

CLIMATIC[™] **USER MANUAL**









CHILLERS V 2.2

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CONTROL AND REGULATION

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IDLE FUNCTION

Function The idle function enables the machine to be stopped during certain times of the day or certain days of the week. Outside the idle period, the refrigeration unit operates normally, in accordance with its instructions. Description Idle time is defined by 4 instructions (all included in the idle period) : HDEBUTI 🖙 Start time of daily idle period HFINI ⇔ End time of daily idle period JFINI ⇔ End day of weekly idle period As an option, the customer has the facility of confirming or stopping the idle function by remote control, by means of a hard contact connected to the logic input provided for this purpose (see wiring diagram). The variable associated with this entry is MAARI. If MAARI = 0, idle times are ignored. If MAARI = 1, idle times are processed. Example: The user wishes to stop the machine: - from Monday to Friday, from 7 p.m. to 6 a.m. the next morning - all day on Saturday and Sunday. In this case the instructions should be set as follows : HDEBUTI = 19 HFINI = 6 JDEBUTI = 7 JEINI = 2 Note: By convention, Sunday is the first day of the week (Sunday = 1).



CONTROL OF EVAPORATOR PUMPS

Function

To control the flow of refrigerant in the evaporator

Description

There are two possible types of regulation, defined by the variable C2POMPE.

• If C2POMPE = 0, the CLIMATIC controls one pump or none.

1 If C2POMPE = 1, the CLIMATIC controls two pumps in normal / standby mode.

The user configures the C2POMPE parameter through switch 1 (or SW1) of CPU card.

☞ <u>Case 0</u> :

The pump POMPE1 is in service if all the following conditions are satisfied:

- \Rightarrow At least one on / off circuit n is ON (MAARn = 1). *
- \Rightarrow The remote on / off switch for the machine is ON (MAARD = 1). *
- \Rightarrow This is not an idle period (INOCCUP = 0).
- \Rightarrow The pump has been off for 1 minute or is already in operation.
- \Rightarrow There is no electrical fault on the pump (DELECP1 = 1).
- \Rightarrow There is no flow fault on the pump (DSDEB1 = 0).

* Cette condition n'est pas prise en compte si l'option "relance hors gel de la pompe" a été choisie et la température d'air extérieur est inférieure à 2°C.

* This condition is not taken into account if the "anti-freeze pump start-up" option has been selected and the outside air temperature is less than 2°C.

POMPE1 is always controlled by the CLIMATIC even if the installation pump is not electrically controlled by the refrigeration unit.

If the customer controls the pump, he/she must comply with the following procedures:

- Pump start-up 1 minute before confirming the remote on / off switch for the unit.
- Pump off at least 2 minutes after MAARD is switched to 0.

☞ <u>Cas ❷</u> :

The pump POMPEk is in service if :

- \Rightarrow At least one on / off circuit n is ON (MAARn = 1). *
- \Rightarrow The remote on / off machine is ON (MAARD = 1). *
- \Rightarrow This is not an idle period (INOCCUP = 0). *
- \Rightarrow Pump POMPEk has priority (PRIP = k-1).
- \Rightarrow The pump has been off for 1 minute or is already in operation.
- \Rightarrow There is no electrical fault on the pump (DELECPk = 1).
- \Rightarrow There is no flow fault on the pump (DSDEBk = 0).

* This condition is not taken into account if the "anti-freeze pump start-up" option has been selected and the outside air temperature is less than 2°C.

The pump priority changes automatically once a week, on Monday at 6 p.m..

In the event of a fault occurring on the pump in service, the unit automatically transfers to the second pump, on condition that the latter is available.

Note: The CLIMATIC waits 2 minutes before stopping the pumps after a request to stop the machine or circuits, to avoid any risk of the evaporator freezing.



COLD THERMOSTAT



HOT THERMOSTAT



COLD REGULATION WITH GRADIENT Function To adapt the regulation set point to the outside air temperature, for improved counterbalancing of solar heat pick-up by the premises to be air conditioned. Description Le calcul du point de consigne de régulation CONSREG se fait en fonction des paramètres suivants : TEA ⇔ Outside air temperature (°C) ⇔ 1st reference air temperature selected (°C) CONSA CONSAM \Leftrightarrow 2nd reference air temperature selected (°C) TEGI ⇔ Minimum chilled water temperature instruction (°C) CONSEG ⇔ Required water instruction for air instruction CONSA (°C) (CONSEG must be lower than +15°C). CONSEI ⇔ Required water instruction for air instruction CONSAM (°C) (CONSEI must be greater than TEGI+2°C). ⇔ Regulation gradient (%) PENTEF The gradient is calculated using the following equation: PENTEF = 100 x (CONSEI - CONSEG) / (CONSAM - CONSA) CONSREG CONSEG PENTEF CONSEI TEGI+2°C CONSA CONSAM TEA CONSREG = CONSEG + PENTEF x (TEA - CONSA) / 100 Example of regulation : CONSREG TEA With = 20°C (°C) (°C) CONSA CONSEG $= 10^{\circ}C$ 20 10 CONSAM = 35°C 25 8,66 CONSEI $= 6^{\circ}C$ 7,33 30 \Rightarrow PENTEF = -26.7 % 35 6



HOT REGULATION WITH GRADIENT

Function

To adapt the regulation set point to the outside air temperature for improved counterbalancing of heat loss to the outside from the premises to be heated.

Description

The regulation set point CONSREG is calculated according to the following parameters :



CONSEC

 \Rightarrow PENTEC = -80 %

= 30°C

42

38

34

30

0

5

10

15

CONTROL OF COMPRESSORS

Function

The cor and eve	npressors are started up and ns out their operating times	sto	ppe	d in	the	ord	er v	vhicl	n av	oids	s the	e an	ti-sh	ort	cycl	e, a	s fa	r as	pos	sibl	э,
Descrip	otion																				
@ Start	-up and stopping order for co	mnre	9550	ors																	
This or	der is determined by a "E		, (fi	ret i	in f	irct		t) ri	ilo	Thi	e fu	ncti	on	inco	rno	rato	e th		uto	mati	c
instanta	instantaneous recording of a priority compressor which has become unavailable																				
☞ <u>Com</u>	pressor start-up and stopping																				
The con	npressor COMPmn starts up	if all	the	follo	owin	g co	ondi	tion	s are	e sa	tisfie	ed :									
						-															
⇔ Th ⊸ Th	ne water circulation pump rec	eive	d th		der ·	to o	pera	ate a	at lea	ast 1	1 mi	nute	e ea	rlier							
r ⇔ Th	he machine is available (DISF	s OI POM	v (iv = 1	1AA).	RN =	= 1).															
⇔ Ci	rcuit n is available (DISPOCr	1 = 1).	,																	
⇔ Co ⇔ Th	ompressor mn is available (D	ISP(R is	Jmr are:) = 1 ater	l). thai	n the	<u>e</u> ni	ımbe	er of	cor	nore	esso	ors in	n se	rvice	e					
⇒ C	OMPmn is the compressor de	fine	d by	the	FIF	O r	ule	as tl	ne n	ext	one	to s	tart	up.	1110	0.					
⇒ C	OMPmn is not in anti-short cy	cle	(AC	Cmr	ו = 1	I).															
The con	The compressor COMPmn stops if at least one of the following conditions is satisfied :																				
r⊃ Ir ⊐> Th	\Rightarrow The remote on / off switch for the machine is OFF (MAARD = 0). \Rightarrow The on / off switch for circuit n is OFF (MAARn = 0)																				
⇔ Tł	\Rightarrow The machine is unavailable (DISPOM = 0).																				
⇔ Circuit n is unavailable (DISPOCn = 0). ⇔ Compressor mp is unavailable (DISPOmp = 0).																					
⇒ Compressor min is unavailable (DISPOMIN = 0). ⇒ The regulation thermostat THER is less than the number of compressors in service and COMPmn is the																					
com	compressor defined by the FIFO rule as the next one to be stopped.																				
			1	1	1			1					1	1	1	1	1				
-	THER	0	1	2	3	4	3	4	3	2	1	2	3	2	3	4	3	2	1	0	
	Last one started up	-	1	2	3	4	-	1	-	-	-	2	3	-	4	1	-	-	-	-	
ssol	Last one stopped	-	-	-	-	-	1	-	2	3	4	-	-	1	-	-	2	3	4	1	
pre							~														
nu	In operation	_	1	12	12	12	2	23	34	4 1	1	12	12	23	23	23	34	4 1	1	_	
O					3	34	4	4 1	1				3	20	4	4 1	1	т I			



CONTROL OF CAPACITY REDUCTIONS FOR HOT REGULATION

Function

To adjust the hot water output temperature as closely as possible to the set point by adapting compressor capacity.

Description

Capacity reduction valves are only available on semi-hermetic reciprocating or screw compressors.

On a machine with several compressors, only the last one started up can modify its capacity. The other compressors are maintained at full capacity.

The number of capacity reductions to be put into operation is defined by the thermostat THERR, in accordance with the following 2 parameters:





CONTROL OF CAPACITY REDUCTIONS FOR HOT REGULATION

Function

To adjust the hot water output temperature as closely as possible to the set point by adapting compressor capacity.

Description

Capacity reduction valves are only available on semi-hermetic reciprocating or screw compressors.

On a machine with several compressors, only the last one started up can modify its capacity. The other compressors are maintained at full capacity.

The number of capacity reductions to be put into operation is defined by the thermostat THERR, in accordance with the following 2 parameters:



If at least one capacity reduction is in service, one is stopped as soon as TSEC is less than CONSREG -1° C. As long as the TSEC condition is satisfied, an additional capacity reduction is stopped every 2 minutes.

Note : At start-up, the compressors are maintained at reduced capacity for 1 minute.



CONTROL OF ELECTRONIC EXPANSION VALVE

Function

To control correct filling of the evaporator with refrigerant in order to obtain highest efficiency, whilst protecting the compressor against slugging.

Description

The expansion valve is controlled by Proportional + Integral + Derivative logic. The ideal theoretical opening RDETAn of the expansion valve on circuit n is determined and compared with the actual opening. Depending on the variation observed, an opening or closing order is issued to the expansion valve.

Calculation of RDETAn

Theopening to be achieved RDETAn depends on the following parameters :

SURCHD	⇔ Superheat instruction (°C)
TASPn-TBPn	Superheat measured on circuit n (°C)
RDETn	⇔ Opening measured on expansion valve (°C)

I.e. Δ et the difference at time t between the measured superheat and the instruction:



Order issued to expansion valve

- ⇒ If RDETAn > RDETn, the expansion valve must be heated (DETn=1) to open it to the desired opening.
- \Rightarrow If RDETAn < RDETn, the expansion value is not heated (DETn=0) so that it can close.
- ⇒ If RDETAn = RDETn, the expansion valve is maintained at its current opening value by alternating start and stop heating operations successively.
- **Note** : Before starting up the first compressor on the circuit, the expansion valve is preheated to an opening value calculated on the basis of the low pressure prevailing in the circuit. This procedure avoids any risk of slugging at compressor start-up.



³ cas se présentent :

CONTROL OF CONDENSER FANS

Function

To maintain as stable a condensation pressure as possible without fans cutting in too frequently.

Description

The CLIMATIC calculates the number of ventilation stages THVn required for the proper functioning of each refrigeration circuit.

THVn depends on the following parameters :



Fan operation

At the start-up of the first compressor on the circuit, as soon as high pressure becomes greater than HPBAS+1bar, N fans are immediately started up (the number N depends on the outside air temperature).

When PTHPn exceeds HPHAUT, the thermostat is increased by one stage. If the pressure remains above HPHAUT, THVn continues to be increased by one unit every T (time interval) :

. If HPHAUT < PTHPn HPHAUT+1bar,	T = TEMPOV
. If HPHAUT+1bar < PTHPn HPHAUT+2bars,	T = TEMPOV/2
. If PTHPn > HPHAUT+2bars,	T = TEMPOV/4

Turning off fans

Once PTHPn falls below HPBAS, THVn is reduced by one stage. As long as PTHPn remains below HPBAS, THVn continues to be decreased by 1 every TEMPOV (time interval).

<u>Note</u>: When stopping a ventilation stage relates to a 2-speed fan, switching from fast to slow speed is delayed by 5 seconds.



SPECIFIC VALVES FOR SCREW COMPRESSORS								
	Li	quid injection valve us	sing intermediate suct	ion				
Function								
To reduce the co	mpressor discł	narge temperature there	by improving cooling on	the compressor motor.				
Description								
 The liquid injection valve INJLmn is open if: the compressor COMPmn is in operation and the discharge temperature TREFmn is greater than 100°C or the economy valve ECOmn is opened. INJLmn is kept open as long as: 								
and the disc	npressor COM charge temperation	Pmn is in operation ature TREFmn is greate	r than 90°C or the econ	omy valve ECOmn is opened	d.			
		Econor	my valve					
Function	Function							
To increase refrig	erating capaci	ty by increased sub-coc	ling of the liquid refriger	ant output from the condense	er.			
Description								
The economy val	The economy valve ECOmn is open if:							
and . the disc and . high pre	 . compressor COMPmn is in operation and at full capacity for 2 minutes and . the discharge temperature TREFmn is greater than and . high pressure in circuit n PTHPn is greater than P1. 							
ECOmn is kept o	pen as long as	:						
and . the disc and . high pre	 . compressor COMPmn is in operation and at full capacity and . the discharge temperature TREFmn is greater than -2°C and . high pressure in circuit n PTHPn is greater than P2. 							
	ſ	θ (°C)	P1 (absolute bar)	P2 (absolute bar)				
	R22	65	11,9	11,2				
R	134a	40	7,7	6,7				
	4070	45	13,5	11,7				



OPTIONS

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FREE-COOLING

Function

To ensure refrigeration whilst optimising the use of free-cooling, thus limiting electrical consumption to a minimum.

Description

Free-cooling outline diagram



TEEGFC	⇔ Temperature of chilled water input to free-cooling (°C)
--------	---

- TSEG ⇔ Chilled water output temperature (°C)
- TEA ⇔ Outside air temperature (°C)

V3VFC 🔅 Three-way free-cooling valve

Control of the three-way free-cooling valve:

V3VFC is fed if all the following conditions are satisfied :

- \Rightarrow TEEGFC is greater than the regulation instruction CONSREG.
- \Rightarrow TEA<TEEGFC-2°C.
- \Rightarrow The chilled water circulation pump has been in operation for at least 30 seconds.
- \Rightarrow The three way valve has remained off for 3 minutes.
- ⇒ The free-cooling water input sensor is not defective.

V3VFC is kept connected as long as all following conditions are satisfied :

- \Rightarrow TEEGFC is not less than CONSREG.
- \Rightarrow TEA<TEEGFC.
- \Rightarrow The pump is in operation.
- \Rightarrow The free-cooling water input sensor is not defective.

Control of free-cooling fans

The number of ventilation stages required for the batteries is determined by the free-cooling thermostat THERFC. This parameter depends on the temperature of the water input to the evaporator TEEG and on the regulation instruction.







HEAT RECOVERY

Function

On air units with heat recovery condenser, to maintain the hot water output temperature as close as possible to the instruction, whilst adapting the air condenser capacity to the excess thermal capacity to be discharged.

Description

Outline diagram of heat recovery process



Determination of heat recovery mode

Unit operation in heat recovery or total discharge mode is defined by the RECUP parameter which is set to 1 or 0. RECUP is determined depending on :

FSR	Recovery condenser flow controller
TSECR	Hot water output temperature (°C)
CONSEH	⇔ Hot water instruction (°C)

RECUP is set to 1 if :	and	. FSR is on for over 15 seconds . TSECR < CONSEH.
RECUP remains at 1 as long as :	and	. FSR has not been off for over 15 seconds . TSECR < CONSEH+2°C.

Control of air condenser fans

On switching to recovery mode, the ventilation thermostat for circuit n THVn is forced to 0 for 5 seconds.

If the high pressure of circuit n exceeds 23 bar, THVn is increased by 1 stage. The ventilation thermostat continues to be incremented by 1 every TEMPOV (time interval) as long as the condition on the pressure is satisfied. Every time THVn is incremented, the value of the hot water output temperature TSECR is memorised in the variable MTSECR.

In recovery mode, if TSECR becomes lower than MTSECR whilst at least one fan is in operation, the ventilation thermostat is decremented.

Note: On water units, the CLIMATIC does not include heat recovery



MANAGEMENT OF UNITS IN PARALLEL

Function

To provide staging of units in order to adjust the temperature of the cooled fluid as closely as possible to the set point.

Description

• Management of the installation by an independent CPU card (recommended configuration)

General regulation is by a KP01 independent of those which directly control the units. Dialogue between the cards is by hard contact only, without chaining.

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REGULATION OF UNITS IN PARALLEL

With CONSEG = $6^{\circ}C$ ENCLG = $1,5^{\circ}C$

DIFETG = $1,5^{\circ}C$

Units	start-up	Unit	t stop
THERG	TBAL (°C)	THERG	TBAL (°C)
0 ⇔ 1	7,5	1 ⇔ 0	6
1 ⇔ 2	9	2 ⇔ 1	7,5
2 ⇔ 3	10,5	3 ⇔ 2	9
3 ⇔ 4	12	4 ⇔ 3	10,5

Notes : THERG can only be incremented by a stage if it has not increased for a time defined using instructions TPTHERM. THERG can only be decremented by a stage if it has not decreased for a time defined using

instructions TPTHERD.

Control of isolation valves for evaporators on each unit

If the regulation thermostat THERG requests operation of unit Gn, valve V2Vn is sent a command to open.

Operation of units

The start-up of the next priority unit Gn is authorised if the opening command has been issued to valve V2Vn for at least TPV2V (variable time). The hard contact representing this authorisation to switch a unit on (associated variable MAARGn) must be wired to the "remote on / off" input connection for the machine.

Each unit controls its own compressors and pump in accordance with its own set point (see "cold thermostat" chapter page 5). For better general regulation, it is recommended to set unit instructions to the same value as CONSEG.

Fault management and automatic unit logging

Each unit sends its availability state to the general regulation card. Depending on the overall availability of all units, an optimal priority order PRIG is defined (units with no faults are put at the top of the priority list) :

PRIG	Ordure of unit start-up
0	G1 / G2 / G3 / G4
1	G4 / G1 / G2 / G3
2	G3 / G4 / G1 / G2
3	G2 / G3 / G4 / G1

In order to level out operating times for the different units, and if they are all available, PRIG changes automatically once a week, on Monday at 6 pm.

If the temperature sensor in the chamber is defective, all the valves are opened and, when the time interval TPV2V is up, start-up authorisation is issued to all the units.



REGULATION OF UNITS IN PARALLEL

Installation management by chaining of unit CPU's

The card responsible for general regulation is that for unit G1 (card number = 0). Dialogue between cards is by chaining.

In order to ensure that the machines do not all start up and stop simultaneously, their set points are staggered. The regulation instruction CONSREG for each machine is determined in accordance with the following parameters :

- VCONSE General regulation instruction (°C) VCONSE is the water instruction entered on unit G1. This unit transmits it to the other units.
- PRIG ⇔ Unit start-up priority PRIG is processed and transmitted to the other units by the unit G1. PRIG changes automatically every Monday at 6 pm, which levels out operating times between the different units
 DIFETC ⇔ Differentail between units (°C)
- DIFETG \Leftrightarrow Differentail between units (°C) DIFETG is an instruction set on each machine.

In the case of an installation with 4 units, regulation instructions CONSREG are calculated as follows :

	Setting instruction CONSREG			
PRIG	Unit G1	Unit G2	Unit G3	Unit G4
0	VCONSE	VCONSE+DIFETG	VCONSE+(2xDIFETG)	VCONSE+(3xDIFETG)
1	VCONSE+DIFETG	VCONSE+(2xDIFETG)	VCONSE+(3xDIFETG)	VCONSE
2	VCONSE+(2xDIFETG)	VCONSE+(3xDIFETG)	VCONSE	VCONSE+DIFETG
3	VCONSE+(3xDIFETG)	VCONSE	VCONSE+DIFETG	VCONSE+(2xDIFETG)

In the event of a breakdown, there is no logging between units. If a machine loses its connection with unit G1, it regulates its instructions independently of the other units. If card no.0 of machine G1 is absent from the chaining, then all units are regulated independently according to their own instructions.



MACHINE FAULTS

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TEMPERATURES OF CHILLED WATER OUTSIDE RANGE					
Logical variable : DTEG	Incident codes KP02 :	1 KP07 icon :			
Description					
The input or output chilled water tem	perature measured by the sense	or is outside the authorised range:			
Water without glycolWater with glycol (maxi 30% glycol)TEEG < TEGI ou TEEG > 65°CTEEG < -15°C ou TEEG > 65°CTSEG < TEGI ou TSEG > 65°CTSEG < -15°C ou TSEG > 65°C					
<u>With</u> :					
 TEEG ⇔ Chilled water input temperature (°C) TSEG ⇔ Chilled water output temperature (°C) TEGI ⇔ Minimum chilled water temperature for evaporator (°C) 					
Action					
Immediate machine halt. Immediate machine halt.					
i rouble-shooting	Solution				
Sensor fault on input or output of chi Wiring fault or disconnection of sens	led water. Replace se or. Check sen	ensor. sor connection.			



HOT WATER TEMPERATURES OUTSIDE RANGE					
Logical variable : DTEC	Incident codes	KP02: 2	KP07 icon :		
Description		I			
The input or output temperature of he	ot water measured by	the sensor is outside	e the authorised range :		
TEEC <-27°C or TEEC> TECS TSEC <-27°C or TSEC> TECS	5				
<u>With</u> :					
TEEC ⇔ Hot water input te TSEC ⇔ Hot water output TECS ⇔ Maximum hot wat	 TEEC ⇔ Hot water input temperature (°C) TSEC ⇔ Hot water output temperature (°C) TECS ⇔ Maximum hot water temperature at condenser (°C) 				
Action					
 Immediate machine halt. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. 					
Resetting					
Automatic fault resetting once hot water temperatures return to normal operating range : TEEC > -27°C and TEEC < TECS-5°C TSEC > -27°C and TSEC < TECS-5°C					
Trouble-shooting	5	Solution			
Sensor fault on hot water. Wiring fault or disconnection of the s	ensor. C	Replace the sensor. Check sensor connec	 ction.		



INSUFFICIENT FLOW OF CHILLED WATER				
Logical variable : DFSE	Incident codes KP02 : 3	KP07 icon : 🛕		
Description		×		
The "flow switch" FSE detects an insuffi	cient flow in the evaporator for over	⁻ 2 seconds.		
Action Immediate machine halt. The fault is displayed on the screen. The remote fault report is delayed for 	r 6 minutes			
Resetting				
The machine restarts <i>automatically</i> 20 seconds after the flow of chilled water is restored.				
Trouble-shooting Wiring fault on pump control. Wiring fault on flow controller. Water filter clogged. Setting fault on flow controller.	Solution Check pump con Check flow contr Clean water filter Adjust flow contr	nection. oller connection. : oller.		



INSUFFICIENT FLOW OF HOT WATER				
Logical variable : DFSEC	Incident codes KP02 : 4	KP07 icon : 🛕 +++		
Description		×		
The "flow switch" FSC detects in	nsufficient flow insufficient in the co	ndenser for over 3 seconds		
Action Immediate machine halt. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes.				
Resetting The machine restarts automatically 20 seconds after the flow of hot water is restored.				
Trouble-shooting Wiring fault on control pump. Wiring fault on flow controller. Water filter clogged. Setting fault on flow controller.	Solution Check pump co Check flow cor Clean water filt Adjust flow cor	onnection. troller connection. er. troller.		



ABSENCE OF 230V SUPPLY WITH BACKUP				
Logical variable : DPT230V	Incident code	es KP02 : 7		
Description		I	***	
The supply presence voltage relay is tripped (PT230V = 0). The compressor casing resistors and the anti-freeze resistors on the hydraulic circuit are no longer fed.				
Action The fault is displayed on the screen The remote fault report is delayed for	n. or 6 minutes.			
Resetting				
The machine restarts <i>automatically</i> 20 seconds after the 230 V supply has been restored.				
Trouble-shooting		Solution		
Wiring fault on 230 V supply. Wiring fault on voltage presence relay		Vérifier les connexi 230 V qui arrive su Vérifier le câblage	ions et la tension de l'alimentation r la machine. du relais de présence tension.	



INCORRECT SEQUENCE OF PHASES			
Logical variable : DPHASE	Incident codes KP02 : 9	KP07 icon : $\Delta_{\widetilde{}}$	
Description		1 1/1	
The phase controller is tripped (PHAS It detects an inversion or a bad phase	SE = 0). e coupling.		
Action			
 Immediate machine halt. The fault is displayed on the screen The remote fault report is delayed 	n. for 6 minutes.		
Resetting			
The machine can only be restarted af	ter manual resetting and the correct	re-establishment of phases.	
Trouble-shooting	Solution		
Fault appears the first time the machi on. Absence of a supply phase. Wiring fault on phase presence conta	ne is switched Reverse two of t Check the prese values between Check wiring on	he three phases upstream of the unit. Ince of the three phases and voltage phases. phase presence contact.	



CIRCUITS FAULTS

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LOW PRESSURE INSUFFICIENT
EVAPORATOR FREEZING
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Logical variable : DBPn	Incident codes KP02 : n1	KP07 icon : 🖉 🛦				
Description						
Case : No compressor on circuit n remains lower than safety l	<u>Case</u> : No compressor on circuit n is working. The liquid valve has been open for 2 minutes, but low pressure remains lower than safety limits.					
<u>Case</u> ●: A compressor on circuit n the expansion valve bypas insufficient. <u>Reminder</u> : The units with option and thermostatic ex	has been operating for more than 2 n ss valve (if applicable) has been clos an expansion valve bypass valve ar pansion valves.	ninutes. The liquid valve is open and ed for 1 minute, but low pressure is e those fitted with the "all seasons"				
Case 1 : A compressor on circuit n the circuit have been operative set of the circuit have bee	has been operating for over 6 minutes ating for at least 2 minutes and insuffic	s, all other compressors in service on ient low pressure is detected				
Action						
 If circuit n is not in operation, start-up has not been authorised. If it is in operation, it stops immediately. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. 						
Resetting						
Case • & • : Three automatic fault resets are allowed daily. After this, circuit n can only be restarted after manual resetting. Case • : Resetting is manual.						
Note : "Low pressure" failure counters TOBPn are all <i>reset to zero daily at 6 pm</i> , on condition that the maximum number of faults authorised has not been reached.						
Trouble-shooting	Solution					
Insufficient circuit load. Malfunction of the liquid solenoid val Malfunction of expansion valve. Dehydrator clogged.	ve. Complete the load Check solenoid va Check expansion Change dehydrat	d. alve operation. valve operation. or.				



EVAPORATOR FREEZING					
Logical variable : DGELn	Incident code	s KP02: n2	KP07 icon : 🌺 🎇		
Description					
This fault is only processed on r (glycol or brine)	nachines cooling v	vater without solut	tion which does not freeze at 0°C		
<u>Case</u> ● : Tubular exchangers A compressor m on circu remain satisfied for over 2 TBPn < TBPI and TAS	<u>Case</u> ● : Tubular exchangers A compressor m on circuit n has been operating for at least 1 minute and the following 2 conditions remain satisfied for over 2 minutes: TBPn < TBPI and TASPn < +5°C				
<u>Case</u>	 Plate exchangers A compressor m on circuit n has been operating for at least 2 minutes and :				
<u>With</u> : TBPn ⇔ Evaporation TBPI ⇔ Minimum eva The minimur . Tubula . R4070 . R22 pl	th : TBPn ⇔ Evaporation temperature circuit n (°C) TBPI ⇔ Minimum evaporation temperature (°C) The minimum (and default) value of instruction TBPI is defined as follows : . Tubular evaporators ⇔ -4°C . R407C plate evaporators ⇔ +1°C (stream saturation)				
TASPn ⇔ Suction temp	perature for circuit n	(°C)			
Action					
 Immediate halt of circuit n. The fault is displayed on the scre The remote fault report is delayed 	en. I for 6 minutes.				
Resetting					
<u>Cas</u> ●: For the first fault, resetting is <i>automatic</i> after of <i>30 minutes</i> , if the evaporation temperature has returned to over +1°C. After this, circuit n can only be restarted after <i>manual</i> resetting					
<u>Cas</u> <i>Q</i> : For the first fault, the resetting is automatic after 30 minutes , if the evaporation temperature has returned to over TBPI+3°C. After this, circuit n can only be restarted after manual resetting.					
Note : "Freeze" failure counters TOGELn are all reset to zero daily at 6 pm , on condition that the maximum number of authorised faults has not been reached.					
Trouble-shooting Solution					
Incorrect TBPI instruction settings. Evaporation, suction or chilled water output sensor fault.			settings. or.		
Wiring fault or disconnection of the sensor.Check sensor connection.Water flow in the evaporator insufficient.Check flow and setting of flow controller.					



s KP02 : n4 rical expansion valve least 2 minutes and o	KP07 icon :			
rical expansion valve least 2 minutes and o	es.			
rical expansion valve least 2 minutes and c (°C)	es.			
east 2 minutes and o	one of the 2 following conditions			
(°C)				
(°C)				
 Immediate halt of circuit n. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. Resetting Fault resetting is <i>manual</i> .				
Solution Replace the sensor. Check sensor connect	ctions.			
	Solution Replace the sensor. Check sensor conne			



VACUUM SUCTION FAILURE					
Logical variable : DPUMPDn	Incident codes KP02 :	n5 KP07 ico	n: ୟୁନ୍		
Description			MM		
For 2 <i>minutes</i> , a compressor on c pressure is still below minimum.	ircuit n is in operation and th	le liquid solenoid is not co	onnected, but low		
Action					
Action					
 Immediate halt of circuit n. The fault is displayed on the scree The remote fault report is delayed 	n. for 6 minutes.				
Resetting					
licounig					
The first 2 faults are automatically re	eset after 2 minutes .				
After this, circuit n can only be restarted after a <i>manual</i> reset.					
<u>Note</u> : Counters of "pump down" failures TOPUMPDn are all <i>reset to zero daily at 6 pm</i> , on condition that the maximum number of authorised faults has not been reached.					
Trouble-shooting	Solution				
Liquid solenoid blocked open by fore	ign matter. Change tl	ne solenoid valve.			



SENSOR OR DETECTOR FAULTS					
Logical variable : DSONDEn	Incident code	s KP02: n6	KP07 icon : 🎽		
Description			¥		
One or more temperature sensors or pressure detectors installed on circuit n are either in short-circuit, broken or disconnected.					
Sensor or detector involved Suction temperature sensor Internal sensor on electronic ex Low pressure detector High pressure detector	<u>d</u> pansion	<u>Condition for</u> TAS 1000 U ≤ BPn HPn	r occurrence of fault Pn ≤ -40°C ≤ RDETn ≤ 50 U ≤ 0,5 bars 1 ≤ 0,5 bars		
Note : All these sensors and detectors are not necessarily present on the same machine.					
Action Immediate halt of circuit n. The fault is displayed on the screer The remote fault report is delayed for the remote fault report is delayed for the screen fault report is delayed fault report report is delayed fault report fault report re	n. for 6 minutes.				
Resetting Circuit n can only be restarted after manual resetting and correct reading of all detectors and sensors.					
Trouble-shooting Sensor or detector fault. Wiring fault or disconnection of a sens	sor or detector.	Solution Replace the eleme Check sensor and	ent. detector connections		



EXPANSION VALVE OPENING INCORRECT

Logical variable : DCDETn

Incident codes KP02 : n7

KP07 icon :

빤

Description

This fault is only processed on units equipped with electric expansion valves DANFOSS TQ type.

No compressor on circuit n is working. A compressor start-up command has been issued and the expansion valve is in the pre-heat phase.

After **6** minutes, the expansion value opening value calculated for start-up of the compressor has still not been reached.

Action

Circuit n start-up is not authorised.

- The fault is displayed on the screen.
- The remote fault report is delayed for 6 minutes.

Resetting

Fault resetting is *manual.*

Trouble-shooting	Solution
Expansion valve sensor fault.	Replace expansion valve.
Wiring fault or disconnection of the sensor.	Check sensor connection.
24V supply fault on expansion valve.	Check supply
The green LED on the static relay is lit up but the	Check the static relay and the expansion valve
expansion valve is not heating.	controller card.


COMPRESSOR FAULTS

CONTENTS

COMPRESSOR CUT-OUT SWITCH TRIPPED	,
OIL PRESSURE INSUFFICIENT	}
EXCESS HIGH PRESSURE)
DISCHARGE TEMPERATURE TOO HIGH40)
INTERNAL PROTECTION TRIPPED41	



Page

COMPRESSOR CUT-OUT SWITCH TRIPPED			
Logical variable : DELECmn	Incident codes KF	202 : mn1	KP07 icon : 🕼
Description		I	, <u>n</u>
The thermomagnetic cut-out switch on o	compressor mn is tri	oped (ELECmn = 0)	
Action			
 Immediate halt of compressor mn. The fault is displayed on the screen. The remote fault report is delayed for 	r 6 minutes.		
Resetting			
Compressor mn can only be restarted after engagement of the cut-out switch and a <i>manual</i> reset.			
Trouble-shooting	S	olution	
Faulty connection or connections too tig Cut-out switch wrongly set.	ght. Cl Se fo	neck connections. et the protection in a r the compressor.	ccordance with the rated current



OIL PRESSURE INSUFFICIENT			
Logical variable : DHUILEmn	Incident codes KP02 : mn	2 KP07 icon : ∰	
Description			
This fault only applies to semi-her	metic reciprocating compressor	·S.	
The total time during which the oil pro The oil pressure is then insufficient fo	essostat on compressor mn POILn or proper lubrication of the compre	nn remains tripped exceeds <i>90 seconds</i> . ssor.	
<u>Note</u> : The counter for periods of lo triggering point for over 3 m	ow oil pressure is reset to zero if th inutes.	e oil pressostat remains above its	
Action			
 Immediate halt of compressor mn. The fault is displayed on the screet The remote fault report is delayed 	en. for 6 minutes.		
Resetting			
The first fault is reset automatically .			
After this, compressor mn can only b	e restarted after a <i>manual</i> reset		
Note : Counters for "oil pressure" failures TOOILmn are all reset to zero daily at 6 pm , on condition that the maximum number of authorised faults has not been reached.			
Trouble-shooting	Solution		
Lack of oil in the compressor. Oil pump fault. Oil pressostat wrongly set. Wiring fault on oil pressostat.	Check oil lev Change oil p Check setting Check wiring	el. ump. g of oil pressostat. on oil pressostat.	



EXCESS HIGH TEMPERATURE			
Logical variable : DHPmn Incident code	s KP02 : mn5 KP07 icon :	l	
Description			
The high pressure safety cut-out on compressor mn PH	IPmn has tripped		
Action Immediate halt of compressor mn. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes.			
Resetting			
The first 2 faults are reset automatically			
After this , the compressor mn can only be started after	a <i>manual</i> reset.		
<u>Note</u> : Counters for " high pressure" failures TOHPmn are all <i>reset to zero daily at 6 pm</i> , on condition that the maximum number of authorised faults has not been reached.			
Trouble-shooting	Solution		
Condenser clogged. Fault on parameter settings for regulation of condensation. Malfunction of liquid solenoid valve. Dehydrator clogged. Wiring fault or high pressure safety cut-out wrongly set	Clean condenser Check parameter settings Check operation of solenoid valve. Replace the dehydrator Check setting and wiring of high pressure safet out.	y cut-	



DISCHARGE TEMPERATURE TOO HIGH				
Logical variable : DREFmn Ind	cident codes KP02 : mn6	KP07 icon : ▲		
Description				
The discharge temperature on compressor mn REFmn stays over 120°C for over 9 seconds .				
Action				
 Immediate halt of compressor mn. The fault is displayed on the screen. The remote fault report is delayed for 6 	3 minutes			
Resetting				
The first 2 faults are reset <i>automatically</i> after a delay of <i>30 minutes</i> on condition that REFmn has dropped below the maximum. After this, compressor mn can only be restarted by <i>manual</i> resetting (this reset can only be processed <i>30 minutes</i> after generation of the fault).				
<u>Note</u> : Counters for "discharge too high" failures TOREFmn <i>are all reset to zero daily at 6 pm</i> , on condition that the maximum number of authorised faults has not been reached.				
Trouble-shooting	Solution			
Discharge sensor fault. Wiring fault on the sensor. Insufficient refrigerant in circuit. Superheat setting too high.	Replace sensor. Check sensor co Check refrigeran Check superheat	nnection. t. t setting.		



INTERNAL PROTECTION TRIPPED	
-----------------------------	--

Logical variable : DPINTmn

Incident codes KP02 : mn7



-			
1)650	rın	tin	n
0000	איי		••

Semi-hermetic compressors (reciprocating and screw type) and scroll compressors: The thermal protection on the motor windings on mn PINTmn is tripped.

Hermetic reciprocating compressors:

Compressor mn has been operating for 6 minutes and the discharge temperature REFmn is less than θ . This shows that the internal protection on the compressor has been tripped.

	θ (°C)
R22 & R407C	40
R134a & R404A	30

Action

☞ Immediate halt of compressor mn.

The fault is displayed on the screen.

The remote fault report is delayed for 6 minutes.

|--|

Resetting

Compressor mn can only be restarted after re-closing the internal protection ans a manual reset.

l rouble-shooting	Solution
Fault on supply to internal protective relay. Discharge sensor badly wired or defective (possible with hermetic reciprocating compressors). Superheat setting too high.	Check supply to relay. Check sensor connection and replace if necessary. Check superheat setting.



MISCELLANEOUS FAULTS

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INTER-CPU DIALOGUE INTERRUPTED			
Logical variable : DSLI	Incident codes KP02 : 8	KP07 icon :	
Description		6 2 01	
The chaining link between 2 (or more	e) cards on the network is interrupted t	for over 15 seconds	
Action The fault is displayed on the scree	ots). n.		
Resetting			
Automatic resetting of the fault 3 minutes after the link between all cards is restored.			
Trouble-shooting Wiring fault on link between CPU's. Power failure on one of the cards. Faulty positioning of SW2 and SW3 ju	Solution Check connectio Check electrical Check the positio	on on link between CPU's. supply to cards. on of jumpers.	



INSUFFICIENT FLOW ESTABLISHED BY THE PUMP				
Logical variable : DSDEBk	Incident codes	KP(81 (pump 1) 82 (pump 2)	KP07 icon : 🗛 🔗	
Description Pump k supplying the evaporator ha	s had the operation	al command for 20 sec	onds	
The "flow switch" FSE detects insuff	icient flow in the exc	hanger for over 25 sec	onds.	
Action				
 <u>Case</u> ●: The unit has one pump only, or no pump (C2POMPE = 0). Immediate halt of pump k. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. 22 seconds before generation of the fault, the machine has been stopped with the fault "insufficient flow of chilled water" (see page 23). 				
 <u>Case</u> : The unit has two pumps (C2POMPE = 1). Immediate halt of pump k. Start-up of the 2nd pump (see chapter "control of evaporator pumps " page 4). The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. 				
Resetting				
<u>Case</u> ●: The unit has no pump (C2POMPE=0 and the flow-switch is closed without POMPEk having the operational command). The machine restarts automatically 20 seconds after the flow is restored.				
<u>Case</u> ❷: The unit has one pump (The machine can only be	C2POMPE=0). restarted after a ma	nual reset		
<u>Case</u> : The unit has <i>two pumps</i> (C2POMPE=1). If the flow is restored within 20 seconds following the start-up command issued to the 2nd pump, the machine restarts <i>automatically</i> . Otherwise, the unit can only be restarted after a <i>manual</i> reset.				
Trouble-shooting		Solution		
Wiring fault on the control pump. Wiring fault on the flow controller. Water filter clogged. Flow controller wrongly set.		Check the pump con Check the connection Clean the water filter Adjust the flow contro	nection. n on the flow controller. oller setting.	



FAN CIRCUIT BREAKERS TRIPPED				
Logical variable : DELECV	Incident codes KP02 :	90 KP07 icon : (₩ ₩	
Description			0	
One or more thermomagnetic circuit b	preakers protecting the air con	denser fans are tripped. (ELECV	′ = 0).	
Action				
The fault is displayed on the screen	n.			
The remote fault report is delayed fault	for 6 minutes.			
Resetting				
The fault is reset automatically once all the fan circuit breakers are reset				
Trouble-shooting	Solution			
Bad connection or connections too tig Circuit breakers wrongly set.	ht. Check co Set prote	nnections. ctions according to the rated curr	ent for fans.	
		-		



PUMP CIRCUIT BREAKER TRIPPED					
Logical variable : DELECPk	Incident codes KP_{92}^{91}	(pompe 1) (pompe 2)	KP07 icon :		
Description					
The thermomagnetic circuit breaker on pump k is tripped (ELECPk = 0).					
Action					
Action Case ①: Pump k is in service and the unit has only one pump (C2POMPE = 0). Immediate halt of pump k Immediate machine halt The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. Case ②: Pump k is in service and the unit has two pumps (C2POMPE = 1). Immediate halt of pump k. Start-up of the 2nd pump (see chapter "control of evaporator pumps" page 4). The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. Case ③: Pump k is not in service. The fault is displayed on the screen. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. Case ④: Pump k is not in service. The fault is displayed on the screen. The fault is displayed on the screen. The remote fault report is delayed for 6 minutes. Case ④: Pump k is not in service. The remote fault report is delayed for 6 minutes.					
Resetting Case ① : The machine restarts automatically 20 seconds after the fault has been cleared and the CLIMATIC has restarted the pump Case ② : The fault is reset automatically once the pump circuit breaker is reset Case ③ : The fault is reset automatically once the pump circuit breaker is reset.					
Trouble-shooting	Solut	ion			
Bad connection or connections too tig Circuit breaker wrongly set.	ht. Check Set the for the	< connections. e protection in a e pump.	accordance with the rated current		



Logical variable : DCONS

Incident codes KP02: 95

KP07 icon :

Description	D	es	cri	pti	on	
-------------	---	----	-----	-----	----	--

The unit should be regulated to the water instruction sent remotely by the customer (SGLCONS = 1), but the signal received is incorrect (TCONS < -25°C).

Action

- The machine is not stopped and is regulated to its own water instruction.
- The fault is displayed on the screen.The remote fault report is delayed for 6 minutes.

Resetting

Once TCONS > -25°C, the fault is reset *automatically*.

The machine can once again be regulated to the remote instruction.

Trouble-shooting	Solution
Wiring fault on 4/20mA signal.	Check wiring (see wiring diagram).



TEMPERATURE OF FREE-COOLING OUTSIDE RANGE			
Logical variable : DSONDEFC	Incident codes KP0	2: 97	KP07 icon :
Description			
The inlet chilled water temperature, cooling coils), is outside authorized ra	which is measured by the	e sensor locate	ed on the collector (forward free-
TEEGFC < -15°C ou TEEGFC	> 65°C		
Action			
 Immediate halt of free-cooling (free The fault is displayed on the scree The remote fault report is delayed 	e-cooling fans stop and the n. for 6 minutes.	e 3 way valve co	ompletely by-pass the coils)
Resetting			
Automatic fault resetting, as soon as	s inlet chilled water tempera	ature is inside tl	ne normal operation conditions.
-10°C < TEEGFC < 60°C			
Trouble-shooting	Solut	ion	
Sensor fault on free-cooling water inl	et. Repla	ce sensor.	
Wiring fault or disconnection of sense	or. Check	sensor conne	ction.



DIALOGUE BETWEEN CPU AND KP07 INTERRUPTED			
Logical variable : -	Incident code	es KP02 : -	KP07 icon : 🛔 💭
Description			2 8 54
After 3 attempts, the KP07 VDU has cards connected to it.	not succeeded in es	stablishing a dialogue	e with at least one of the CPU
Action			
 Regular attempts to restore comm The fault is displayed on the scree The remote fault report is delayed 	unication. n. for 6 minutes.		
Resetting The fault is reset <i>automatically</i> once	e dialogue is restore	.d.	
Trouble-shooting		Solution	
Wiring fault on link between the KP07 Power failure on one of the cards.	7 and the CPU.	Check the connecti Check electrical su	on of the link between the cards. pply to cards.





This console is principally used to read and/or modify the values of variables or instructions for the CPU card to which it is connected.

Dialogue with the CPU is initiated by the KP02. If, after 3 attempts, communication is not established, a message indicating the communication problem is displayed (see §II.5.c). The console will then make regular attempts to reconnect.

Data transmission speed is 1200 baud, in 8-bit format (1 start, 8 bits, odd parity, 1 stop).

II. DISPLAY FORMATS

II.1. Time



 \Leftrightarrow 12 hours and 59 minutes

When the console keypad is inactive for 5 minutes, the time is automatically displayed.



CONSOLE NUMERIQUE KP02

II.2. Date



II.3. Address of a varialbe



II.4. Value of a variable

II.4.a. Logical values





II.4.b. Températures

The temperatures are displayed in °C, to nearest 0.1°C.



KP02 DIGITAL CONSOLE

When a fault occurs on the machine, the red led "general alarm" flashes. If the user whishes to know the nature of the fault, he can consult the variable "breakdown" representative of the code "breakdown".

II.5. Specific displays

II.5.a. Application release

When the console is switched on, the computer application release number is displayed.



II.5.b. Test de l'afficheur

Correct operation of the VDU can only be tested at the time the console is switched on, by pressing on the 3 keys "A", "M" and "-" simultaneously. Correct operation of the VDU is shown as follows:



II.5.c. KP02 / CPU communication fault

An absence of dialogue between the KP02 console and the CPU card is signalled by the permanent following message:



 $\Leftrightarrow "communication problem"$

III. OPERATING MODES

4 modes are available:

- 1. VARIABLES mode is used to read the values of variables.
- 2. INSTRUCTIONS mode is used to modify setting instructions.
- 3. READ DATER mode is used to read the time and date.
- 4. SET DATER mode is used modify the time and date.

The user selects the required mode by pressing the "M" key as many times as necessary.

Mode	Indicator "V"	Indicator "C"
VARIABLES	On	off
INSTRUCTIONS	Off	On
READ DATER	Off	Off
SET DATER	On	on



KP02 DIGITAL CONSOLE

III.1. VARIABLES mode

Pressing on "A" displays the address of the variable currently being read.

The address is incremented by pressing keys "A" and "+" simultaneously. The address is incremented slowly if "+" is pressed briefly, or faster if it is pressed continuously.

The address is decremented in a similar manner, using keys "A" and "-".

When the required address is selected, pressing key "V" displays the value of the corresponding variable. Variables are updated cyclically every n seconds.

<u>Note</u>: When an address is selected, if the user does not enter a value request, this takes place automatically after 1 minute.

III.2. INSTRUCTIONS mode

The address of the instruction to be modified is selected as for VARIABLES mode (see § III.1.).

The value of the instruction is increased by pressing keys "V" and "+" simultaneously. The value increases slowly if "+" is pressed briefly, and faster if it is pressed continuously. Slow incrementation is by 0.1 for temperatures and pressures and 1 for other values. Fast incrementation starts with the rightmost digit then moves to the left.

Decrementation is in a similar manner, using keys "A" and "-".

As soon as key "V" is released, the value displayed is sent to the CPU.

Access to instructions other than CONSEA, CONSEB, DELTAT, MAARCn and RESET is restricted. For access to all instructions, a password must be entered in the reserved instruction at address no.0. If the password is correct, the following message is displayed when key "V" is released:



After 5 minutes of keypad inactivity, the console automatically cancels unlimited access to instructions. To modify a protected instruction the password must be re-entered.

III.3. READ DATER mode

Read accessible dater elements are :			
. Time	\Leftrightarrow	HEure	
. and date	\Leftrightarrow	9966	

The element is selected by holding key " A " pressed down and pressing briefly on " + " or " - .



CONSOLE NUMERIQUE KP02

Pressing key "V" displays the value of the selected data item.

Note: If the user does not press "V", the value appears automatically after 1 minute.

III.4. SET DATER mode

This mode can be used to adjust the 6 dater elements :



The element to be modified is selected as for READ DATER mode.

In the same way as for instructions, incrementation of the value is by simultaneously pressing keys "V" and "+" and decrementation by simultaneously pressing "V" and "-".

For the different types of data, setting ranges are as follows :

Item	Minimum value	Maximum value
Hours and minutes	00-00H	23-59H
Day of the month	1	31
Day of the week	1	7
Month	1	12
Year	0	99

Pressing key "A" saves the value entered.

Note: Months with less than 31 days are not automatically checked on entry. If a day is entered which is not compatible with the current month, the value is refused at dater level and the old day is retained. Examples:

	Day of the month			
	Current value Value entered Final value			
02 (February)	15	30	15	
10 (September)	26	31	31	



KP07 VDU (VISUAL DISPLAY UNIT) CONSOLE

IV. GENERAL PRESENTATION

The KP07 console is a man-machine interface with a black and white liquid crystal graphics screen, back-lit, with definition 240 x 128 pixels. It also has 2 indicator lights and 12 keys.



The principal functions of the console are :

- Management of the tree structure of interactive screens.
- Permanent updating of all dynamic parameters displayed on the different screens.
- Saving successive states of predefined variables to be used for analogue and event logs.

A KP07 console can be connected to a maximum of 8 distinct controllers, on condition that they all have the same structure of variables. The number of controllers connected is declared in the application program for the VDU. If a single CPU is connected, its card number is also declared.

The controller / VDU link is serial type and uses JBUS protocol. On connection, the console tries to establish a dialogue with the declared controllers. If, after 3 attempts, the console cannot communicate with a controller, the latter is set to "disconnected" status. The link problem is then displayed on the screen (if the disconnected controller is selected for operator dialogue) and saved in the event log. The KP07 then makes regular attempts to reconnect.

Communication speed is 4800 baud. Data is transferred in 8-bit format (1 start, 8 bits, odd parity, 1 stop).



KP07 VDU (VISUAL DISPLAY UNIT) CONSOLE

I.1. Key allocation

I.1.a. SCREEN keys

These are the 7 keys located around the LCD screen :



The function of these keys may vary from one screen to another, and is defined on the active screen by an icon. For keys "1", "2" "3" and "4", the icon is displayed above the key. For the other 3 keys "A", "B" and "C", the icon is displayed to their left.

Each key offers the possibility:

- of accessing another screen.
- or entering a Boolean value in a given variable.

I.1.b. Offset keys

The functions of these 5 keys are fixed.

\bigcirc	PAGE DOWN key:	Go to the next page of the same type of screen.
0	PAGE UP key :	Go back to the previous page of the same type of screen.
S	SUMMARY key :	Go back to the first screen in the tree structure ϵ -to-d summary)
	LAST SCREEN key :	Return to the last screen selected.
M	MODIFICATION key :	Pressing this key activates " modification " mode (see § 1.2.)

I.2. "Modification" mode

This mode is used to modify the values of all modifiable variables displayed on the active screen. This mode uses the 4 keys "1", "2", "3" and "4", assigning them pre-defined functions :

Key	Associated icon	Key function
1	Ē	Selection of the variable to be modified.
2	Ð	Selection of the number to be modified. (Press the key successively to move the cursor, digit by digit, from the right to the left, then the cursor is repositioned on the last digit of the value to be changed.)
3	0	Incrementation of the digit from 0 to 9.
4	e	Confirmation of the current modification.



"Modification" mode offers the user the following main possibilities :

- Selecting the number of the controller on which variables are to be displayed (where several KP01 cards are connected to the same KP07 console)
- Setting instructions
- Configuration of on/off switches on circuits.

To exit from "modification" mode and return to the active screen, press MODIFICATION key.

<u>Notes :</u> - During the modification phase, the screen is no longer updated.

- If a modification is not confirmed, the variable remains at its previous value.

I.3. Contrast adjustment

Contrast on the display unit is adjusted in " modification " mode (see § 1.2) :

- Press successively on key " A " to increase contrast.
- Press successively on key " B " to reduce contrast.
- Key " C " is used to restore the contrastsetting by default.





* For units with more than one refrigeration circuit, branches C2, C3 and C4, corresponding to operating states for circuits 2, 3 and 4 respectively, are active.



CONSOLE GRAPHIQUE KP07

VI. VI. CONTENT OF SCREENS

III.1. Summary



The water instruction is a variable which can be modified in "modification" mode. For a liquid cooler, the value displayed or entered is read or copied respectively into the active instruction ("A" or "B" depending on the value of the variable CHPCONS).

Where several KP01 cards are connected to the same KP07, the controller number can also be modified. On all other screens, the controller number can only be read.

Date and time data can also be changed. Every 24 hrs, the console automatically reads the date and time on the lowest JBUS address controller and sends this information to any other controllers connected to it.

III.2. Water output temperature curve



The monitoring frequency for the temperature of chilled water output (or hot water for a PAC) is 10 minutes, over a complete 24 hour cycle. The console therefore memorises the last 144 values of the monitored variable.





III.5. Refrigeration diagrams

III.5.a. Groupes à condensation par air



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III.6.c. TOR outputs and other variables



This screen shows the state of the of actuators which command circuit components other than the compressors, whose operation has already been described in operating states for circuits (see § III.4.). This screen also displays significant calculation variables for the circuit, such as the anti-short cycle for compressors.

III.7. Pump operating states





III.9. Tables of general variables



This screen gives access to the values of analogue inputs, logic inputs, TOR outputs, fault counters, and other variables relating to the entire machine (not related to a specific refrigeration circuit). Each variable is identified by its mnemonic.

III.9.a. Analogue inputs



This screen contains the temperatures associated with specific options (e.g.: temperature of hot water output from heat recovery / temperature of chilled water output from free-cooling).

III.9.b. Logic inputs

N.Ø			
MAARD	ON	ELECP1	ON
PHASE	ON	ELECP2	ON
PT230V	ON	ELECV	ON
FSE	ON	CHPCONS	OFF
		C2POMPE	ON

This screen shows the states of contacts which have an effect on the overall operation of the machine (e.g.: remote on / off, circuit breakers for pumps, choice of setting instruction, etc.)







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III.10. Fault log



The event log can be used, depending on the configuration chosen in the console application program, to record :

- either the last 24 fault occurrences
- or the last 24 fault occurrences and clearances .

The log displayed relates only to the controller which is currently in communication with the display unit. If other KP01 cards are linked to this display unit, their respective event logs can be accessed by modification of the controller number in the summary screen (see § III.1.).

III.11. On / off switches on refrigeration circuits

N.Ø		(ੇੇ _ਸ ਼	☞♪
C1 태 <mark> </mark>	ON		_
C2 터	ON		

This screen can be used to configure authorisation to switch on each refrigeration circuit, or to keep it switched off, using "modification" mode.











VII. GLOSSARY OF ICONS

Icons are classed in 6 categories:

- 1. Keys
- 2. Screen headings
- 3. Identification of components
- 4. Operating states
- 5. Faults
- 6. On / off settings and instructions

<u>IV.1. Keys</u>



Access to the temperature curve for water output from machine. Access to operating states for refrigeration circuits, pumps and machine Access to operating state for refrigeration circuit no.1 (no faults are reported on the circuit Access to operating state for refrigeration circuit no.1 (there is a fault on the circuit). Access to operating state for refrigeration circuit no.2 (no faults are reported on the circuit). Access to operating state for refrigeration circuit no.2 (there is a fault on the circuit). Access to operating state for refrigeration circuit no.3 (no faults are reported on the circuit). Access to operating state for refrigeration circuit no.3 (there is a fault on the circuit). Access to operating state for refrigeration circuit no.4 (no faults are reported on the circuit). Access to operating state for refrigeration circuit no.4 (there is a fault on the circuit). Access to operating state for chilled water pumps (no faults are reported on the pumps). Access to operating state for hot water pumps (no faults are reported on the pumps). Access to operating state for hot water pumps (there is a fault on the pumps). Access to operating state for hot water pumps (there is a fault on the pumps). Access to operating state for machine (there is a fault on the machine). Access to operating state for machine (there is a fault on the machine). Reset faults and fault counters to zero. Access to refrigeration diagram for selected circuit.





Access to fault log.

Access to the different tables of variables.

Access to analogue inputs (other than those shown on refrigeration diagrams).

Access to logic inputs.



Access to TOR outputs.

Access to TOR outputs and other variables associated with the selected refrigeration circuit.

Access to miscellaneous variables.

Access to fault counters.

Access to on / off controls and instructions. Selection of the variable to be modified (see §I.2.).

Selection of figure to be modified (see §I.2.)



Incrementation of figure from 0 to 9 (see §I.2.).



Validation of current modification (see §I.2.).

Access to on / off controls for refrigeration circuits.



Access to the various instructions.





Access to control parameters for condenser fan.



Access to idle timers (day / night).



Access to parameters for regulation with gradient on air temperature.

IV.2. Screen headings



Temperature curves for water output from the machine.

Access to operating states for refrigeration circuits, pumps and machine.


KP07 VDU CONSOLE



Operating state of refrigeration circuit no.1.

Operating state of refrigeration circuit no.2.

Operating state of refrigeration circuit no.3.

Operating state of refrigeration circuit no.4.

Operating state of chilled water pumps.

Operating state of hot water pumps.

Operating state of machine.

Fault log.

Access to the different tables of variables.

Analogue inputs (other than those shown on refrigeration diagrams).

Logic inputs.

TOR outputs.

TOR outputs and other variables associated with selected refrigeration circuit

Fault counters.

Miscellaneous variables.



On / off controls for refrigeration circuits.



On / off controls for chilled water pumps.

On / off controls for hot water pumps.

Password entry for access to modifiable instructions.



Access to the various instructions.

Water temperature instructions.



Control parameters for condenser fan.



KP07 VDU CONSOLE



Parameters for regulation with gradient on air temperature.



Idle timers (day / night).

IV.3. Identification of components



Machine.



Refrigeration circuit no. 1

Refrigeration circuit no. 2

Refrigeration circuit no. 3

Refrigeration circuit no. 4

Compressor or pump no. 1 (in " circuits or pumps " operating states respectively).

Compressor or pump no. 2 (in " circuits or pumps " operating states respectively).

Compressor no. 1 for refrigeration circuit no. 1

Compressor no. 2 for refrigeration circuit no. 1

Compressor no. 1 for refrigeration circuit no. 2

Compressor no. 2 for refrigeration circuit no. 2

Compressor no. 1 for refrigeration circuit no. 3

Compressor no. 1 for refrigeration circuit no. 4

Chilled water pump no. 1.

Chilled water pump no. 2



CONSOLE GRAPHIQUE KP07



Hot water pump no. 1.

Hot water pump no. 2.

IV.4. Operating states



Stages required for chilled water regulation.

Stages required for hot water regulation.

Compressor in operation (representation on refrigeration diagram).

Compressor in operation.

Compressor in operation at full capacity.

Compressor in operation at reduced capacity.

Compressor operating at 75% of its total capacity

Compressor operating at 50% of its total capacity.

Compressor operating at 25% of its total capacity.

Compressor stopped (representation on refrigeration diagram).

Compressor stopped.

Compressor stopped for regulation.

Compressor stopped in anti-short cycle.

Compressor stopped by idle timers

Compressor stopped by non operation of pump.



CONSOLE GRAPHIQUE KP07



Compressor stopped by refrigeration circuit on/off.

Compressor stopped by remote on / off command to machine.



Pump in operation.



Pump stopped.

IV.5. Faults



On the unit, presence of a machine, circuit compressor or miscellaneous fault

Chilled water flow insufficient.

IV.5.a. General machine faults

Chilled water temperature outside authorised range

Hot water temperature outside authorised range.



Absence of power on 230 V electrical supply to the machine.

Incorrect connection of 3 phases of general electrical supply to the machine.

IV.5.b. Faults on the refrigeration circuit



Low pressure insufficient.

Evaporator freezing.



Superheat insufficient.

Vacuum draught on circuit not achieved.



KP07 VDU CONSOLE



Temperature sensors or pressure detectors faulty.

Tripping of thermomagnetic circuit breaker for compressor.



IV.5.c. Compressor faults



Insufficient oil pressure.

Excess high pressure.

Discharge temperature too high.

Tripping of internal protection for compressor.

IV.5.d. Miscellaneous faults

Dialogue interrupted between 2 CPU cards on network.

Insufficient water flow although operational command has been issued to pump.

Tripping of thermomagnetic circuit breaker for at least one fan.

Tripping of thermomagnetic circuit breaker for pump.



Water tank level or pressure insufficient.

Bad reception of 4/20 mA signal transmitted remotely for water instruction.

Chilled water temperature at the input of free cooling outside authorised range.

Dialogue interrupted between KP07 console and a CPU card on the network.



KP07 VDU CONSOLE

IV.6. On / off settings and instructions

- C1 स¦ С2 н¦ СЗН C4 H IINI
- On / off refrigeration circuit no. 1.
- On / off refrigeration circuit no. 2.
- On / off refrigeration circuit no. 3.
- On / off refrigeration circuit no. 4.
- On/Off pump no. 1.
- On/Off pump no. 2.
- First chilled water setting (CONSEA).
- Second chilled water setting (CONSEB).
- Active chilled water setting (measured variable CONSREG)
- First hot water setting (CONSEA).
- Second hot water setting (CONSEB).
- Active hot water setting (measured variable CONSREG)
- Desired temperature difference, as an absolute value, between processed water input and output (DELTAT).
- Minimum chilled water temperature (TEGI).



Minimum evaporation temperature (TBPI).



ELECTRONIC CARD DATA

CONTENTS

CLIMATIC CARD KP01				
EXTENSION - 16 LOGIC INPUTS KP0383				
EXTENSION -ANALOGUE OUTPUT KP0484				
EXTENSION - 8 ANALOGUE INPUTS KP0585				
EXTENSION - 8 RELAYS KP0886				
EXTENSION - +18VDC SUPPLY KP1087				
FEMALE CARD -ANALOGUE OUTPUT KP1189				
DIGITAL CONSOLE KP0290				
VDU CONSOLE KP0791				



CLIMATIC CARD KP01

• General presentation

The CLIMATIC consists of a main KP01 microcontroller card, with 8 analogue inputs, 8 logic inputs and 8 logic outputs in its standard version. Two analogue outputs and a +18Vdc supply are also available as an option.

- Togic inputs are linked to hard contacts.
- The Analogue inputs are linked to temperature or pressure detectors.
- To Outputs are connected to control contactors (compressors, fans, etc.).

Modules can be added to the system using extension cards :

- @ 3 extensions 16 logic inputs (KP03 card)
- @ 4 extensions analogue output (KP04 card)
- 3 extensions 8 analogue inputs (KP05 card)
- @ 4 extensions 8 supplementary logic outputs (KP08 card)
- @ 2 asynchronous serial links for dialogue with:
 - a micro-computer or a VDU console (1200, 2400 or 4800 baud).
 - a basic digital console (KP02), and/or a VDU console with LCD display unit (KP07).

Replacement of a KP01 card

Procedure to be followed :

- Note the values of all settings.
- Turn off the power supply to the card and change the card.
- The Retrieve the EPROM from the old card and fit it to the new one (see drawing below).
- The Reconnect all the connections to the CLIMATIC, referring to the wiring diagram.
- The set the battery jumper to position "on" (T) together with the various configuration jumpers.
- Turn the power supply to the card back on and enter the old settings on the new card.

Note : Never connect or disconnect the I²C connectors when the power supply to the card is on.

Positioning direction for the EPROM :





CLIMATIC CARD KP01

❸ Supply

A single transformer provides the power supply to the Climatic and its extensions :



12V/6VA for supply to KP07VDU console 12V/7.2VA for isolated supply to extensions KP03/KP04/KP01 12V/50VA for KP01 supply

Switches Switches

SW2,SW3: By default, the card is configured in If there is a link between cards (max

If there is a link between cards (maximum 8), set switches as follows:

- Card 0 (master) internal supply: SW2 and SW3 = 1-2
- Card n (slave) external supply: SW2 and SW3 = 2-3 (card 0 supplies the link)
- ☞ <u>SW4</u> :

This switch turns the battery on or off. Caution: the dater will not work if the battery is not in position "on".

☞ <u>SW5-1 à SW5-8</u>:

These switches are used to configure the type of analogue input (CTN / 0-20mA / 0-5V). Caution: every addition of a KP05 extension (1 to 3) causes an analogue input (1 to 3) on the main KP01 unit to become unavailable. In this case, the switches for the corresponding inputs (SW5-1 to SW5-3) must be set to "inactive", i.e. neither on position CTN, nor on 0-20mA, but simply withdrawn.

❺ <u>Bus I²C</u>

Never handle the I²C bus when the power is switched on.





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CARTE CLIMATIC KP01

Key :

J1 to J8:	3 point removable pin connectors, pitch 5.08 for 8 changeover relays
J10:	3 point removable pin connectors, pitch 5.08 for $\ 12Vac \ supply \ and \ Earth$
J11:	2 point removable pin connectors, pitch 3.81 for 12Vac isolated supply
J13:	3 point removable pin connectors, pitch 3.81 for card chaining
J14, J15:	RJ45 connectors for I ² C bus
J17, J21:	2 point removable pin connectors, pitch 3.81 for 2 analogue outputs
J18, J22:	4 point removable pin connectors, pitch 3.81 for 2 serial links
J24:	2 point removable pin connectors, pitch 3.81 for +18Vdc supply
J25:	12 point removable pin connector, pitch 3.81 for analogue inputs
J26:	12 point removable pin connector, pitch 3.81 for logic inputs
PT1, PT2:	12Vac
PT3:	0V isolated
PT6:	11V isolated
PT4:	Vcc(+5V)
PT5:	Gnd
PT7:	Vref
PT9:	Reset
PT10:	Power Fail
PT11, PT13:	12Vac isolated
PT12:	Clock
SW1:	DIL microswitches
SW2, SW3:	Configuration switches for internal or external supply to chaining link
SW4:	Battery switch (on or off)
SW5:	Configuration switch - type analogue input



EXTENSION 16 ENTREES LOGIQUES KP03

The KP03 card is used for processing the 16 logic inputs (10V/10mA).

It is possible to connect up to 3 extensions to a KP01 card, to attain a maximum capacity of $8 + 3 \times 16 = 56$ logic inputs.

The state of each input is shown by an LED.





EXTENSION ANALOGUE OUTPUT KP04

The KP04 card provides, via a digital/analogue converter, analogue output (0-10V), resolution 39mV.

It is possible to connect up to 4 KP04 extensions to the same CPU, which offers a maximum capacity of $2 + 4 \times 1 = 6$ analogue outputs.

The card is calibrated by adjusting the potentiometer P1.



- PT7: +12V r
 - +12V rectified and filtered (before adjustment)



EXTENSION 8 ENTREES ANALOGIQUES KP05

The KP05 card is used for the acquisition of 8 analogue inputs. These inputs may connect either a CTN temperature sensor ($10K\Omega$ at 25°C), or a conventional 0-20mA detector (via the +18Vdc supply). The type of element connected is configured using switch SW1.

It is possible to connect up to 3 KP05 extensions to the same CPU card. Every addition of a KP05 means that a KP01 analogue input becomes unavailable. The complete configuration therefore allows a maximum number of $5 + 3 \times 8 = 29$ inputs.

<u>Note</u>: Inputs 5 to 8 are not equipped to receive a 0-20mA signal. In fact resistors R10 to R14 ($249\Omega/0.1\%$) are not fitted in the original configuration.



Key :

J1 (JEA):	12 point removable pin connector, pitch 3.81 for analogue inputs
J2:	14 point HE10 connector for analogue bus
J3:	2 point removable pin connector, pitch 3.81 for the two outputs +18Vcontinuous
LD1:	LED presence of power
SW1 to SW8:	Jumpers for the configuration of 0-20mA inputs or CTN The position of jumpers, depending on the type of input, is marked on the card.
SW9:	Switches for configuration of the card address.



EXTENSION 8 RELAYS KP08

The KP08 card carries 8 outputs on changeover relays (16A/250Vac).

It is possible to connect up to 4 KP08 cards to the same CPU, offering a maximum number of $8 + 4 \times 8 = 40$ discrete outputs.



<u>Key</u> :

- J1 to J8:3 point removable pin connector , pitch 5.08 for double-throw contacts for relays RL1 to RL8J9, J10:RJ45 connector for I²C BusLD1:LED presence of power from KP01
- LD2: LED presence of I²C dialogue
- SW1, SW2:
 Switches for configuration of the card address

 The position of jumpers for each configuration is marked on the card.

 PT1:
 VRF

 PT2:
 Earth
- PT3: Vcc (+5V)



EXTENSION ALIMENTATION +18VDC KP10

Presentation :

The KP10 extension is presented in the form of a small plug-in card positioned on the main KP01unit and designed to supply detectors type 0-20mA.

Precautions :

When installing the module, take care to comply with the circuit orientation as printed on the main KP01 unit.







CARTE FILLE SORTIE ANALOGIQUE KP11

Presentation :

The KP11 extension is presented in the form of a small plug-in card positioned on the main KP01unit. It supplies analogue voltage 0-10Vdc/10mA A CPU may receive 2 cards KP11 at the most.

Precautions :

When installing the module, take care to comply with the circuit orientation as printed on the main KP01 unit.









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VDU CONSOLE KP07

Key :

LD1:	LED presence of dialogue
PT1, PT2:	12Vac
PT3:	Vref
PT4:	Vcc
PT5:	Gnd
PT6:	VLcd
PT8:	Reset
PT9:	Power Fail
SW1, SW2:	Configuration switches internal/external supply
SW3:	On/off switch for back-lighting on display unit

<u>Note</u>: The cable linking the display unit to the main unit must be earthed by means of a ferrule fixed to the front face by the nut provided for this purpose. Since there are joints between the front face and console base, as well as between the base and the door of the electrical cabinet, two bonding straps are required between the latter to ensure a good electrical contact.

<u> Replacement of a VDU console </u>

Procedure to be followed :

- Turn off the supply to the card and change the card.
- The Retrieve the EPROM from the old card and the fit it to the new one (see drawing below).
- The Reconnect all connections to the KP07, referring to the wiring diagram.

EPROM positioning :







GREAT BRITAIN , IRELAND :	LENNOX INDUSTRIES LTD tél. : + 44 1604 599400 fax : + 44 1604 594200 e-mail : marketing@lennoxind.com	
BELGIUM :	LENNOX BENELUX N.V./S.A. tél. : + 32 3 633 30 45 fax : + 32 3 633 00 89 e-mail : info@lennoxbenelux.com	
CZECH REPUBLIC :	JANKA RADOTIN AS tél. : + 420 2 510 88 111 fax : + 420 2 579 10 393 e-mail : janka@janka.cz	
FRANCE :	LENNOX FRANCE tél. : + 33 1 60 17 88 88 fax : + 33 1 60 17 86 58 e-mail : accueil@lennoxfrance.com	ß
GERMANY :	LENNOX RUHAAK GmbH tél. : + 49 69 42 09790 fax : + 49 69 42 53 65 e-mail : info@lennoxdeutchland.com	
NETHERLANDS :	LENNOX BENELUX B.V. tél. : + 31 33 2471 800 fax : + 31 33 2459 220 e-mail : info@lennoxbenelux.com	
POLAND :	LENNOX POLSKA SP z o. o. tél. : + 48 22 832 26 61 fax : + 48 22 832 26 62 e-mail : lennoxpolska@inetia.pl	
PORTUGAL :	LENNOX CLIMATIZAÇAO LDA. tel. : +351 2 999 84 60 fax : +351 2 999 84 68	Alto A
RUSSIA :	LENNOX DISTRIBUTION MOSCOU tél. : + 7 095 246 07 46 fax : + 7 502 933 29 55 e-mail : janka_alex@mtu-net.ru	
SLOVAKIA :	LENNOX SLOVAKIA tél. : + 421 7 44 88 92 16 fax : + 421 7 44 88 16 88	
SPAIN :	LENNOX REFAC S.A. tél. : + 34 902 400 405 fax : + 34 91 542 84 04 e-mail : marketing@lennox-refac.com	10 miles
UKRAINE :	LENNOX DISTRIBUTION KIEV tél. : + 380 44 213 14 21 fax : + 380 44 213 14 21 e-mail : jankauk@uct.kiev.ua	
OTHER EUROPEAN COUNTRIES, AFRICA, MIDDLE-EAST :	LENNOX DISTRIBUTION tél. : + 33 4 72 23 20 00 fax : + 33 4 72 23 20 28 e-mail : marketing@lennoxdist.com	I EM

www.Lennox.com

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