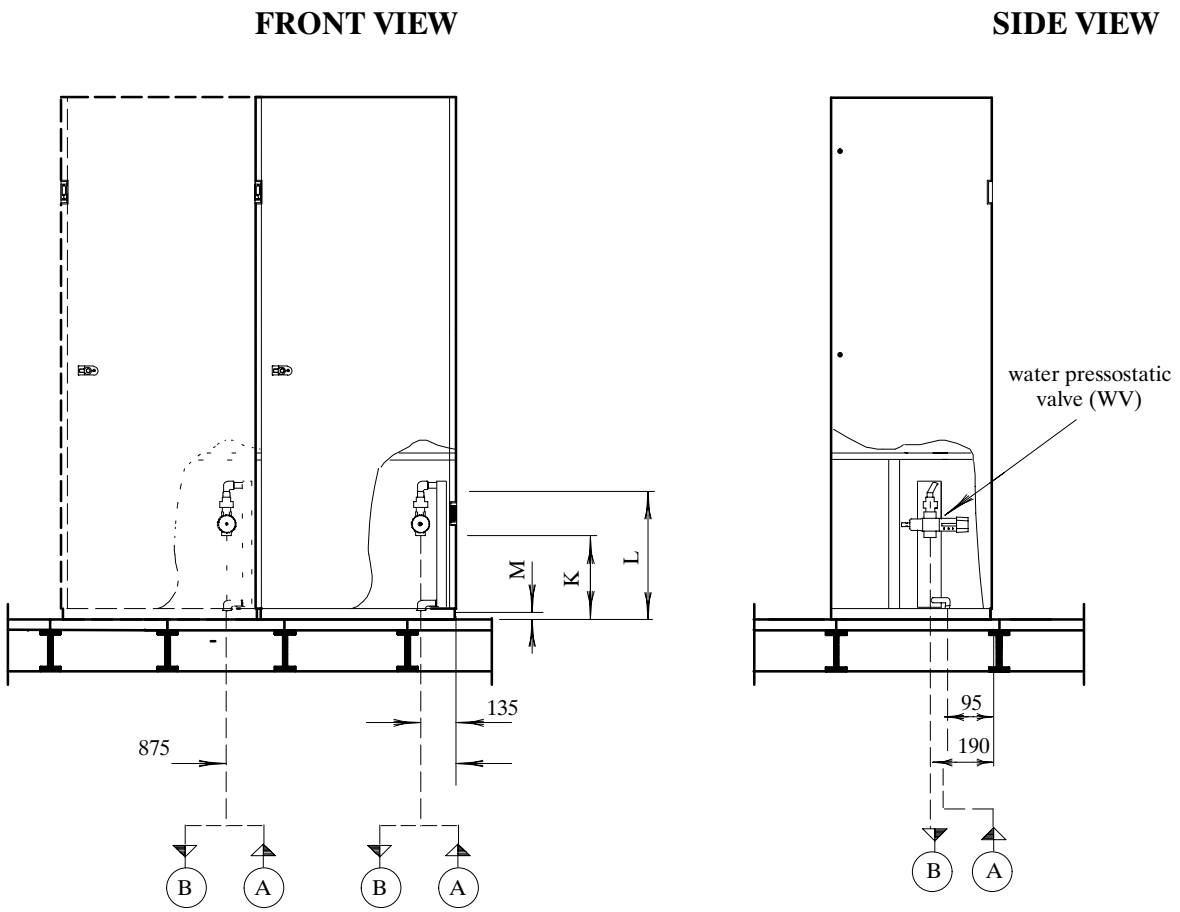


Fig. 16 – Cooling water connections

Hiflex W
under/over



POS.	DIMENSION	
	4–5 U/O	6–7–8–9U/O
K (unit with WV – optional)	280	240
L (unit without WV)	440	420
M	30	15

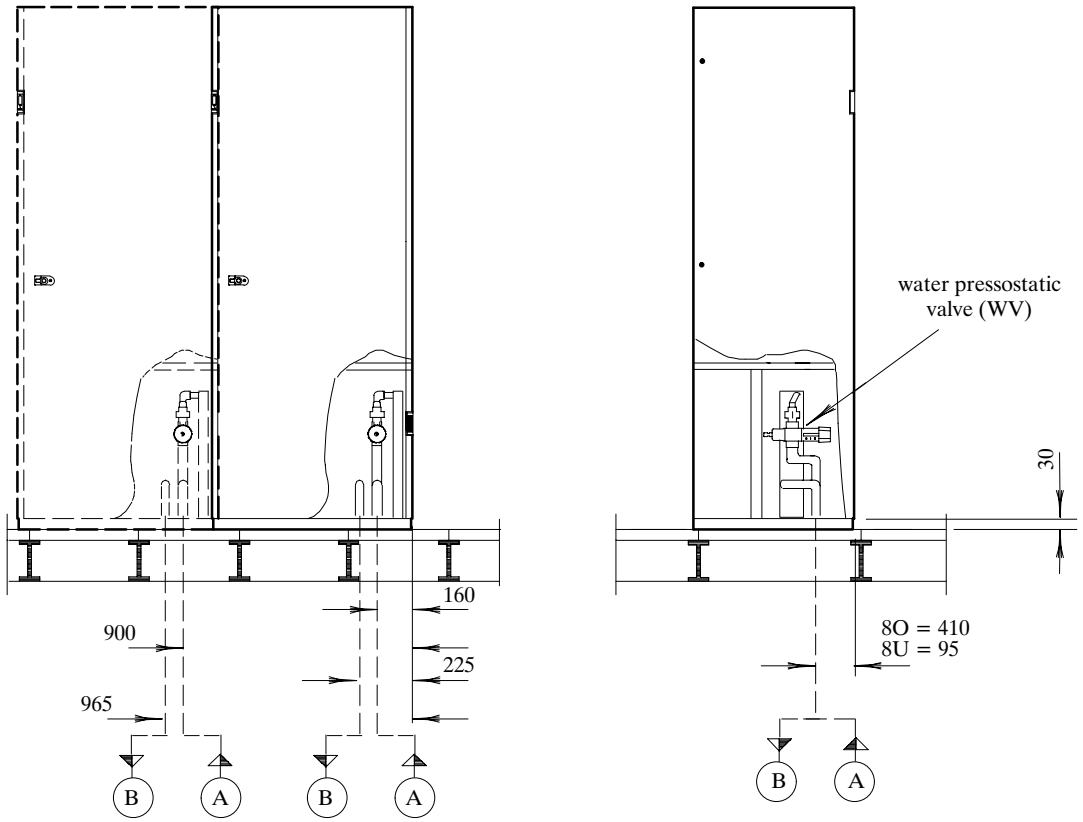
POS.	CONNECTION		DIMENSION	
			unit without valve (WV)	unit with valve (WV)
A	Cooling water inlet	4–5 U/O	½"G female	½"G female
		6–7–8–9 U/O	¾"G female	¾"G female
B	Cooling water outlet	4–5 U/O	½"G female	½"G female
		6–7–8–9 U/O	¾"G female	¾"G female

Fig. 17 – Water connections

Hiflex F
under/over

FRONT VIEW

SIDE VIEW

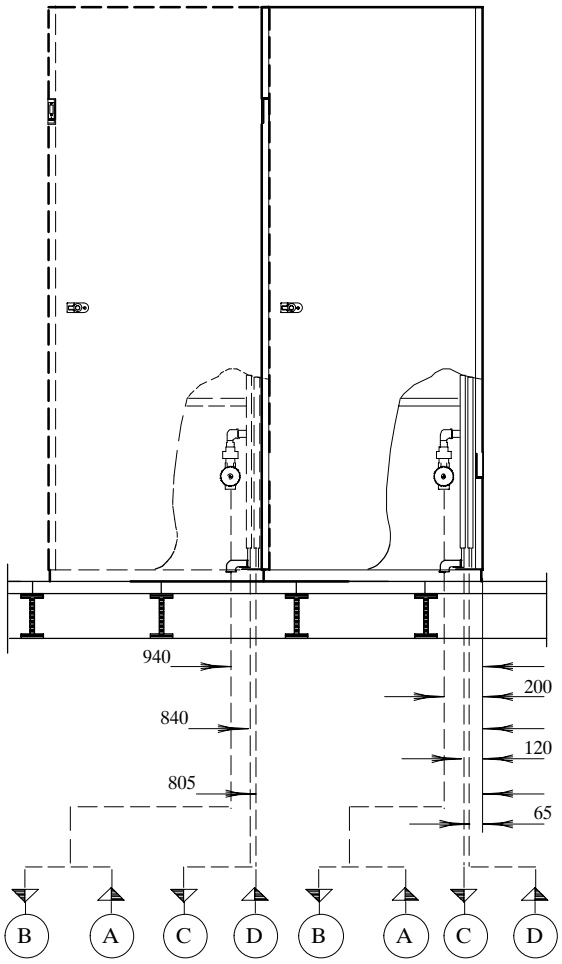


POS.	CONNECTION		DIMENSION
A	Water inlet	8 – 9 U/O	1”G male
B	Water outlet	8 – 9 U/O	1”G male

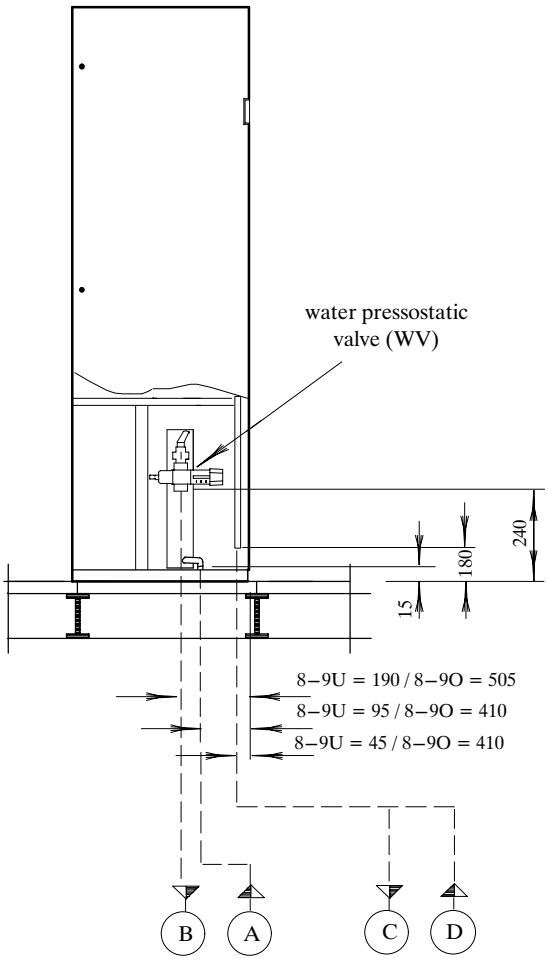
Fig. 18 – Water connections

Hiflex W/H
under/over

FRONT VIEW

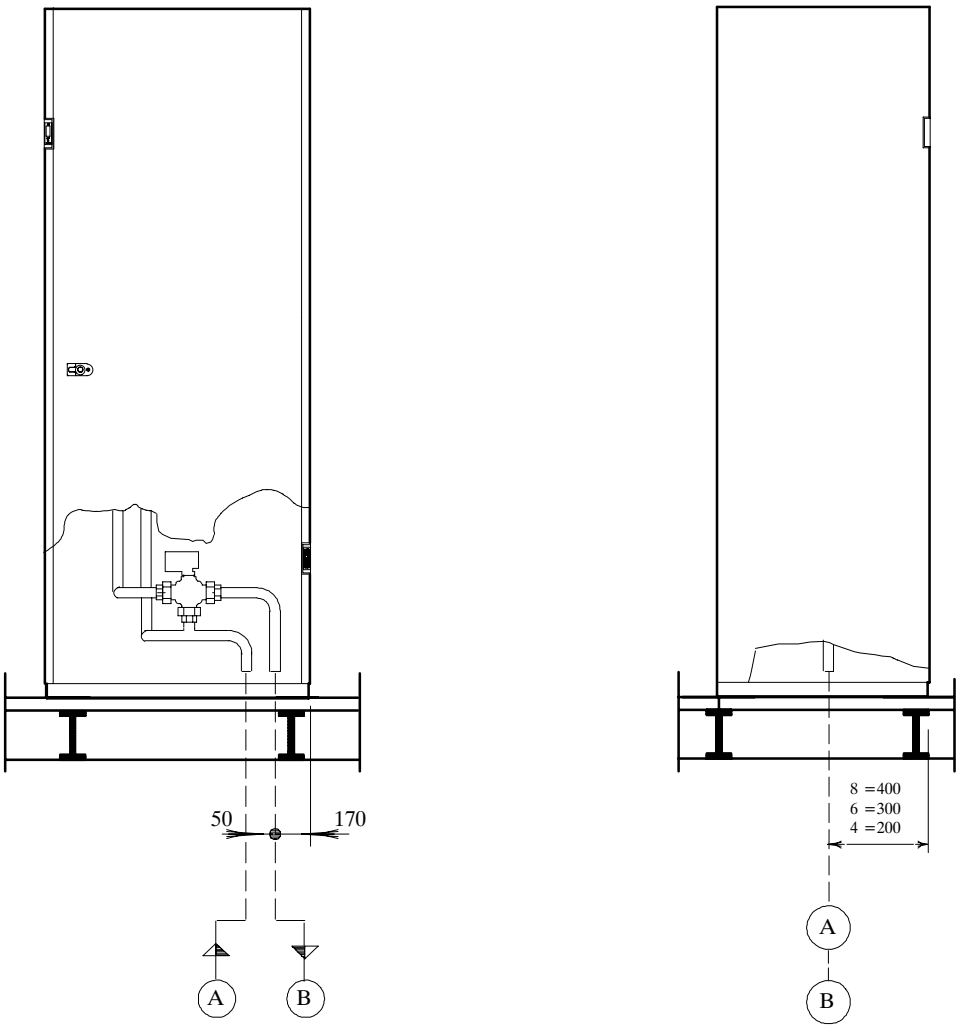


SIDE VIEW



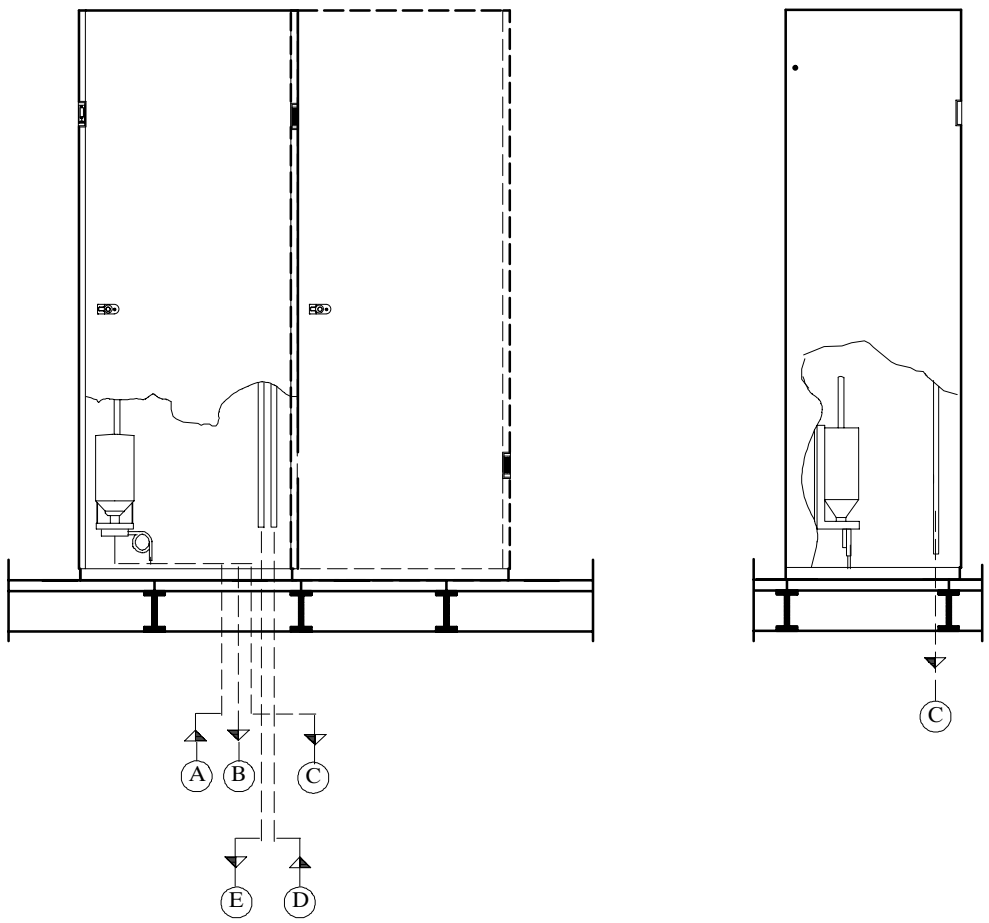
POS.	CONNECTION		DIMENSION
A	Cooling water inlet (condenser)	8–9 U/O	¾"G female
B	Cooling water outlet (condenser)	8–9 U/O	¾"G female
C	Chilled water outlet	8–9 U/O	Ø 22 x 1
D	Chilled water inlet	8–9 U/O	Ø 22 x 1

Fig. 19 – Chilled water connections	Hiflex C



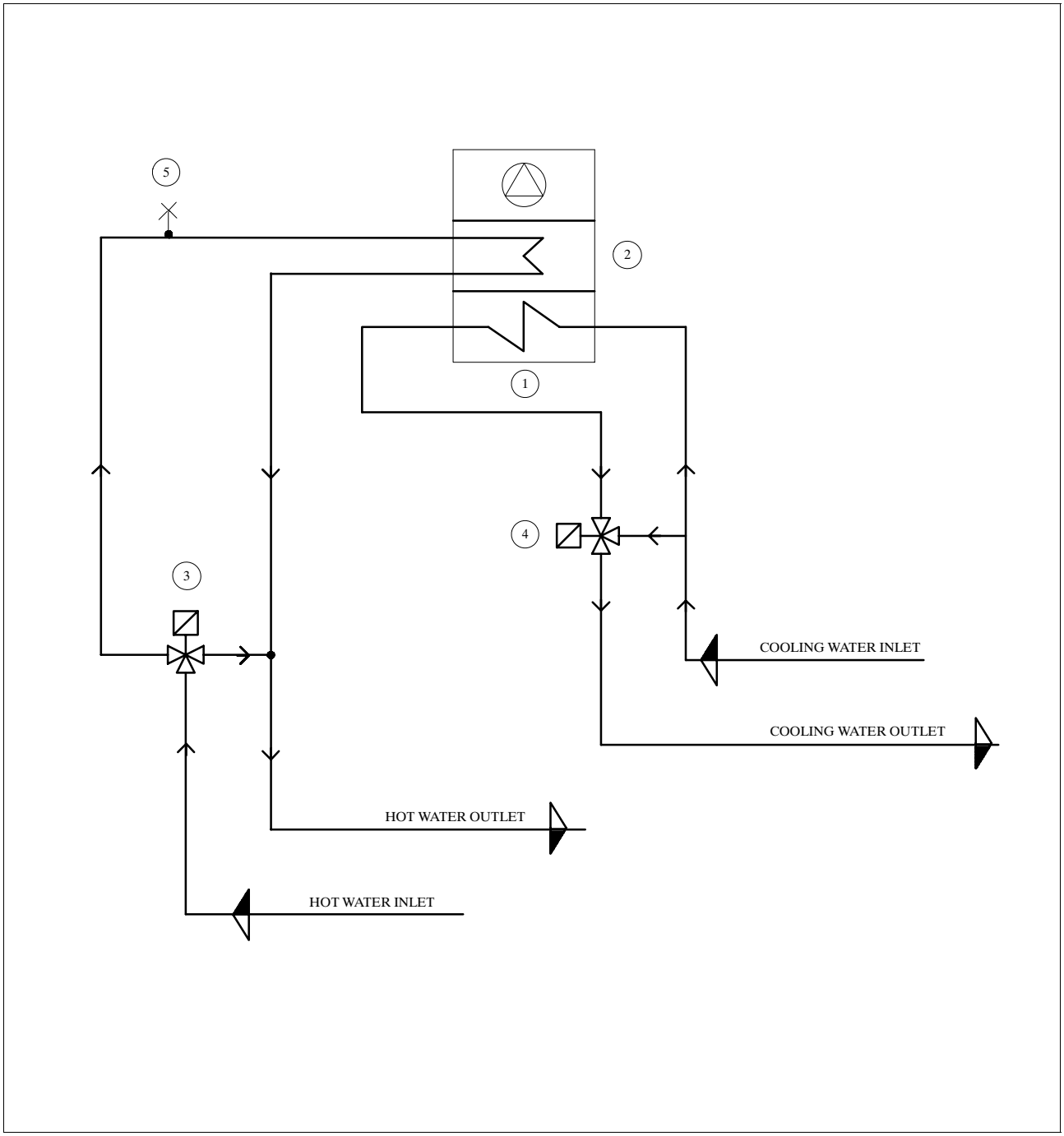
POS.	CONNECTION	DIMENSION		
		4 U/O	6 U/O	8 U/O
A	Chilled water inlet	o.d. 18 x 1 mm	o.d. 22 x 1 mm	o.d. 22 x 1 mm
B	Chilled water outlet	o.d. 18 x 1 mm	o.d. 22 x 1 mm	o.d. 22 x 1 mm

Fig. 20 – Auxiliary water connections



POS.	CONNECTION	DIMENSION
A	HUMIDAIR water supply (optional)	½" G male
B	HUMIDAIR water drain (optional)	ø 22 mm female
C	Condensate drain	ø 20 mm female
D	Hot water inlet (optional)	ø 16 x 1 mm
E	Hot water outlet (optional)	ø 16 x 1 mm

Fig. 21 – Water circuit	Hiflex C under/over



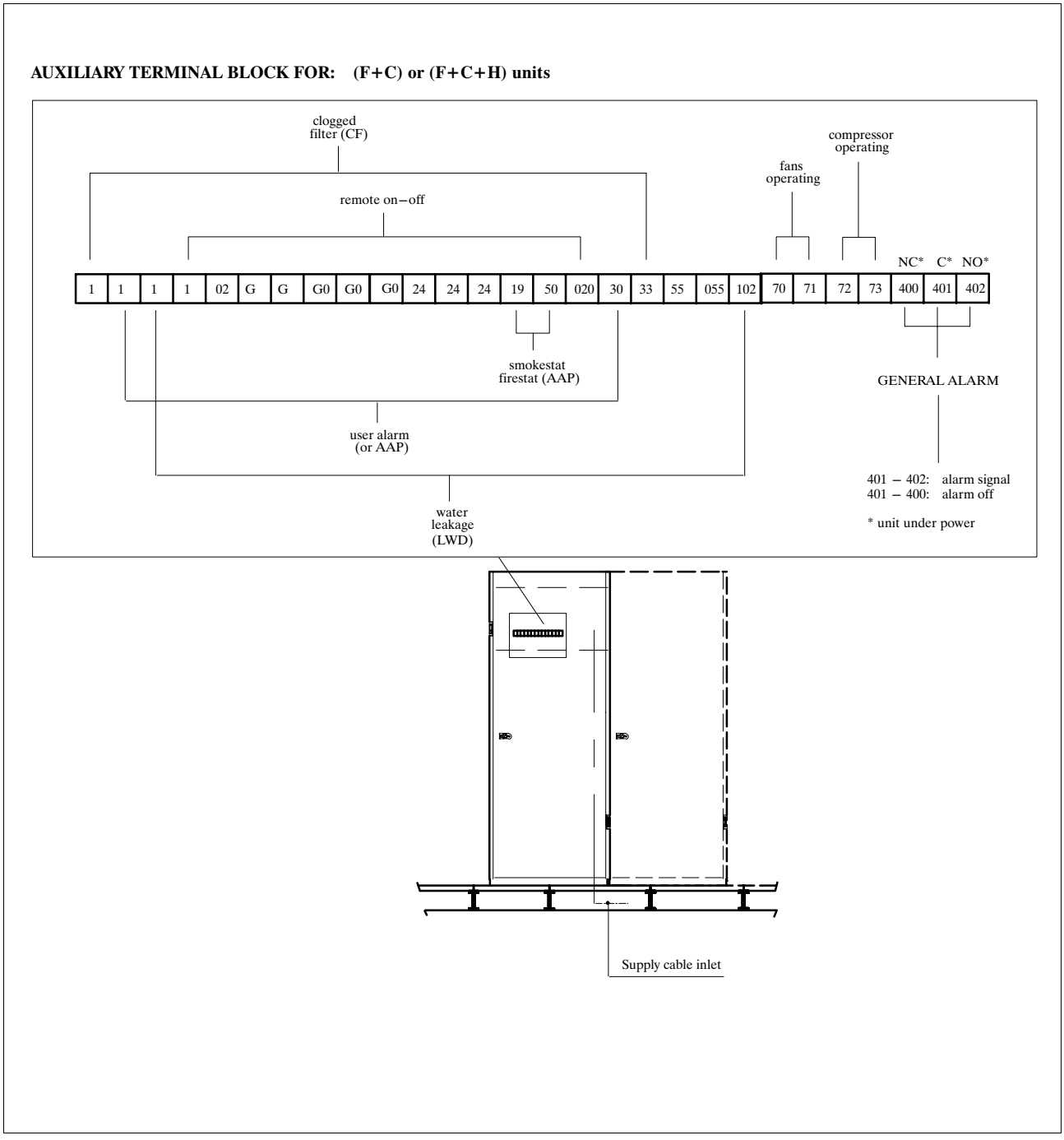
POS.	DESCRIPTION
1	Chilled water coil
2	Reheating coil (optional)
3	ON–OFF 3–way valve (optional)
4	Chilled water 3–way valve
5	Manual air valve

6 – Electrical connections

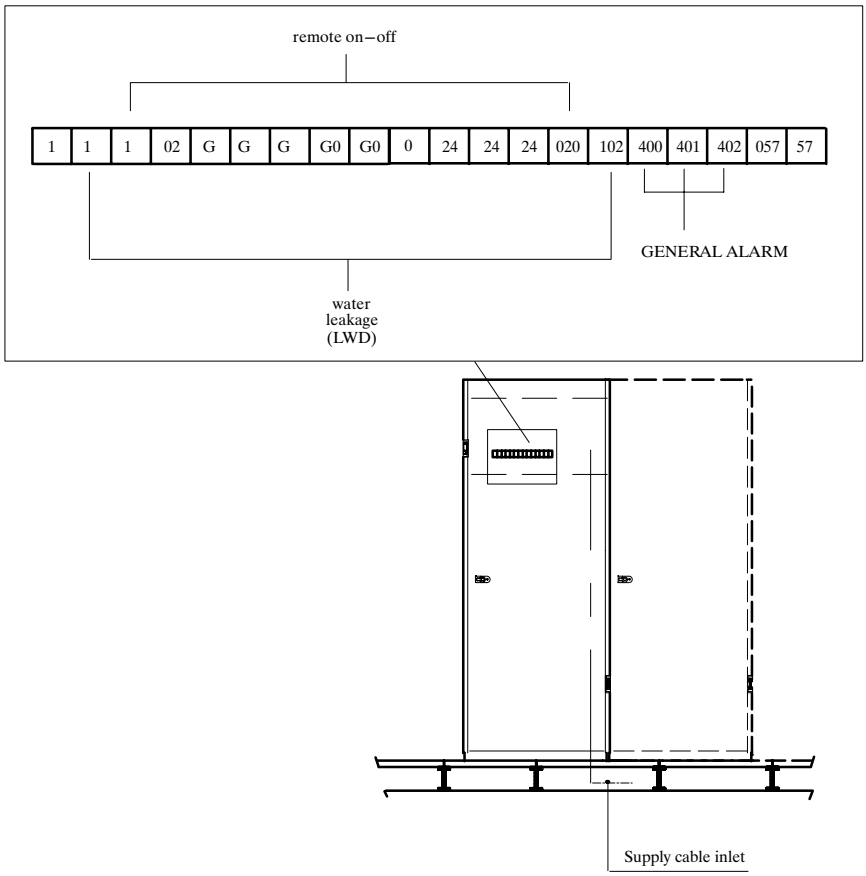
6.1 – Electrical connections

1) Before proceeding with the electrical connections, ensure that:
   - all electrical components are undamaged;
   - all terminal screws are tight;
   - the supply voltage and frequency are as indicated on the unit.
2) Power supply cable connections:
   - Connect the cable to the Line inlet terminal board.
   - Use the stated cable size.
   - Protect the supply using a back–up fuse.
3) Wiring connections:
   - Connections for remote on–off and hot water consent must be done by the installer.
   - The General Alarm terminals allow remote alarm signalling.

Fig. 22 – Electrical connections



AUXILIARY TERMINAL BLOCK FOR: (F) units only



Operation conditions		MODEL	RESIDUAL−CURRENT CIRCUIT BREAKERS IΔn = 0.3A	
			400V	230V
Cooling	(F)	4M−4S A/W	16 A	16 A
		5S A/W	32 A	32 A
		4L A/W	10 A	16 A
		5L A/W	20 A	32 A
		6S−L A/W	16 A	20 A
		7S−L A/W	20 A	50 A
		8S−L A/W	16 A	25 A
		9S−L A/W	40 A	63 A
		4−6L C	6 A	6 A
		8L C	10 A	10 A
Cooling + Humidity	(F+H)	4M−4S A/W	20 A	40 A
		5S A/W	40 A	20 A
		4L A/W	16 A	20 A
		5L A/W	25 A	40 A
		6S−L A/W	20 A	32 A
		7S−L A/W	32 A	63 A
		8S−L A/W	25 A	32 A
		9S−L A/W	40 A	125 A
		4−6−8L C	16 A	16 A
Cooling + Electr. heating + Humidity	(F+C+H)	4M−4S A/W	32 A	32 A
		5S A/W	50 A	50 A
		4L A/W	25 A	32 A
		5L A/W	40 A	50 A
		6S−L A/W	32 A	40 A
		7S−L A/W	40 A	125 A
		8S−L A/W	32 A	50 A
		9S−L A/W	63 A	125 A
		4L C	20 A	25 A
		6−8L C	20 A	32 A

NOTE: Above values are valid irrespective of type of fan.

Tab. 7 – Electrical data

50 Hz / 400V / R22

component	STANDARD POWER SUPPLY							
	FAN (1ph – 230V)				COMPRESSOR (3ph – 400V) / (1 ph – 230V)*			
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)
STANDARD R22								
4SUA/W (*)	1.40	2.10	3.10	0.30	6.50	10.90	45.00	1.40
4LUA/W	2.60	3.80	4.40	0.60	3.80	5.50	38.50	2.00
6SUA/W	2.60	4.50	8.00	0.40	4.50	6.30	43.50	2.50
6LUA/W	3.30	4.50	8.00	0.50	5.90	7.50	51.00	2.90
8SUA/W	4.50	6.80	11.00	0.90	5.90	7.50	51.00	2.90
8LUA/W	5.40	6.80	11.00	1.20	7.40	9.60	59.50	3.60
5SUA/W (*)	1,40 + 1,40	2,10 + 2,10	3,10 + 3,10	0.60	6,50 + 6,50	10,90 + 10,90	45,0 + 45,0	2.80
5LUA/W	2,60 + 2,60	3,80 + 3,80	4,40 + 4,40	1.20	3,80 + 3,80	5,50 + 5,50	38,50 + 38,50	4.00
7SUA/W	2,60 + 2,60	4,50 + 4,50	8,0 + 8,0	0.80	4,50 + 4,50	6,30 + 6,30	43,50 + 43,50	5.00
7LUA/W	3,30 + 3,30	4,50 + 4,50	8,0 + 8,0	1.00	5,90 + 5,90	7,50 + 7,50	51,0 + 51,0	5.80
9SUA/W	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	1.80	5,90 + 5,90	7,50 + 7,50	51,0 + 51,0	5.80
9LUA/W	5,40 + 5,40	6,80 + 6,80	11,0 + 11,0	2.40	7,40 + 7,40	9,60 + 9,60	59,50 + 59,50	7.20
4SOA/W (*)	1.20	2.10	3.10	0.30	6.50	10.90	45.00	1.40
4LOA/W	2.50	3.80	4.40	0.50	3.80	5.50	38.50	2.00
6SOA/W	2.20	4.50	8.00	0.30	4.50	6.30	43.50	2.50
6LOA/W	3.10	4.50	8.00	0.50	5.90	7.50	51.00	2.90
8SOA/W	3.90	6.80	11.00	0.80	5.90	7.50	51.00	2.90
8LOA/W	4.70	6.80	11.00	1.10	7.40	9.60	59.50	3.60
4SCA/W (*)	1.40	2.10	3.10	0.30	6.50	10.90	45.00	1.40
4LCA/W	2.40	3.80	4.40	0.60	3.80	5.50	38.50	2.10
6SCA/W	2.20	4.50	8.00	0.40	4.50	6.30	43.50	2.50
8SCA/W	4.20	6.80	11.00	0.80	5.90	7.50	51.00	2.90
5SOA/W (*)	1,20 + 1,20	2,10 + 2,10	3,10 + 3,10	0.60	6,50 + 6,50	10,90 + 10,90	45,0 + 45,0	2.80
5LOA/W	2,50 + 2,50	3,80 + 3,80	4,40 + 4,40	1.00	3,80 + 3,80	5,50 + 5,50	38,50 + 38,50	4.00
7SOA/W	2,20 + 2,20	4,50 + 4,50	8,0 + 8,0	0.60	4,50 + 4,50	6,30 + 6,30	43,50 + 43,50	5.00
7LOA/W	3,10 + 3,10	4,50 + 4,50	8,0 + 8,0	1.00	5,90 + 5,90	7,50 + 7,50	51,0 + 51,0	5.80
9SOA/W	3,90 + 3,90	6,80 + 6,80	11,0 + 11,0	1.60	5,90 + 5,90	7,50 + 7,50	51,0 + 51,0	5.80
9LOA/W	4,70 + 4,70	6,80 + 6,80	11,0 + 11,0	2.20	7,40 + 7,40	9,60 + 9,60	59,50 + 59,50	7.20
4LUC	2.60	3.80	4.40	0.60				
6LUC	3.30	4.50	8.00	0.50				
8LUC	5.40	6.80	11.00	1.20				
4LOC	2.50	3.80	4.40	0.50				
6LOC	3.10	4.50	8.00	0.50				
8LOC	4.70	6.80	11.00	1.10				
8LUD/H	5.00	6.80	11.00	1.10	7.30	9.60	59.50	3.60
8LOD/H	4.50	6.80	11.00	1.00	7.30	9.60	59.50	3.60
8LUF	5.00	6.80	11.00	1.10	8.10	9.60	59.50	4.40
8LOF	4.50	6.80	11.00	1.00	8.00	9.60	59.50	4.40
9LUD/H	5,0 + 5,0	6,80 + 6,80	11,0 + 11,0	2.20	7,30 + 7,30	9,60 + 9,60	59,50 + 59,50	7.20
9LOD/H	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	2.00	7,30 + 7,30	9,60 + 9,60	59,50 + 59,50	7.20
9LUF	5,0 + 5,0	6,80 + 6,80	11,0 + 11,0	2.20	8,10 + 8,10	9,60 + 9,60	59,50 + 59,50	8.80
9LOF	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	2.00	8,0 + 8,0	9,60 + 9,60	59,50 + 59,50	8.80

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to – room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to – room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.

50 Hz / 230V / R22

component	STANDARD POWER SUPPLY							
	FAN (1ph – 230V)				COMPRESSOR (3ph – 400V) / (1 ph – 230V)*			
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)
STANDARD R22								
4SUA/W (*)	1.40	2.10	3.10	0.30	6.50	10.90	45.00	1.40
4LUA/W	2.60	3.80	4.40	0.60	6.60	10.90	80.90	2.00
6SUA/W	2.60	6.50	5.50	0.40	7.80	12.40	91.40	2.50
6LUA/W	3.30	6.50	5.50	0.50	10.20	14.80	108.00	2.90
8SUA/W	4.50	6.80	11.00	0.90	10.20	14.80	108.00	2.90
8LUA/W	5.40	6.80	11.00	1.20	12.80	19.10	136.00	3.60
5SUA/W (*)	1,40 + 1,40	2,10 + 2,10	3,10 + 3,10	0.60	6,50 + 6,50	10,90 + 10,90	45,0 + 45,0	2.80
5LUA/W	2,60 + 2,60	3,80 + 3,80	4,40 + 4,40	1.20	6,60 + 6,60	10,90 + 10,90	80,90 + 80,90	4.00
7SUA/W	2,60 + 2,60	6,50 + 6,50	5,50 + 5,50	0.80	7,80 + 7,80	12,40 + 12,40	91,40 + 91,40	5.00
7LUA/W	3,30 + 3,30	6,50 + 6,50	5,50 + 5,50	1.00	10,20 + 10,20	14,80 + 14,80	108,0 + 108,0	5.80
9SUA/W	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	1.80	10,20 + 10,20	14,80 + 14,80	108,0 + 108,0	5.80
9LUA/W	5,40 + 5,40	6,80 + 6,80	11,0 + 11,0	2.40	12,80 + 12,80	19,10 + 19,10	136,0 + 136,0	7.20
4SOA/W (*)	1.20	2.10	3.10	0.30	6.50	10.90	45.00	1.40
4LOA/W	2.50	3.80	4.40	0.50	6.60	10.90	80.90	2.00
6SOA/W	2.20	4.50	8.00	0.30	7.80	12.40	91.40	2.50
6LOA/W	3.10	4.50	8.00	0.50	10.20	14.80	108.00	2.90
8SOA/W	3.90	6.80	11.00	0.80	10.20	14.80	108.00	2.90
8LOA/W	4.70	6.80	11.00	1.10	12.80	19.10	136.00	3.60
4SCA/W (*)	1.40	2.10	3.10	0.30	6.50	10.90	45.00	1.40
4LCA/W	2.40	3.80	4.40	0.60	6.60	10.90	80.90	2.10
6SCA/W	2.20	4.50	8.00	0.40	7.80	12.40	91.40	2.50
8SCA/W	4.20	6.50	11.00	0.80	10.20	14.80	108.00	2.90
5SOA/W (*)	1,20 + 1,20	2,10 + 2,10	3,10 + 3,10	0.60	6,50 + 6,50	10,90 + 10,90	45,0 + 45,0	2.80
5LOA/W	2,50 + 2,50	3,80 + 3,80	4,40 + 4,40	1.00	6,60 + 6,60	10,90 + 10,90	80,90 + 80,90	4.00
7SOA/W	2,20 + 2,20	4,50 + 4,50	8,0 + 8,0	0.60	7,80 + 7,80	12,40 + 12,40	91,40 + 91,40	5.00
7LOA/W	3,10 + 3,10	4,50 + 4,50	8,0 + 8,0	1.00	10,20 + 10,20	14,80 + 14,80	108,0 + 108,0	5.80
9SOA/W	3,90 + 3,90	6,80 + 6,80	11,0 + 11,0	1.60	10,20 + 10,20	14,80 + 14,80	108,0 + 108,0	5.80
9LOA/W	4,70 + 4,70	6,80 + 6,80	11,0 + 11,0	2.20	12,80 + 12,80	19,10 + 19,10	136,0 + 136,0	7.20
4LUC	2.60	3.80	4.40	0.60				
6LUC	3.30	4.50	8.00	0.50				
8LUC	5.40	6.50	11.00	1.20				
4LOC	2.50	3.80	4.40	0.50				
6LOC	3.10	4.50	8.00	0.50				
8LOC	4.70	6.50	11.00	1.10				
8LUD/H	5.00	6.50	11.00	1.10	12.60	19.10	136.00	3.60
8LOD/H	4.50	6.50	11.00	1.00	12.60	19.10	136.00	3.60
8LUF	5.00	6.50	11.00	1.10	14.00	19.10	136.00	4.40
8LOF	4.50	6.50	11.00	1.00	13.90	19.10	136.00	4.40
9LUD/H	5,0 + 5,0	6,50 + 6,50	11,0 + 11,0	2.20	12,60 + 12,60	19,10 + 19,10	136,0 + 136,0	7.20
9LOD/H	4,50 + 4,50	6,50 + 6,50	11,0 + 11,0	2.20	12,60 + 12,60	19,10 + 19,10	136,0 + 136,0	7.20
9LUF	5,0 + 5,0	6,50 + 6,50	11,0 + 11,0	2.20	14,0 + 14,0	19,10 + 19,10	136,0 + 136,0	8.80
9LOF	4,50 + 4,50	6,50 + 6,50	11,0 + 11,0	2.00	13,90 + 13,90	19,10 + 19,10	136,0 + 136,0	8.80

50 Hz / 230V / R22

component	STANDARD POWER SUPPLY							
	FAN (1ph – 230V)				COMPRESSOR (1ph – 230V)			
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)
STANDARD R22								
4MUA	1.20	1.60	2.90	0.30	6.00	8.70	36.50	1.40
4MOA	0.90	1.60	2.90	0.20	6.00	8.70	36.50	1.40

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to – room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to – room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.

50 Hz / 400V / R407C

component	STANDARD POWER SUPPLY							
	FAN (1ph – 230V)				COMPRESSOR (3ph – 400V) / (1 ph – 230V)*			
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)
OPTIONAL R407C								
4PUA/W (*)	1.40	2.10	3.10	0.30	6.80	10.90	45.00	1.50
4GUA/W	2.60	3.80	4.40	0.60	4.20	5.50	38.50	2.20
6PUA/W	2.60	4.50	8.00	0.40	4.80	6.30	43.50	2.50
6GUA/W	3.30	4.50	8.00	0.50	6.00	7.50	51.00	3.10
8PUA/W	4.50	7.00	7.10	0.90	6.00	7.50	51.00	3.10
8GUA/W	5.40	7.00	7.10	1.20	7.60	9.60	59.50	3.80
5PUA/W (*)	1,40 + 1,40	2,10 + 2,10	3,10 + 3,10	0.60	6,80 + 6,80	10,90 + 10,90	45,0 + 45,0	3.00
5GUA/W	2,60 + 2,60	3,80 + 3,80	4,40 + 4,40	1.20	4,20 + 4,20	5,50 + 5,50	38,50 + 38,50	4.40
7PUA/W	2,60 + 2,60	4,50 + 4,50	8,0 + 8,0	0.80	4,80 + 4,80	6,30 + 6,30	43,50 + 43,50	5.00
7GUA/W	3,30 + 3,30	4,50 + 4,50	8,0 + 8,0	1.00	6,0 + 6,0	7,50 + 7,50	51,0 + 51,0	6.20
9PUA/W	4,50 + 4,50	7,0 + 7,0	7,10 + 7,10	1.80	6,0 + 6,0	7,50 + 7,50	51,0 + 51,0	6.20
9GUA/W	5,40 + 5,40	7,0 + 7,0	7,10 + 7,10	2.40	7,60 + 7,60	9,60 + 9,60	59,50 + 59,50	7.60
4POA/W (*)	1.20	2.10	3.10	0.30	6.80	10.90	45.00	1.50
4GOA/W	2.50	3.80	4.40	0.50	4.20	5.50	38.50	2.20
6POA/W	2.20	4.50	8.00	0.30	4.80	6.30	43.50	2.50
6GOA/W	3.10	4.50	8.00	0.50	6.00	7.50	51.00	3.10
8POA/W	3.90	6.80	11.00	0.80	6.00	7.50	51.00	3.10
8GOA/W	4.70	6.80	11.00	1.10	7.60	9.60	59.50	3.80
4PCA/W (*)	1.40	2.10	3.10	0.30	6.80	10.90	45.00	1.50
4GCA/W	2.40	3.80	4.40	0.60	4.20	5.50	38.50	2.20
6PCA/W	2.20	4.50	8.00	0.40	4.80	6.30	43.50	2.50
8PCA/W	4.20	6.80	11.00	0.80	6.00	7.50	51.00	3.10
5POA/W (*)	1,20 + 1,20	2,10 + 2,10	3,10 + 3,10	0.60	6,80 + 6,80	10,90 + 10,90	45,0 + 45,0	3.00
5GOA/W	2,50 + 2,50	3,80 + 3,80	4,40 + 4,40	1.00	4,20 + 4,20	5,50 + 5,50	38,50 + 38,50	4.40
7POA/W	2,20 + 2,20	4,50 + 4,50	8,0 + 8,0	0.60	4,80 + 4,80	6,30 + 6,30	43,50 + 43,50	5.00
7GOA/W	3,10 + 3,10	4,50 + 4,50	8,0 + 8,0	1.00	6,0 + 6,0	7,50 + 7,50	51,0 + 51,0	6.20
9POA/W	3,90 + 3,90	6,80 + 6,80	11,0 + 11,0	1.60	6,0 + 6,0	7,50 + 7,50	51,0 + 51,0	6.20
9GOA/W	4,70 + 4,70	6,80 + 6,80	11,0 + 11,0	2.20	7,60 + 7,60	9,60 + 9,60	59,50 + 59,50	7.60
8GUD/H	5.00	6.80	11.00	1.10	7.60	9.60	59.50	3.80
8GOD/H	4.50	6.80	11.00	1.00	7.60	9.60	59.50	3.80
8GUF	5.00	6.80	11.00	1.10	8.60	9.60	59.50	4.70
8GOF	4.50	6.80	11.00	1.00	8.50	9.60	59.50	4.60
9GUD/H	5,0 + 5,0	6,80 + 6,80	11,0 + 11,0	2.20	7,60 + 7,60	9,60 + 9,60	59,50 + 59,50	7.60
9GOD/H	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	2.00	7,60 + 7,60	9,60 + 9,60	59,50 + 59,50	7.60
9GUF	5,0 + 5,0	6,80 + 6,80	11,0 + 11,0	2.20	8,60 + 8,60	9,60 + 9,60	59,50 + 59,50	9.40
9GOF	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	2.00	8,50 + 8,50	9,60 + 9,60	59,50 + 59,50	9.20

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to – room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to – room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.

50 Hz / 230V / R407C

component	STANDARD POWER SUPPLY							
	FAN (1ph – 230V)				COMPRESSOR (3ph – 230V)			
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)
OPTIONAL R407C								
4PUA/W	1.40	2.10	3.10	0.30	6.80	10.90	45.00	1.50
4GUA/W	2.60	3.80	4.40	0.60	7.30	10.90	80.90	2.20
6PUA/W	2.60	6.50	5.50	0.40	8.30	12.40	91.40	2.50
6GUA/W	3.30	6.50	5.50	0.50	10.40	14.80	108.00	3.10
8PUA/W	4.50	7.00	7.10	0.90	10.40	14.80	108.00	3.10
8GUA/W	5.40	7.00	7.10	1.20	13.10	19.10	136.00	3.80
5PUA/W	1,40 + 1,40	2,10 + 2,10	3,10 + 3,10	0,30 + 0,30	6,80 + 6,80	10,90 + 10,90	45,0 + 45,0	1,50 + 1,50
5GUA/W	2,60 + 2,60	3,80 + 3,80	4,40 + 4,40	0,60 + 0,60	7,30 + 7,30	10,90 + 10,90	80,90 + 80,90	2,20 + 2,20
7PUA/W	2,60 + 2,60	6,50 + 6,50	5,50 + 5,50	0,40 + 0,40	8,30 + 8,30	12,40 + 12,40	91,40 + 91,40	2,50 + 2,50
7GUA/W	3,30 + 3,30	6,50 + 6,50	5,50 + 5,50	0,50 + 0,50	10,40 + 10,40	14,80 + 14,80	108,0 + 108,0	3,10 + 3,10
9PUA/W	4,50 + 4,50	7,0 + 7,0	7,10 + 7,10	0,90 + 0,90	10,40 + 10,40	14,80 + 14,80	108,0 + 108,0	3,10 + 3,10
9GUA/W	5,40 + 5,40	7,0 + 7,0	7,10 + 7,10	1,20 + 1,20	13,10 + 13,10	19,10 + 19,10	136,0 + 136,0	3,80 + 3,80
4POA/W	1.20	2.10	3.10	0.30	6.80	10.90	45.00	1.50
4GOA/W	2.50	3.80	4.40	0.50	7.30	10.90	80.90	2.20
6POA/W	2.20	6.50	5.50	0.30	8.30	12.40	91.40	2.50
6GOA/W	3.10	6.50	5.50	0.50	10.40	14.80	108.00	3.10
8POA/W	3.90	7.00	7.10	0.80	10.40	14.80	108.00	3.10
8GOA/W	4.70	7.00	7.10	1.10	13.10	19.10	136.00	3.80
4PCA/W	1.40	2.10	3.10	0.30	6.80	10.90	45.00	1.50
4GCA/W	2.40	3.80	4.40	0.60	7.30	10.90	80.90	2.20
6PCA/W	2.20	4.50	8.00	0.40	8.30	12.40	91.40	2.50
8PCA/W	4.20	6.80	11.00	0.80	10.40	14.80	108.00	3.10
5POA/W	1,20 + 1,20	2,10 + 2,10	3,10 + 3,10	0,30 + 0,30	6,80 + 6,80	10,90 + 10,90	45,0 + 45,0	1,50 + 1,50
5GOA/W	2,50 + 2,50	3,80 + 3,80	4,40 + 4,40	0,50 + 0,50	7,30 + 7,30	10,90 + 10,90	80,90 + 80,90	2,20 + 2,20
7POA/W	2,20 + 2,20	6,50 + 6,50	5,50 + 5,50	0,30 + 0,30	8,30 + 8,30	12,40 + 12,40	91,40 + 91,40	2,50 + 2,50
7GOA/W	3,10 + 3,10	6,50 + 6,50	5,50 + 5,50	0,50 + 0,50	10,40 + 10,40	14,80 + 14,80	108,0 + 108,0	3,10 + 3,10
9POA/W	3,90 + 3,90	7,0 + 7,0	7,10 + 7,10	0,80 + 0,80	10,40 + 10,40	14,80 + 14,80	108,0 + 108,0	3,10 + 3,10
9GOA/W	4,70 + 4,70	7,0 + 7,0	7,10 + 7,10	1,10 + 1,10	13,10 + 13,10	19,10 + 19,10	136,0 + 136,0	3,80 + 3,80
8GUD/H	5.00	6.80	11.00	1.10	13.10	19.10	136.00	3.80
8GOD/H	4.50	6.80	11.00	1.00	13.10	19.10	136.00	3.80
8GUF	5.00	6.80	11.00	1.10	14.90	19.10	136.00	4.70
8GOF	4.50	6.80	11.00	1.00	14.70	19.10	136.00	4.60
9GUD/H	5,0 + 5,0	6,80 + 6,80	11,0 + 11,0	1,10 + 1,10	13,10 + 13,10	19,10 + 19,10	136,0 + 136,0	3,80 + 3,80
9GOD/H	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	1,0 + 1,0	13,10 + 13,10	19,10 + 19,10	136,0 + 136,0	3,80 + 3,80
9GUF	5,0 + 5,0	6,80 + 6,80	11,0 + 11,0	1,10 + 1,10	14,90 + 14,90	19,10 + 19,10	136,0 + 136,0	4,70 + 4,70
9GOF	4,50 + 4,50	6,80 + 6,80	11,0 + 11,0	1,0 + 1,0	14,70 + 14,70	19,10 + 19,10	136,0 + 136,0	4,60 + 4,60

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to – room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to – room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.

60 Hz / 380V / R22

component	FAN (1ph – 230V)				COMPRESSOR (3ph – 380V)				
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)	power supply (V/ph/Hz)
STANDARD R22									
4MUA/W	1.5	1.5	2.7	0.3	6.0	10.3	36.5	1.7	230/1/60
4SUA/W	2.3	2.9	4.3	0.5	6.5	11.4	56.0	1.7	208–230/1/60
4LUA/W	4.3	4.8	5.6	1.0	6.6	11.4	83.0	2.5	200–230/3/60
6SUA/W	3.7	5.4	9.6	0.7	7.8	13.4	95.0	3.0	200–230/3/60
6LUA/W	4.0	5.4	9.6	0.8	5.9	7.8	57.0	3.5	380/3/60
8SUA/W	5.9	7.0	11.3	1.3	5.9	7.8	57.0	3.5	380/3/60
8LUA/W	7.1	7.0	11.3	1.6	7.4	10.7	64.0	4.3	380/3/60
5SUA/W	2.3+2.3	2.9+2.9	4.3+4.3	1.0	6.5+6.5	11.4+11.4	56.0+56.0	3.4	208–230/1/60
5LUA/W	4.3+4.3	4.8+4.8	5.6+5.6	2.0	6.6+6.6	11.4+11.4	83.0+83.0	5.0	200–230/3/60
7SUA/W	3.7+3.7	5.4+5.4	9.6+9.6	1.4	7.8+7.8	13.4+13.4	95.0+95.0	6.0	200–230/3/60
7LUA/W	4.0+4.0	5.4+5.4	9.6+9.6	1.6	6.9+6.9	7.8+7.8	57.0+57.0	7.0	380/3/60
9SUA/W	5.9+5.9	7.0+7.0	11.3+11.3	2.6	5.9+5.9	7.8+7.8	57.0+57.0	7.0	380/3/60
9LUA/W	7.1+7.1	7.0+7.0	11.3+11.3	3.2	7.4+7.4	10.7+10.7	64.0+64.0	8.6	380/3/60
4MOA/W	1.2	1.5	2.7	0.2	5.9	10.3	36.5	1.7	230/1/60
4SOA/W	2.1	2.9	4.3	0.5	6.5	11.4	56.0	1.7	208–230/1/60
4LOA/W	4.1	4.8	5.6	1.0	6.6	11.4	83.0	2.5	200–230/3/60
6SOA/W	3.3	5.4	9.6	0.7	7.8	13.9	95.0	3.0	200–230/3/60
6LOA/W	3.7	5.4	9.6	0.8	5.9	7.8	57.0	3.5	380/3/60
8SOA/W	5.1	7.0	11.3	1.1	5.9	7.8	57.0	3.5	380/3/60
8LOA/W	6.2	7.0	11.3	1.4	7.4	10.7	64.0	4.3	380/3/60
4SCA/W	1.9	2.9	4.3	0.4	6.5	11.4	56.0	1.7	208–230/1/60
4LCA/W	3.9	4.8	5.6	1.0	6.6	11.4	83.0	2.5	200–230/3/60
6SCA/W	2.5	6.4	9.6	0.5	7.8	13.9	95.0	3.0	200–230/3/60
8SCA/W	4.6	7.0	11.3	1.1	5.9	7.8	57.0	3.5	380/3/60
5SOA/W	2.1+2.1	2.9+2.9	4.3+4.3	1.0	6.5+6.5	11.4+11.4	56.0+56.0	3.4	208–230/1/60
5LOA/W	4.1+4.1	4.8+4.8	5.6+5.6	2.0	6.5+6.5	11.4+11.4	83.0+83.0	5.0	200–230/3/60
7SOA/W	3.3+3.3	5.4+5.4	9.6+9.6	1.4	7.8+7.8	13.9+13.9	95.0+95.0	6.0	200–230/3/60
7LOA/W	3.7+3.7	5.4+5.4	9.6+9.6	1.6	5.9+5.9	7.8+7.8	57.0+57.0	7.0	380/3/60
9SOA/W	5.1+5.1	7.0+7.0	11.3+11.3	2.2	5.9+5.9	7.8+7.8	57.0+57.0	7.0	380/3/60
9LOA/W	6.2+6.2	7.0+7.0	11.3+11.3	2.8	7.4+7.4	10.7+10.7	64.0+64.0	8.6	380/3/60
4LUC	4.3	4.8	5.6	1.0					
6LUC	4.0	5.4	9.6	0.8					
8LUC	7.1	7.0	11.3	1.6					
4LOC	4.1	4.8	5.6	1.0					
6LOC	3.7	6.4	9.6	0.8					
8LOC	6.2	7.0	11.3	1.4					
8LUD/H	6.6	7.0	11.3	1.5	7.3	10.7	64.0	4.4	380/3/60
8LOD/H	5.8	7.0	11.3	1.4	7.2	10.7	64.0	4.4	380/3/60
8LUF	6.6	7.0	11.3	1.5	8.0	10.7	64.0	5.2	380/3/60
8LOF	5.8	7.0	11.3	1.4	7.9	10.7	64.0	5.2	380/3/60
9LUD/H	6.6+6.6	7.0+7.0	11.3+11.3	3.0	7.3+7.3	10.7+10.7	64.0+64.0	8.8	380/3/60
9LOD/H	5.8+5.8	7.0+7.0	11.3+11.3	2.8	7.2+7.2	10.7+10.7	64.0+64.0	8.8	380/3/60
9LUF	6.6+6.6	7.0+7.0	11.3+11.3	3.0	8.0+8.0	10.7+10.7	64.0+64.0	10.4	380/3/60
9LOF	5.8+5.8	7.0+7.0	11.3+11.3	2.8	15.8+15.8	10.7+10.7	64.0+64.0	10.4	380/3/60

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to – room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to – room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.

60 Hz / 380V / R407C

component	FAN (1ph – 230V)				COMPRESSOR (3ph – 380V)				
Model	OA	FLA	LRA	nominal power (kW)	OA	FLA	LRA	nominal power (kW)	power supply (V/ph/Hz)
OPTIONAL R407C									
4PUA/W	2.3	2.9	4.3	0.5	6.8	11.4	56.0	1.7	208–230/1/60
4GUA/W	4.3	4.8	5.6	1.0	7.3	11.4	83.0	2.6	200–230/3/60
6PUA/W	3.7	5.4	9.6	0.7	8.3	13.9	95.0	3.0	200–230/3/60
6GUA/W	4.0	5.4	9.6	0.8	6.0	7.8	57.0	3.7	380/3/60
8PUA/W	5.9	7.0	11.3	1.3	6.0	7.8	57.0	3.7	380/3/60
8GUA/W	7.1	7.0	11.3	1.6	7.6	10.7	64.0	4.6	380/3/60
5PUA/W	2.3+2.3	2.9+2.9	4.3+4.3	1.0	6.8+6.8	11.4+11.4	56.0+56.0	3.4	208–230/1/60
5GUA/W	4.3+4.3	4.8+4.8	5.6+5.6	2.0	7.3+7.3	11.4+11.4	83.0+83.0	5.2	200–230/3/60
7PUA/W	3.7+3.7	5.4+5.4	9.6+9.6	1.4	8.3+8.3	13.9+13.9	95.0+95.0	6.0	200–230/3/60
7GUA/W	4.0+4.0	5.4+5.4	9.6+9.6	1.6	6.0+6.0	7.8+7.8	57.0+57.0	7.4	380/3/60
9PUA/W	5.9+5.9	7.0+7.0	11.3+11.3	2.6	6.0+6.0	7.8+7.8	57.0+57.0	7.4	380/3/60
9GUA/W	7.1+7.1	7.0+7.0	11.3+11.3	3.2	7.6+7.6	10.7+10.7	64.0+64.0	9.2	380/3/60
4POA/W	2.1	2.9	4.3	0.5	6.8	11.4	56.0	1.8	208–230/1/60
4GOA/W	4.1	4.8	5.6	1.0	7.3	11.4	83.0	2.6	200–230/3/60
6POA/W	3.3	5.4	9.6	0.7	8.3	13.9	95.0	3.0	200–230/3/60
6GOA/W	3.7	5.4	9.6	0.8	6.0	7.8	57.0	3.7	380/3/60
8POA/W	5.1	7.0	11.3	1.1	6.0	7.8	57.0	3.7	380/3/60
8GOA/W	6.2	7.0	11.3	1.4	7.6	10.7	64.0	4.6	380/3/60
4PCA/W	1.9	2.9	4.3	0.4	6.8	11.4	56.0	1.8	208–230/1/60
4GCA/W	2.9	4.8	5.6	1.0	7.3	11.4	83.0	2.6	200–230/3/60
6PCA/W	3.9	5.4	9.6	0.5	8.3	13.9	95.0	3.0	200–230/3/60
8PCA/W	4.6	7.0	11.3	1.1	6.0	7.8	57.0	3.7	380/3/60
5POA/W	2.1+2.1	2.9+2.9	4.3+4.3	1.0	6.8+6.8	11.4+11.4	56.0+56.0	3.6	208–230/1/60
5GOA/W	4.1+4.1	4.8+4.8	5.6+5.6	2.0	7.3+7.3	11.4+11.4	83.0+83.0	5.2	200–230/3/60
7POA/W	3.3+3.3	5.4+5.4	9.6+9.6	1.4	8.3+8.3	13.9+13.9	95.0+95.0	6.0	200–230/3/60
7GOA/W	3.7+3.7	5.4+5.4	9.6+9.6	1.6	6.0+6.0	7.8+7.8	57.0+57.0	7.4	380/3/60
9POA/W	5.1+5.1	7.0+7.0	11.3+11.3	2.2	6.0+6.0	7.8+7.8	570+57.0	7.4	380/3/60
9GOA/W	6.2+6.2	7.0+7.0	11.3+11.3	2.8	7.6+7.6	10.7+10.7	64.0+64.0	9.2	380/3/60
8GUD/H	6.6	7.0	11.3	1.5	7.6	10.7	64.0	4.6	380/3/60
8GOD/H	5.8	7.0	11.3	1.4	7.6	10.7	64.0	4.6	380/3/60
8GUF	6.6	7.0	11.3	1.5	8.4	10.7	64.0	5.5	380/3/60
8GOF	5.8	7.0	11.3	1.4	8.4	10.7	64.0	5.5	380/3/60
9GUD/H	6.6+6.6	7.0+7.0	11.3+11.3	3.0	7.6+7.6	10.7+10.7	64.0+64.0	9.2	380/3/60
9GOD/H	5.8+5.8	7.0+7.0	11.3+11.3	2.8	7.6+7.6	10.7+10.7	64.0+64.0	9.2	380/3/60
9GUF	6.6+6.6	7.0+7.0	11.3+11.3	3.0	8.4+8.4	10.7+10.7	64.0+64.0	11.0	380/3/60
9GOF	5.8+5.8	7.0+7.0	11.3+11.3	2.8	8.4+8.4	10.7+10.7	64.0+64.0	11.0	380/3/60

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to – room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to – room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.

OPTIONAL

Model	400 V/3 ph/50−60 Hz				230 V/3 ph/50−60 Hz			
	Electrical heating		Humidifier		Electrical heating		Humidifier	
	FLA	nominal power [kW]	FLA	nominal power [kW]	FLA	nominal power [kW]	FLA	nominal power [kW]
4S/P/M U/O/C A/W*	6.5	4.5	6.5	1.5	11.3	4.5	6.5	1.5
4L/G U/O/C A/W/C*	6.5	4.5	6.5	1.5	11.3	4.5	6.5	1.5
6S/P U/O/C A/W	6.5	4.5	5.0	3.4	11.3	4.5	8.1	3.4
6L/G U/O A/W/C	6.5	4.5	5.0	3.4	11.3	4.5	8.1	3.4
8S/P U/O A/W	6.5	4.5	5.0	3.4	11.3	4.5	8.1	3.4
8L/G U/O A/W/F/D/H/C	6.5	4.5	5.0	3.4	11.3	4.5	8.1	3.4
5S/P U/O A/W*	2 x 6.5	9.0	5.0	3.0	2 x 11.3	9.0	8.1	3.0
5L/G U/O A/W*	2 x 6.5	9.0	5.0	3.0	2 x 11.3	9.0	8.1	3.0
7S/P U/O A/W	2 x 6.5	9.0	5.0	6.8	2 x 11.3	9.0	8.1	6.8
7L/G U/O A/W	2 x 6.5	9.0	5.0	6.8	2 x 11.3	9.0	8.1	6.8
9S/P U/O A/W	2 x 6.5	9.0	5.0	6.8	2 x 11.3	9.0	8.1	6.8
9L/G U/O A/W/F/D/H	2 x 6.5	9.0	5.0	6.8	2 x 11.3	9.0	8.1	6.8

SPECIAL CONFIGURATION

MODEL	COMPONENTS	ELECTRIC POWER 230−400/3/50 + N			POWER SUPPLY 230−380/3/60 + N		
		OA	FLA	LRA	OA	FLA	LRA
4S/P/M U A/W	HP FAN	2.4	3.2	6.5	3.72	4.3	
4S/P/M O A/W		2.3	3.2	6.5	3.48	4.3	
4S/P C A/W			3.2	6.5	3.01	4.3	
4L/G U A/W/C		2.9	3.2	6.5	4.82	6.3	
4L/G O A/W/C		2.8	3.2	6.5	5.03	6.3	
4L/G C A/W			3.2	6.5	4.86	6.3	
6S/P U A/W		5.3	6.5	12.0	5.71	6.3	
6S/P O A/W		5.6	6.5	12.0	5.51	6.3	
6S/P C A/W			6.5	12.0	5.11	6.3	
6L/G U A/W/C		5.4	6.5	12.0	6.09	6.3	
6L/G O A/W/C		5.6	6.5	12.0	5.89	6.3	
8S/P U A/W		7.5	9.4	17.0			
8S/P O A/W		7.6	9.4	17.0			
8S/P C A/W				17.0			
8L/G U A/W/C/D/F/H		7.6	9.4	17.0			
8L/G O A/W/C/D/F/H		7.8	9.4	17.0			
5S/P U A/W		2.4+2.4	3.2+3.2	6.5+6.5	3.72+3.72	4.3+4.3	
5S/P O A/W		2.3+2.3	3.2+3.2	6.5+6.5	3.48+3.48	4.3+4.3	
5L/G U A/W		2.9+2.9	3.2+3.2	6.5+6.5	4.98+4.98	6.3+6.3	
5L/G O A/W		2.8+2.8	6.5+6.5	6.5+6.5	5.03+5.03	6.3+6.3	
7S/P U A/W		5.3+5.3	6.5+6.5	12.0+12.0	5.71+5.71	6.3+6.3	
7S/P O A/W		5.6+5.6	6.5+6.5	12.0+12.0	5.51+5.51	6.3+6.3	
7L/G U A/W		5.4+5.4	6.5+6.5	12.0+12.0	6.09+6.09	6.3+6.3	
7L/G O A/W		5.6+5.6	6.5+6.5	12.0+12.0	5.89+5.89	6.3+6.3	
9S/P U A/W		7.5+7.5	9.4+9.4	17.0+17.0			
9S/P O A/W		7.6+7.6	9.4+9.4	17.0+17.0			
9L/G U A/W/C/D/F/H		7.6+7.6	9.4+9.4	17.0+17.0			
9L/G O A/W/C/D/F/H		7.8+7.8	9.4+9.4	17.0+17.0			

1) Fan OA is for standard unit operating at the standard pressure drop.
2) Compressor OA is referred to − room conditions: 24°C, 50% RH; condensing temperature: 45°C. A/W/D/H models
3) Compressor OA is referred to − room conditions: 24°C, 50% RH; ext. temperature: 35°C. F models
4) Compressor FLA is for the contemporary conditions of maximum evaporating and condensing pressures.
5) Electrical heating values are for maximum heating (3 steps).

(*) The humidifiers in the models 4Sx and 4Lx are single−phase (230V/1ph/50−60 Hz)

7 – Start–up

7.1 – **First start–up** (or after long standstill)

A, W, F, D and H only: TO PREVENT COMPRESSOR DAMAGE THE CRANKCASE(S) MUST BE PREHEATED FOR AT LEAST 4 HOURS BEFORE CONDITIONER START–UP (FAILURE TO DO SO INVALIDATES THE GUARANTEE).
Start the air conditioner as follows:

1) *A, W, F, D and H only*: Open all valves in the refrigeration circuit according to the instruction label attached to the valve.
2) *C, W, F and H only*: Open all valves in the water circuit according to the instruction label attached to the valve.
3) *A, W, F, D and H only*: Ensure that the refrigerant charge is correct (see Chap. 4).
4) *A, W, F, D and H only*: Using a leak detector, verify that there are no refrigerant leaks. If there are any, then repair the leak and recharge as described in Chap. 4.
5) *A, W, F, D and H only*: At least 4 hours before start–up, close **QS** and **QF8** on the electrical panel.
   In the "*Microface*" control system factory setting the *stand alone* mode is standard. The *stand alone* mode gives the possibility of turning on the unit simply rotating the main switch on the electric panel. The **yellow** LED on the *Microface* case will light after turning on the unit, because of the presence of electric power.
   If the LED does not light up:
   - check the electric panel power supply;
   - check the protection devices (e.g.: thermal switches);
   - check the fuses.
6) *A, W, F, D and H only*: Verify the operation of the crankcase heater.
7) Check that there are no water leakages.
8) *C, D and H only*: Bleed all air out of the chilled water circuit using the bleed valve on the chilled water coil.
9) *A, W, F, D and H only*: If an external condenser or Dry cooler is installed, start it by supplying power to it.
10) *Only for units with belt–driven fans*: check that the fan belts are under the correct tension (they should give by about 2 cm if pulled by a finger at mid–span).
11) Close all MCBs on the electrical panel.
12) Check the supply voltage on all phases.
13) *A, W, F, D and H only*: Check the supply voltage on all phases for the external condenser or Dry cooler, if fitted.
14) *A, W, F, D and H only*: ENSURE THAT THE COMPRESSOR HAS BEEN PREHEATED FOR AT LEAST 4 HOURS BEFORE STARTING THE UNIT.
15) Start the unit by pressing **ON OFF** (see Fig. 23).
16) **IMPORTANT – *For units with 3–phase Scroll compressors.* If compressor makes a loud and unusual noise the electrical phase connections MUST BE INVERTED.**
17) Check the electrical absorption of all components (see Chap. 6), including *(A, W, F, D and H only)* the external condenser/Dry cooler, *if fitted.*
18) **IMPORTANT – If the compressor makes a loud and unusual noise IT IS NECESSARY TO INVERT the electrical connections of the phases supplying the corresponding scroll compressors, which accept only one direction of rotation.**
19) *Only for units with belt–driven fans*: Ensure that the fans rotate in the correct direction (see arrow on fan).
20) Ensure that all control system settings are correct and that there are no alarms (see Control manual).
21) *C, W, F and H only*: Verify the water flow.
22) *W, F and H only*: For closed circuit units ensure that the water pump starts when the compressor starts.
23) Verify the Fresh Air Intake operation *(if fitted)*.
24) Once the system is operating under load, check the various components, as follows:
   - Verify that the fans are operating properly.
   - Ensure that the temperature and relative humidity are being controlled, and that the humidifier *(optional)* and heating steps *(optional)* operate when required.
   - *A, W, F, D and H only*: Ensure that the compressor operates when required.
   - *C, D and H only*: Ensure that chilled water valve operates when required.
   - *A, W, F, D and H only*: Ensure that the fan operation controller on the external condenser/Dry cooler *(if fitted)* is calibrated correctly, and that it controls the fan operation.

7.2 – Starting and stopping

- *A, W, F, D and H only*: ALWAYS ENSURE THAT EACH CRANKCASE HAS BEEN PREHEATED.
  FOR BRIEF STOPPAGES KEEP THE SUPPLY TO THE CRANKCASE HEATER.

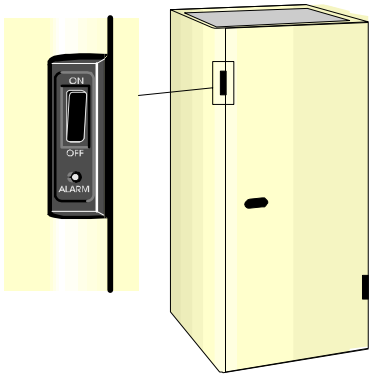
Turn on the unit operating on the ON/OFF switch placed on the left case of the unit (Fig. 23). If the ON/OFF remote device is not installed, the green LED on the *Microface* case will light up together with the LED placed below the ON/OFF switch. The fan starts immediately (the fan always works when the unit is ON); after 2 minutes the regulation is activated, so the cooling (compressor), heating (electric heaters), humidifying and dehumidifying devices can start.
Adjust the set–point as indicated in **Control manual.**
Stop the unit putting the ON/OFF switch in OFF.

- *C only*: The main switch **QS** should only be switched off if the unit is stopped for a long period of time.

7.3 – Automatic restart

If desired, the unit will automatically restart on the return of power after a supply interruption (see Control manual).
A, W, F, D and H only: If the power interruption is expected to be of several hours, to avoid an automatic cold restart of the compressor stop the unit before the black–out and, on the return of power, allow the compressor to preheat before restarting the unit.

Fig. 23 – On–Off switch



8 – Operation

Unit operation is completely automatic. The below sequence explains how the unit operates (see also Chap. 4):

- The air, sucked in by the fan(s), enters the unit.
- The air is immediately filtered.
- The TEMPERATURE sensor or HUMITEMP (temperature + rel. humidity) sensor (check type installed), verifies the state of the inlet air, and relays this information to the control system.
- The control system compares the relayed information to the set point and proportional band values programmed into its memory: it then commands the air conditioner to treat the air as follows (see also Control manual):
  - **COOLING**
    A and W only:
    The compressor is started and the cold refrigerant flows through the evaporator, thus cooling the air passing over it. For compressor operation see Control manual.
    C only:
    Chilled water flows through the chilled water coil, thus cooling the air passing over it. The chilled water flow is controlled by a timed modulating (3–way) valve, which regulates the flow rate in order to obtain the exact amount of cooling required.
  - **HEATING**
    This can take one of three forms:
    – electrical heating *(optional)*: the heating elements heat the air passing over them. There are 3 heating steps.
    – hot water heating *(optional)*: if hot water is available, this flows through the hot water coil, thus heating the air passing over it. The hot water flow is controlled by an on–off (3–way) valve.
    – hot gas reheat (*optional* used during dehumidification): the hot refrigerant which exits the compressor flows through the hot gas coil, thus heating the air passing over it.
  - **DEHUMIDIFICATION – *optional***
    A, W and F only:
    One of the compressors starts and either the air flow or the evaporator surface is reduced (depending on the model), thereby causing dehumidification (refer also to Control manual).
    C only:
    Maximum chilled water flow is requested through the coil, whose temperature drops below the dew point of the air, thus dehumidifying it.
    If necessary, heating is used to reheat the air.
    D and H only:
    See Control manual
    N.B.: If, during dehumidification, the ambient temperature drops below a specified level, dehumidification will be stopped if necessary (see LOW LIMIT intervention in Control manual).
  - **HUMIDIFICATION – *optional***
    The humidifier creates steam, which is distributed into the air stream via the steam distribution pipe (see also App. A).
- Filtered new air is injected into the air stream via the Fresh Air Intake.
- The treated air passes through the fans, which operate continuously, and is then dispersed out of the unit.
- *Under unit only:* the air passes from the underfloor void into the room via air distribution outlets.

N.B.: Manual control can be performed using the control system (see Control manual).

8.1 – Chilled water valve *(C, D and H only)*

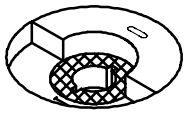
The 3–way valve controls the chilled water flow. It operates as follows (Fig. 24):

- When the valve is fully open (i.e. max. chilled water flow) the actuator slot is set to 'I'.
- When the valve is closed (i.e. no chilled water flow) the actuator slot is set to 'O'.

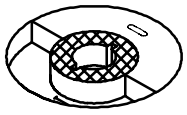
The valve running time is set to the value specified in Fig. 24.

N.B.: In the unlikely event of control system failure, the valve can be manually controlled by means of a 5 mm allen key placed into the actuator slot.
NEVER PERFORM THIS OPERATION USING A SCREWDRIVER.

Fig. 24 – Position of the chilled water valve actuator



valve fully open (by–pass closed)



valve closed (by–pass open)

9 – Calibrations *(A/W/F/D/H only)*

- The air conditioner has already been factory–tested and calibrated as shown below.
- The air conditioner has already been factory–tested and calibrated as shown below (except for the water pressostatic valve WV which must be set during start–up).
- For calibrations of instruments installed on the external condensers/Dry coolers refer to the relevant manual.
- For control system calibrations refer to Control manual (to prevent erratic operations do not use temperature and rel. humidity set points/proportional bands which differ excessively from the Standard Settings).

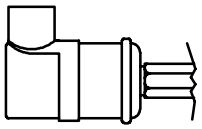
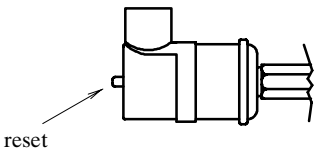
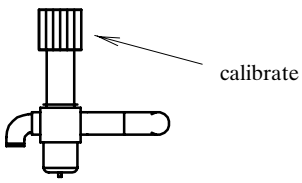
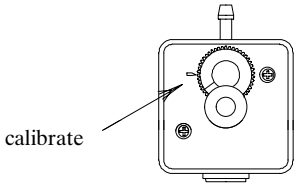
9.1 – Setting the thermostatic expansion valve

THIS OPERATION MUST BE PERFORMED BY AN EXPERIENCED REFRIGERATION TECHNICIAN.

The valve has already been factory–set and should be reset (only if necessary) as follows:

1) IMPORTANT: Ensure that the instructions in Chap. 4 have been carried out.
2) Allow the compressor to operate for 15 mins.
3) Measure the superheat as follows:
   a) Place a contact thermometer on the tube exiting the evaporator;
   b) Connect a manometer (by a tube of max. 30 cm) to the compressor suction valve.
   c) The overheating is the difference between the refrigerant saturation temperature corresponding to the pressure read on the manometer and the real temperature read on the thermometer.
4) The superheat must be 7–8 °C; if not, set the expansion valve as follows:
   a) Remove the protective cover;
   b) Turn the adjustment screw by 2–4 turns only;
   c) Wait 10 minutes.
   d) Measure the superheat and repeat the operation if necessary.

   N.B.: If the superheat is too low (compressor cool to the touch) the screw must be turned in a clockwise direction.
   If the superheat is too high (compressor hot to the touch) the screw must be turned in a counterclockwise direction.

COMPONENT	SETTING	NOTES
Low Pressure Switch (LP)	STOP 2 barg START 2.8 barg DIFFER. (fixed) 0.8 bar (fixed setting – automatic reset)	delayed automatic reset (see HIROMATIC/MICROFACE manual) 
High Pressure Switch (HP)	STOP 24 barg START 17.5 barg DIFFER. (fixed) 6.5 bar (fixed setting – manual reset)	
Water Pressure Valve (WV) *(W/F/H only)*	ADVISED: ≈17 bar (MIN.: ≈15 bar)	
Fan differential pressure switch (SP) *(units with Hiromatic Advanced only)*	0.8 mbar (80 Pa)	
Clogged filter differential pressure switch (CF)	According to installed filter	

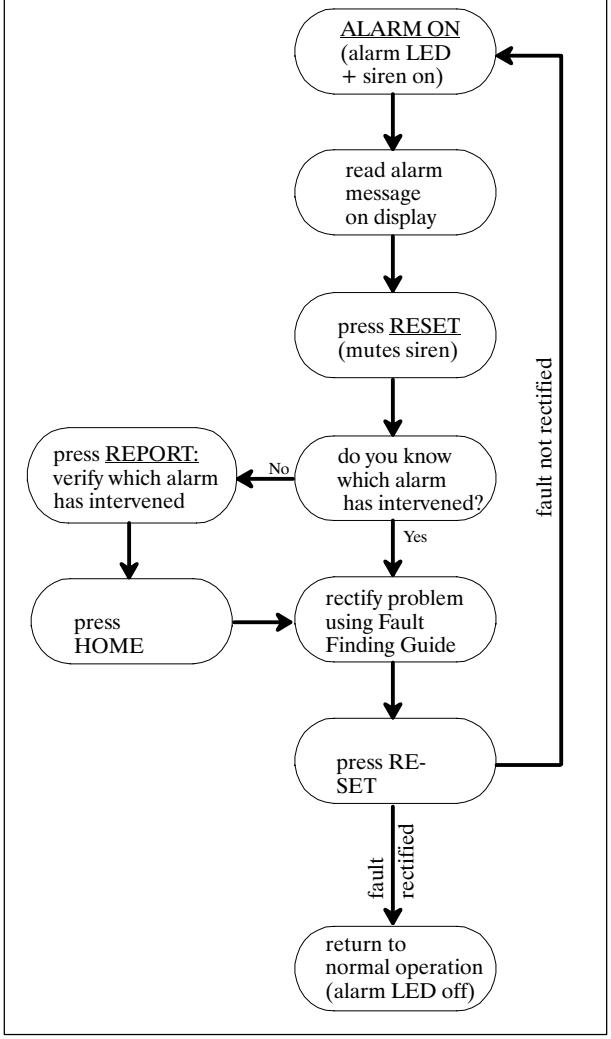
10 – Fault finding / alarms

Use the Fault Finding Guide on the right as follows:
Commence at "**START**" and follow the arrows marked either 'YES' or 'NO' according to the type of fault.
The guide uses the following abbreviations:

- *CW: chilled water unit*
- *DX: direct expansion unit*
- *A: DX unit: air–cooled*
- *WO: DX unit: water–cooled in open circuit*
- *WC: DX unit: water–cooled in closed circuit*
- *DXC: DX unit using capillary (instead of expan–sion valve)*

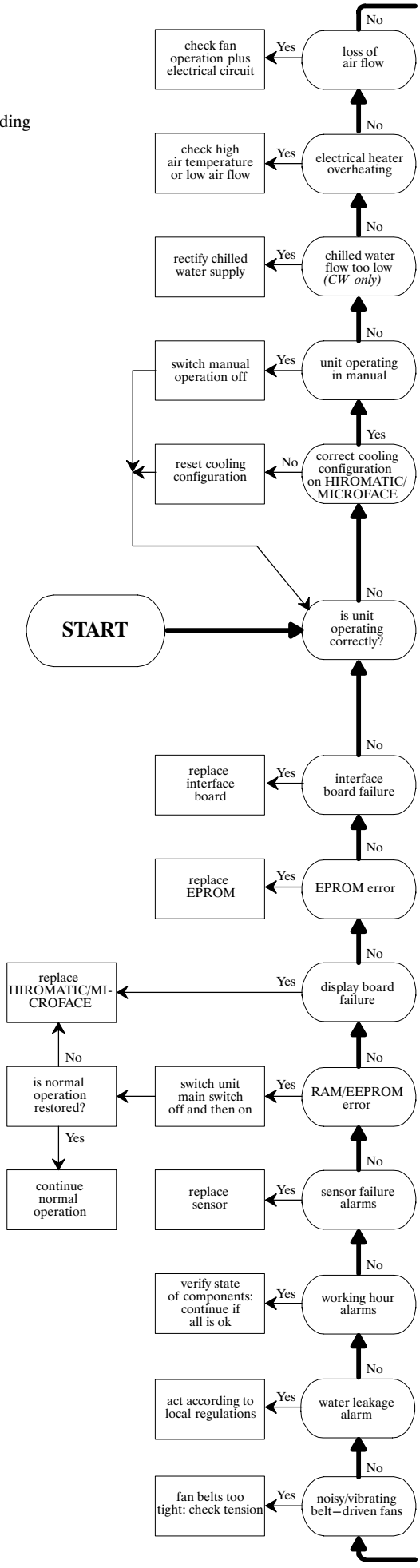
NOTE:
For Freecooler (F) refer to DX and WC.
For air–cooled Dualfluid (D) refer to CW, DX and A.
For water–cooled Dualfluid (H) refer to CW, DX and either WO or WC.
Alarms, shown shaded in the Guide, are reset as in Fig. 25.

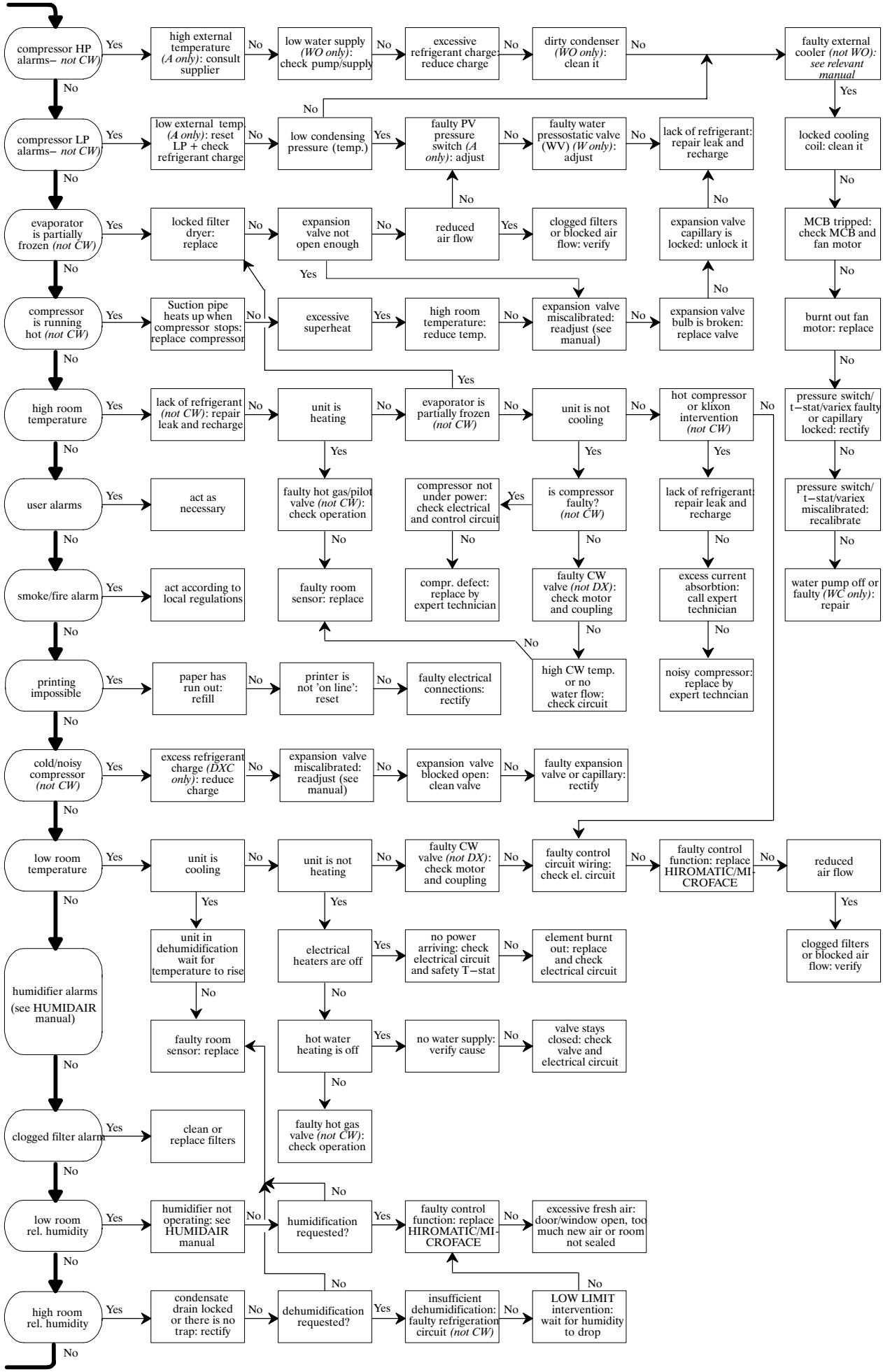
Fig. 25 – How to reset an alarm



NOTES:

- For multiple alarms, all are reset together; only the last to intervene is displayed.
- STATUS REPORT lists all recent alarms (see Hiromatic/ Microface manual).
- For more detailed information see Hiromatic manual.




compressor HP alarms– not CW)
high external temperature (A only): consult supplier
low water supply (WO only): check pump/supply
excessive refrigerant charge: reduce charge
dirty condenser (WO only): clean it
faulty external cooler (not WO): see relevant manual
compressor LP alarms– not CW)
low external temp. (A only): reset LP + check refrigerant charge
low condensing pressure (temp.)
faulty PV pressure switch (A only): adjust
faulty water pressostatic valve (WV) (W only): adjust
lack of refrigerant: repair leak and recharge
locked cooling coil: clean it
evaporator is partially frozen (not CW)
locked filter dryer: replace
expansion valve not open enough
reduced air flow
clogged filters or blocked air flow: verify
expansion valve capillary is locked: unlock it
MCB tripped: check MCB and fan motor
compressor is running hot (not CW)
Suction pipe heats up when compressor stops: replace compressor
excessive superheat
high room temperature: reduce temp.
expansion valve miscalibrated: readjust (see manual)
expansion valve bulb is broken: replace valve
burnt out fan motor: replace
high room temperature
lack of refrigerant (not CW): repair leak and recharge
unit is heating
evaporator is partially frozen (not CW)
unit is not cooling
hot compressor or klixon intervention (not CW)
pressure switch/ t–stat/variex faulty or capillary locked: rectify
user alarms
act as necessary
faulty hot gas/pilot valve (not CW): check operation
compressor not under power: check electrical and control circuit
is compressor faulty? (not CW)
lack of refrigerant: repair leak and recharge
pressure switch/ t–stat/variex miscalibrated: recalibrate
smoke/fire alarm
act according to local regulations
faulty room sensor: replace
compr. defect: replace by expert technician
faulty CW valve (not DX): check motor and coupling
excess current absorbtion: call expert technician
water pump off or faulty (WC only): repair
printing impossible
paper has run out: refill
printer is not 'on line': reset
faulty electrical connections: rectify
high CW temp. or no water flow: check circuit
noisy compressor: replace by expert technician
cold/noisy compressor (not CW)
excess refrigerant charge (DXC only): reduce charge
expansion valve miscalibrated: readjust (see manual)
expansion valve blocked open: clean valve
faulty expansion valve or capillary: rectify
low room temperature
unit is cooling
unit is not heating
faulty CW valve (not DX): check motor and coupling
faulty control circuit wiring: check el. circuit
faulty control function: replace HIROMATIC/MICROFACE
reduced air flow
unit in dehumidification wait for temperature to rise
electrical heaters are off
no power arriving: check electrical circuit and safety T–stat
element burnt out: replace and check electrical circuit
clogged filters or blocked air flow: verify
humidifier alarms (see HUMIDAIR manual)
faulty room sensor: replace
hot water heating is off
no water supply: verify cause
valve stays closed: check valve and electrical circuit
clogged filter alarm
clean or replace filters
faulty hot gas valve (not CW): check operation
low room rel. humidity
humidifier not operating: see HUMIDAIR manual
humidification requested?
faulty control function: replace HIROMATIC/MICROFACE
excessive fresh air: door/window open, too much new air or room not sealed
high room rel. humidity
condensate drain locked or there is no trap: rectify
dehumidification requested?
insufficient dehumidification: faulty refrigeration circuit (not CW)
LOW LIMIT intervention: wait for humidity to drop
Yes
No

11 – Maintenance / Spare Parts

AS THE HIROMATIC/MICROFACE FEATURES AUTOMATIC RESTART (AFTER A SUPPLY INTERRUPTION) IT IS ADVISED TO EITHER DISABILITATE AUTORESTART OR TO OPEN SWITCH QS WHEN PERFORMING ANY MAINTENANCE.

- On a daily basis check the HIROMATIC/MICROFACE readings for temperature and, if shown, rel. humidity.
- The Maintenance Programme below should be carried out by a qualified technician, preferably working under a maintenance contract.

Maintenance schedule – Monthly check

FANS	Check that the fan motor rotates freely without any abnormal noise, and ensure that the bearings are not running hot. Also check the current absorption.
AIR FILTERS	Verify the state of the filters; if necessary clean or replace them. In very dusty ambients perform this check more frequently.
NEW AIR FILTER *(if fitted)*	Verify the state of the filter; if necessary clean or replace it.
CONTROL SYSTEM	Verify the operation of LEDs, display and alarms.
HUMIDIFIER *(if fitted)*	See App. A.
ELECTRICAL CIRCUIT	• Check the electrical supply on all phases. • Ensure that all electrical connections are tight.
COOLING WATER *(W, F and H only)*	• Verify the cooling water circulation. • Ensure that there are no water leaks. • Closed circuit only: Verify that the water pump is operating correctly and bleed any air out of the circuit.
REFRIGERATION CIRCUIT *(A, W, F, D and H only)*	• Check the evaporation pressures (to be done by a refrigeration technician). • Check the compressor current absorption, its head temperature and the presence of any unusual noise. • Ensure that there is no ice formation on the evaporator.
EXTERNAL CONDENSER/ Dry cooler *(A, W, F, D and H only – if fitted)*	See relevant manual.
CHILLED WATER CIRCUIT *(C, D and H only)*	• Ensure that there are no water leaks. • Bleed any air out of the chilled water circuit using the bleed valve situated on the top right of the chilled water coil. • Verify the correct chilled water flow. • Check the inlet – outlet fluid temperature and pressure using the thermometers and manometers, if fitted.

11.1 – Refrigeration circuit

WHEN REPAIRING THE REFRIGERATION CIRCUIT COLLECT ALL REFRIGERANT IN A CONTAINER: DO NOT ALLOW IT TO ESCAPE.

- When either removing (for repairs) or charging refrigerant this must always be done on both the high and low pressure sides of the compressor simultaneously.
- The compressor copper plated steel connections should be welded with a silfos material containing a minimum of 5% silver.

11.1.1 – Refrigerant charge of the water–cooled units *(W, F and H)*

1) Start the unit as described in para. 7.1.
2) Manually start the compressor (ensure the unit is not in dehumidification).
3) Wait a few minutes to allow conditions to stabilize.
4) Check whether there are any bubbles visible in the sight glass. If there are any, this means there is a leak, which must be traced (using a leak detector) and repaired; then recharge the unit until no further bubbles are visible.
5) Using a manometer, check that the evaporating temperature is above 0°C; if not, see CHAP. 10 (evaporator partially frozen).
6) Verify the water pressostatic valve (WV) setting (CHAP. 8).
7) Verify that the superheat is 7–8 °C (to do this refer to para. 8.1).

11.1.2 – Oil charge R22

The oil to be used when topping up (only if there are any leaks) is SUNISO 3GS.

Tab. 8 – Suniso 3GS oil (for R22 only)

approx. specific weight (at 15°C)	:	0.91 kg/l
flash point (C.O.C.)	:	170 °C
pour point	:	– 40 °C
ENGLER viscosity at 50°C	:	2.7 E
viscosity index	:	0
copper corrosion (100°C, 3hr) ASTM	:	1
D130	:	0.03 max.
neutralization value	:	0%
conradson carbon	:	> 30kV
dielectric strength		

11.1.3 – Oil charge R407C

The oil to be used when topping up (only if there are any leaks) is Mobil EAL Arctic 22CC (see Tab. 9).

Tab. 9 – Mobil Arctic EAL 22CC oil (for R407C only)

approx. specific weight (at 15°C)	:	0.__ kg/l
flash point (C.O.C.)	:	245 °C
pour point	:	<–54 °C
viscosity at 40°C	:	23.6 cSt
viscosity at 100°C	:	4.7 cSt
viscosity index	:	116

These oils rapidly absorb the humidity present in the air when they are exposed to the atmosphere.
If the oil absorbs humidity, the ester molecules can break down, forming acidity.
We therefore recommend exposing the oil for as short a time as possible (a few minutes) and, in case of topping up, using exclusively the oil indicated on the refrigerating compressor.
Normally 1 or 2–liter cans are available for this purpose; once they are opened, they must be completely used up. They must not be used after a long period, as they absorb humidity.
It is therefore obvious that the taps of the compressor must only be turned after the whole plant has been subjected to a vacuum and partial filling.

11.1.4 – Oil topping–up of an installed circuit

If oil leakages occur, the topping–up operation is necessary.
Please contact the Technical Support Department if topping–up is necessary.

Tab. 10 – Refrigerant and oil charge

Refri-geran	MODEL	REFRIGERANT CHARGE (Kg)			SUNISO 3GS OIL CHARGE (litres)	
		air–cooled (A–D) + condenser without hot gas	charge to be added for every metre between conditioner and condenser – A–D only (+)	**water–cooled (W–F–H)** without hot gas	oil within each compressor	oil to be added for every 10 m over 30 m line (A–D only)
R22	**4 S/L O/U**	3	0.25	1.35	0.7	0.2
	5 S/L O/U	2 x 3	0.25	2 x 1.35	0.7	0.2
	6 S/L O/U	3.5	0.25	1.55	0.9	0.2
	7 S/L O/U	2 x 3.5	0.25	2 x 1.55	0.9	0.2
	8 S/L O/U	4	0.25	1.75	1.4	0.2
	9 S/L O/U	2 x 4	0.25	2 x 1.75	1.4	0.2
					MOBIL EAL ARCTIC 22 CC (litres)	
R407C	**4 P/G O/U**	3	0.25	1.25	1.5	0.2
	5 P/G O/U	2 x 3	0.25	2.5	1.5	0.2
	6 P/G O/U	3.5	0.25	1.45	1.9	0.2
	7 P/G O/U	2 x 3.5	0.25	2.9	1.9	0.2
	8 P/G O/U	4	0.25	1.65	2.4	0.2
	9 P/G O/U	2 x 4	0.25	3.3	2.4	0.2
					SUNISO 3GS OIL CHARGE (litres)	
R22	**4 S/L C**	3	0.25	2.2	0.7	0.2
	6 S C	3.5	0.25	2.5	0.9	0.2
	8 S C	4	0.25	3.2	1.4	0.2
					MOBIL EAL ARCTIC 22 CC (litres)	
R407C	**4 P/G C**	3	0.25	2.3	1.2	0.2
	6 P C	3.5	0.25	2.6	1.4	0.2
	8 P C	4	0.25	3.3	2.4	0.2

MODEL	air–cooled (A) + condenser	REFRIGERANT CHARGE R22(Kg)			
		Line length			
		5 m	10 m	15 m	20 m
4M	**UCA 50/51**	2.050	2.300	2.550	2.800
	UCA 76	2.450	2.700	2.950	3.200

(+) Valid for standard tube diameters.

N.B. 1: The air conditioner is supplied pressurized with 3 bar of dry nitrogen.

N.B. 2: A only – Above charges are valid for standard condensers (operation at external temperature up to 40°C).

11.2 – Spare parts

It is recommended the use of original spare parts. When placing an order refer to "Component List" enclosed with the machine and quote the unit model no. and serial no.

11.3 – Dismantling the unit

The machine has been designed and built to ensure continuous operation.

The working life of some of the main components, such as the fan and the compressor, depends on the maintenance that they receive.

If the unit has to be dismantled, this operation must be done by skilled refrigeration technicians.

The refrigerating fluid and the lubricating oil in the circuit must be disposed of in conformity with the laws in force in your country.

App. A – HUMIDAIR humidifier

App. A.1 – Preface

The HUMIDAIR represents the best humidifier technology available, guaranteeing the steam as clean as possible together with simple maintenance.

In order to obtain optimum performance from the HUMIDAIR it is advisable to read this manual carefully.

13 – Humidair specifications

HUMIDAIR KIT		steam production (variable)	humidifier power supply voltage	max. cylinder water volume	max. supply water quantity	max. drain water quantity
model	code	kg/h (*)	V/ph/Hz	(l)	(l/min.)	(l/min.)
Hiflex 4–5 HAK 21L	141100	0.6 – 2.0	230 V 1 PH 50–60 Hz	1.05	0.3	2.5
Hiflex 6–7–8–9 HAK 53H	141101	1.3 – 4.5	400 V trifase 50–60 Hz	2.84	0.6	2.5

For humidifier current (FLA) and rated power refer to electrical features in air conditioner manual.

(*) Unit is factory–set to produce 70% of the maximum value (see Microface manual).

App. A.2 – Installation

The humidifier is supplied already mounted within the air conditioner. The only necessary operations are the connections for the supply water (Fig. 26) and drain water (Fig. 27); for the positions of the supply/drain connections within the unit see Microface manual.

Fig. 26 – Supply water connection

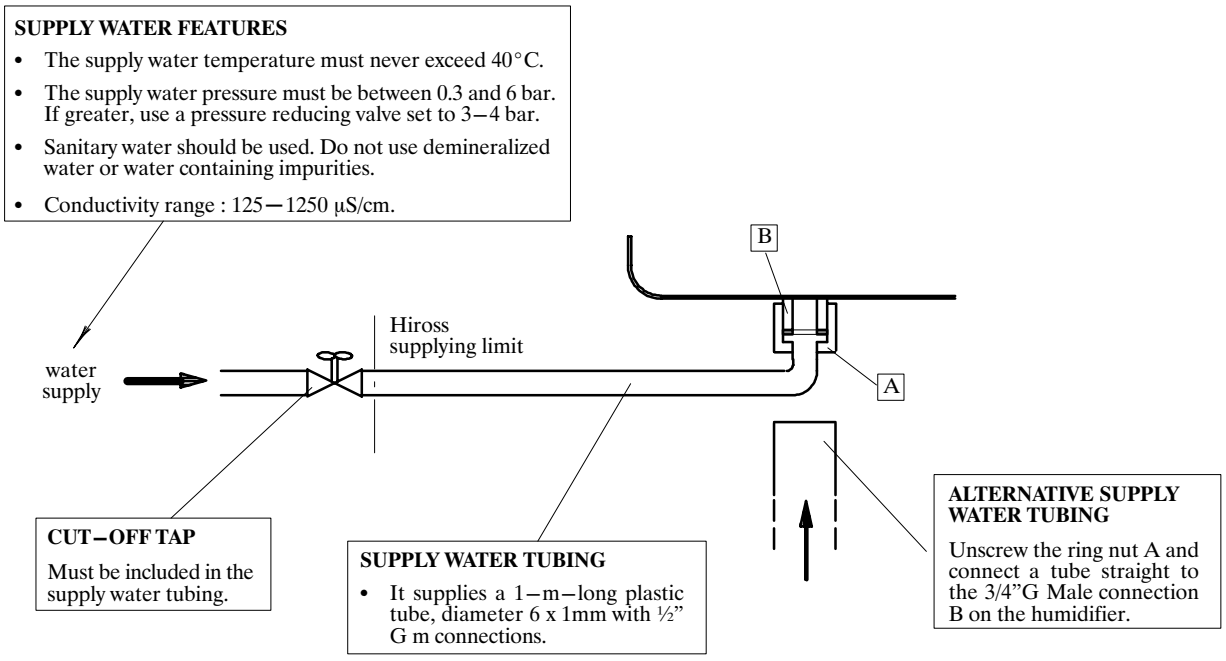
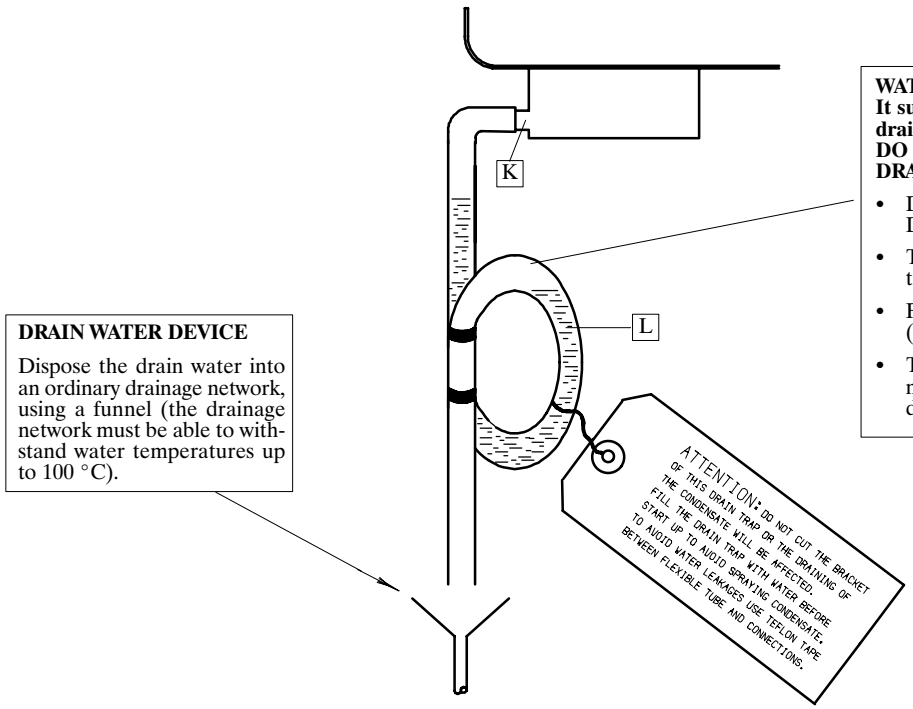


Fig. 27 – Drain water connection



DRAIN WATER DEVICE

Dispose the drain water into an ordinary drainage network, using a funnel (the drainage network must be able to withstand water temperatures up to 100 °C).

WATER DRAIN TUBING
It supplies a hose with an integral drain trap.
DO NOT DISMANTLE THE DRAIN TRAP.

- DO NOT DISMANTLE THE DRAIN TRAP.
- The hose is already fitted onto the humidifier drain outlet (K).
- Fill the drain trap with water (L).
- The drain pipe is made of plastic material which does not conduct electricity.

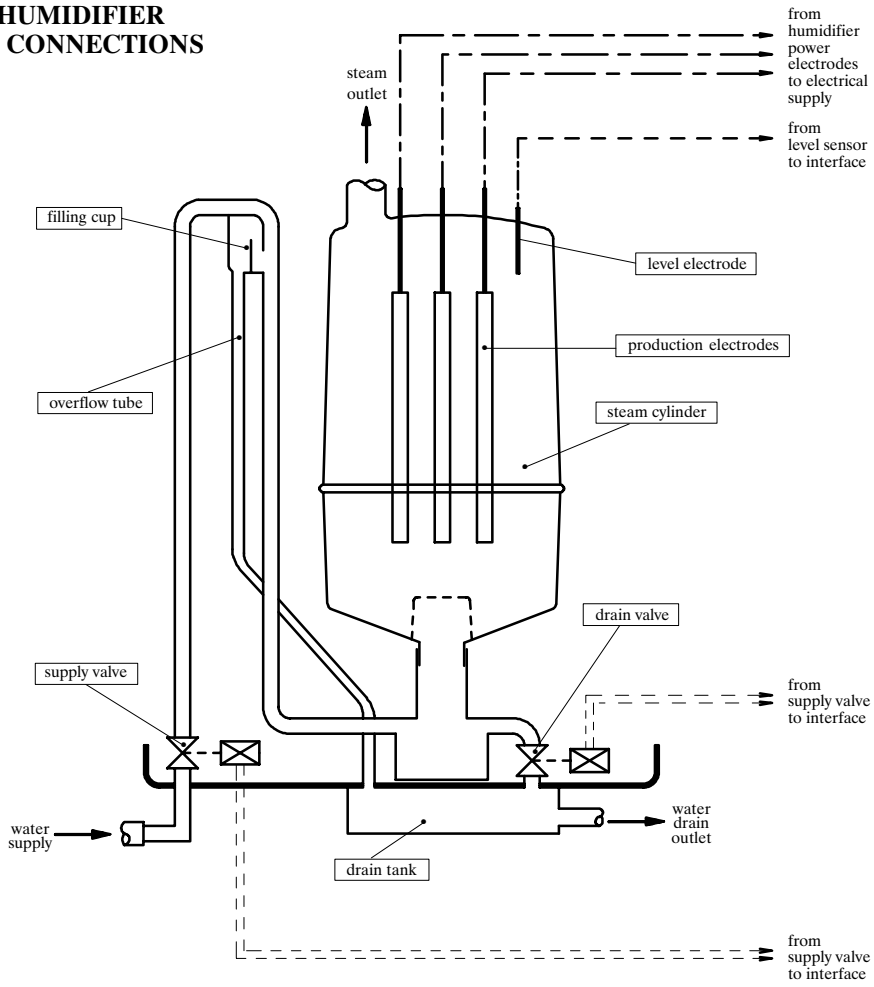
NOTES:

1) Allow a 2% gradient towards the drain outlet.
2) Avoid back pressures in the drain piping.

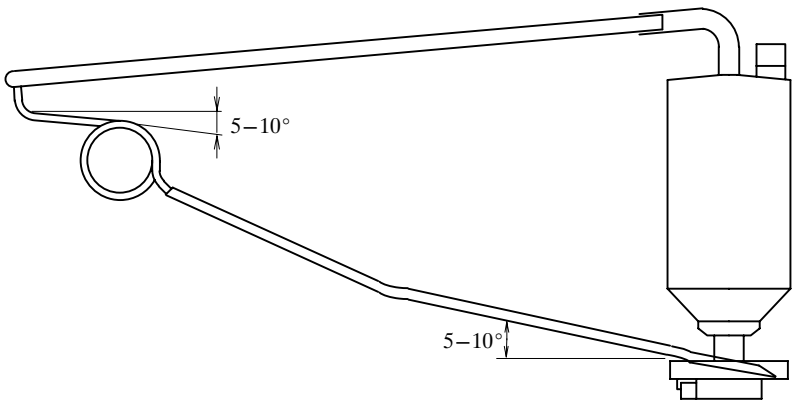
App. A.3 – Humidair components

The components of the HUMIDAIR humidifiers are shown below. The page on the right shows the wiring connections, already carried out in the factory.

THE HUMIDIFIER AND ITS CONNECTIONS



CONDENSE DRAIN



Note for installers and maintenance technicians:

Be sure that steam distributor and drain tube are positioned as in the drawing and are not tampered with when the steam cylinder has to be replaced.

App. A.4 – Start–up and operation

App. A.4. 1 – Start–up

Before using the humidifier, check the following:

- Supply and drain connections.
- That the cut–off tap is open.
- All wiring.
- Earthing.
- Steam hose connection between steam cylinder and distributor.

To start the humidifier simply switch on the air conditioner, which will in turn automatically start and stop the humidifier as required. The (adjustable) parameters which determine humidifier operation have already been factory–preset (see HIROMATIC manual).

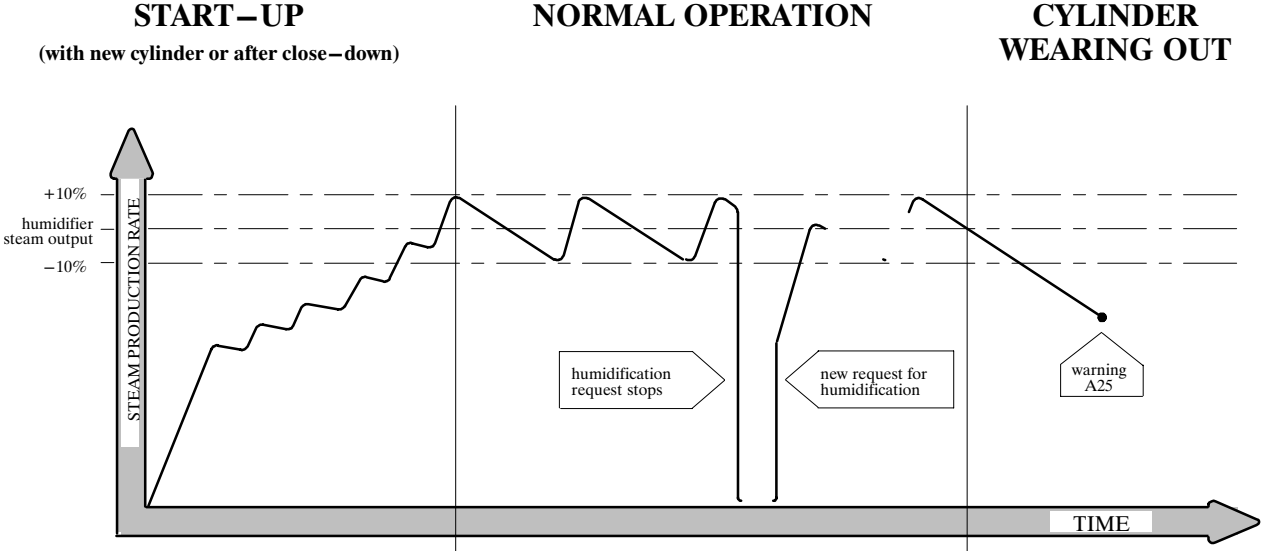
App. A.4. 2 – Operation

Water, provided it contains even a small quantity of salts in solution, is a conductor of electricity. Therefore, if the steam cylinder is filled with water and a potential difference is applied between the production electrodes, the water behaves like an ordinary electrical resistance and becomes hot, thus creating steam.
The steam production rate can be controlled by varying the water level in the cylinder; the higher the water level, the deeper the electrodes are immersed into it and the greater the steam production.
The HUMIDAIR operates according to this logic, producing steam as a function of the control algorithm explained in Fig. 28.

Caution

In case of low water conductivity the cylinder 93H (9.0 kg/h) or 53H (4.5kg/h) can be substituted with the cylinder 93L or 53L without changing the power supply.
Please remember to set the right cylinder type into the Control system.
The steam production will remain unchanged.

Fig. 28 – Humidifier operation



When starting with an empty cylinder, the water conductivity is **normally** insufficient for the HUMIDIFIER STEAM OUTPUT (see N.B. at bottom of page) to be reached immediately. Therefore the humidifier produces as much steam as possible to fill the cylinder completely. Any evaporation water is immediately refilled.
The drain valve is kept shut and therefore, as the steam does not contain any salts, the conductivity of the water within the cylinder slowly increases until the HUMIDIFIER STEAM OUTPUT is obtained.

NOTE: The length of the start–up period depends upon the water conductivity. For very conductive water it may occur that the HUMIDIFIER STEAM OUTPUT is obtained immediately.

The water level is controlled so as to keep a steam output equivalent to the HUMIDIFIER STEAM OUTPUT +/– 10%.
The supply and drain valves are used not only to control the water level, but also to keep the water conductivity at the optimum level; in this manner operating efficiency and cylinder life are maximized.

If the request for humidification stops, the steam production rate returns to zero. However, as the water remains in the cylinder, when there is a new request for humidification the HUMIDIFIER STEAM OUTPUT is obtained almost immediately.

With the passing of time, calcareous deposits start to form on the electrodes and a higher water level needs to be kept to obtain the HUMIDIFIER STEAM OUTPUT.
When the water level reaches the level electrode, the drain valve is kept shut so as to increase the conductivity. The steam production rate will however start to decrease and when this has lowered to 50% of the HUMIDIFIER STEAM OUTPUT, warning A25 is generated to warn the user that the cylinder needs to be replaced.

N.B. The "HUMIDIFIER STEAM OUTPUT" is selected, on the HIROMATIC, within the range of 30 – 100% of the maximum output available.

App. A.5 – Maintenance

App. A.5. 1 – Removing the steam cylinder

To remove the steam cylinder, proceed as follows (see Fig. 29):

1) Open the General Switch relative to the humidifier.
2) Drain all the water from the cylinder by activating "**HUM. DRAIN**" in the HIROMATIC Service menu several times (see Microface manual).
3) Disconnect the steam hose (S) (made of non–conductive rubber).
4) Disconnect the power electrode wires (P) and level sensor wire (L).
5) Undo the clip (R).
6) Pull the cylinder (C) out of its gland at the bottom (G).

App. A.5. 2 – Replacing the steam cylinder

When the steam cylinder is approaching the stage where it needs to be replaced, warning **A25** is generated (see HIROMATIC manual) to advise the user that the cylinder must be replaced. To replace the cylinder, proceed as follows (see Fig. 29):

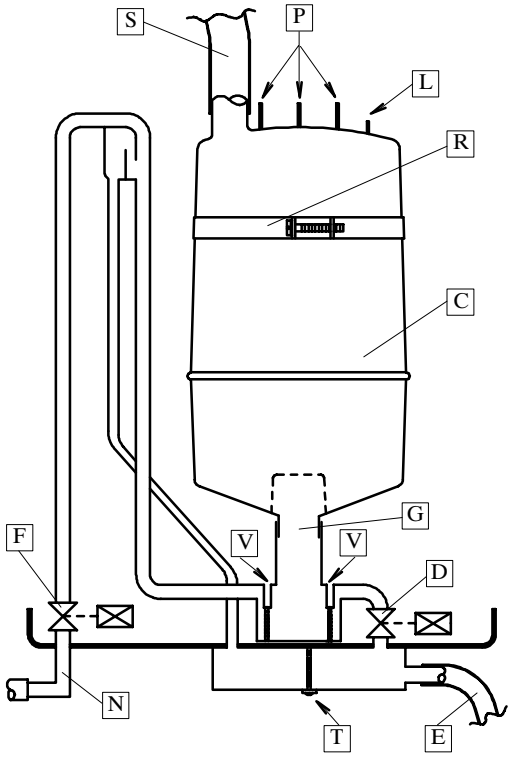
1) Carry out the instructions in para. **Removing the steam cylinder**.
2) Using the new cylinder, carry out 4)–6) of para. 5.1 in reverse order.
3) Connect the steam hose (S); the clip on the hose needs to be tightened only slightly.
4) Manually switch the humidifier on for 2–3 minutes (in the HIROMATIC Service menu). Then switch it off.
5) Drain the water as for 2) in para. **Removing the steam cylinder**.
6) If the air conditioner features a HIROMATIC with Graphic display, reset the humidifier working hours (window no. 1 of **PARAMETER MENU**) to zero.
7) Close the General Switch relative to the humidifier.

App. A.5. 3 – Annual maintenance

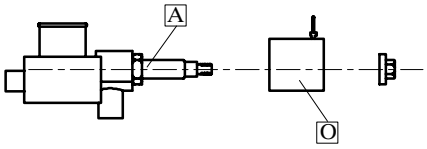
Annually (e.g. before any close–down period) carry out the following service on the humidifier (see Fig. 29):

1) Carry out the instructions in para. **Removing the steam cylinder**.
2) Disconnect the supply (F) and drain (D) valve wires.
3) Unscrew and remove the drain tank (T).
4) Unscrew the drain valve assembly screws (V).
5) Remove the drain valve assembly.
6) Unscrew and remove the drain valve solenoid (O).
7) Unscrew and remove the drain valve armature (A).
8) Clean all parts of the drain valve using a commercially available descaling agent (to remove any incrustations).
9) Detach the hose from the supply valve.
10) Remove the supply valve connection (N).
11) Unscrew the supply valve (F) and remove it.
12) Clean the supply valve using a jet of water.
13) Replace any hose which has become hard and brittle.
14) Thoroughly flush the drain line (E).
15) Reassemble the humidifier by carrying out the above instructions in reverse order.

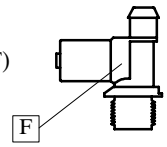
Fig. 29 – Humidifier components



DRAIN VALVE ASSEMBLY (D)

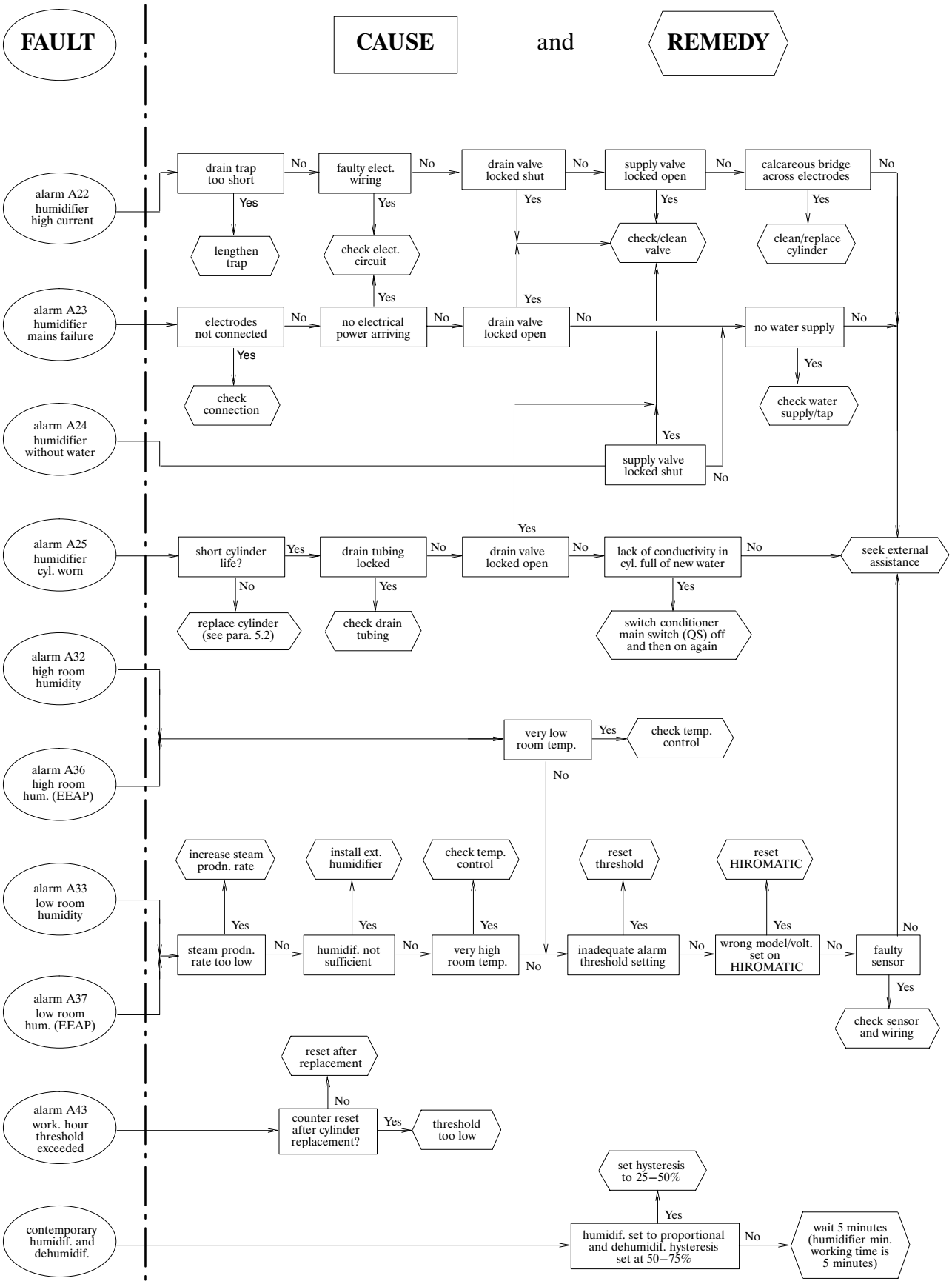


SUPPLY VALVE (F)



ATTENTION

Always empty the cylinder completely before any close–down period.



NOTE: For alarms refer also to HIROMATIC manual.

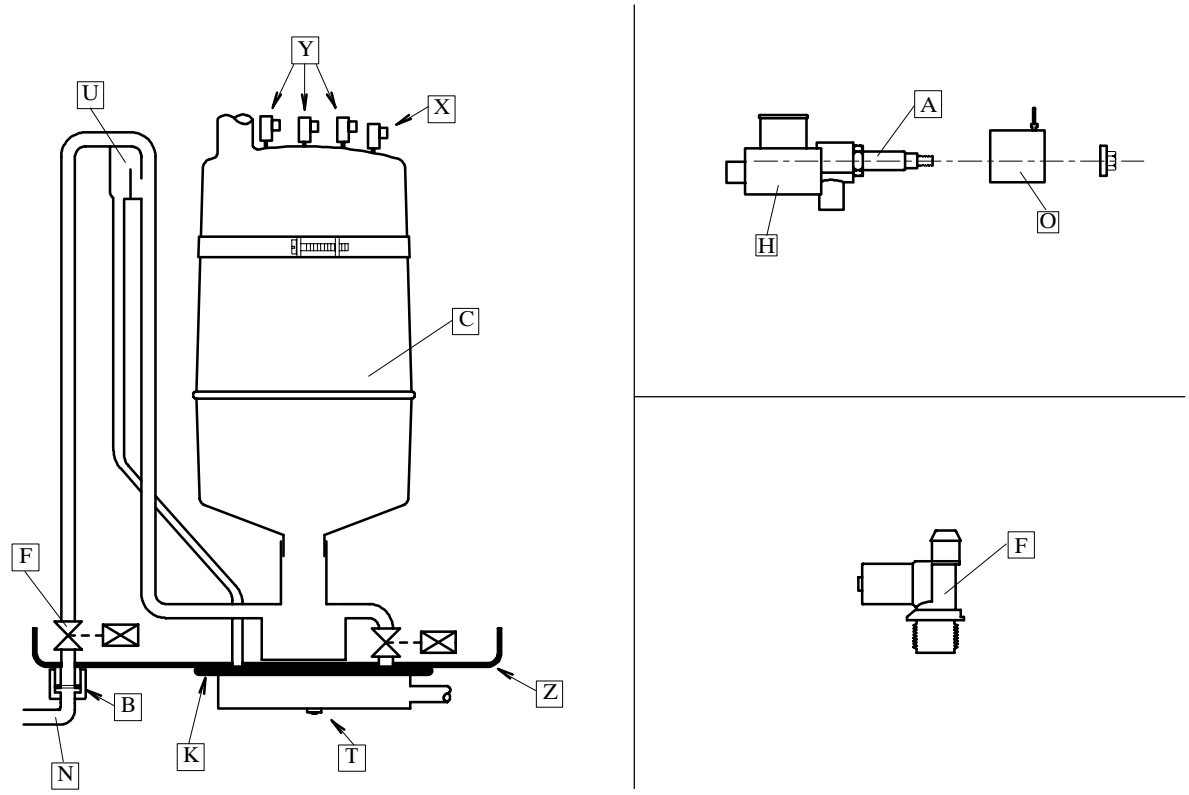
App. A.7 – Spare part list

It is recommended the use of original spare parts. When placing an order refer to “Component List” enclosed with the machine and quote the unit model no. and serial no.

POSITION (see Fig. 30)	CODE	DESCRIPTION	INSTALLED QUANTITY					Notes
			21L	53H	53L	93H	93L	
C	141070	Steam cylinder 140	1					(*)
	141071	Steam cylinder 263		1				(*)
	141072	Steam cylinder 243			1			(*)
	141073	Steam cylinder 363				1		(*)
	141074	Steam cylinder 343					1	(*)
T	141200	Drain tank	1	1	1	1	1	
U	141201	Filling cup	1	1	1	1	1	
N	141300	Supply valve connection	1	1	1	1	1	
K	2400006	Rubber gasket for drain tank	1	1	1	1	1	
B	240007	Rubber gasket for supply valve connection	1	1	1	1	1	
F	183209	Complete supply valve	1					
	183204	Complete supply valve		1	1	1	1	
A	183205	Drain valve armature	1	1	1	1	1	
H	183206	Drain valve housing	1	1	1	1	1	
O	254001	Drain valve solenoid	1	1	1	1	1	(+)
X	254393	Connector for level electrode	1	1	1	1	1	
Y	254394	Connector for production electrode	2	3	3	3	3	
	275905	Isolator for level sensor	1	1	1	1	1	
Z	271099	Base	1	1	1	1	1	

(+) = Spare part recommended
(*) = Consumable material

Fig. 30 – Spare parts



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