ITELCO-CLIMA

AQL-AQH control

2 Compressors

ELECTRONIC SERVICE MANUAL

AQU@LOGIC CONTROL

1 GENERAL INFORMATION

1.1 INTRODUCTION

This document contains the information and the operating instructions for AQUALOGIC's electronic control.

This information is for the after-sales service.

1.2 MAIN CHARACTERISTICS

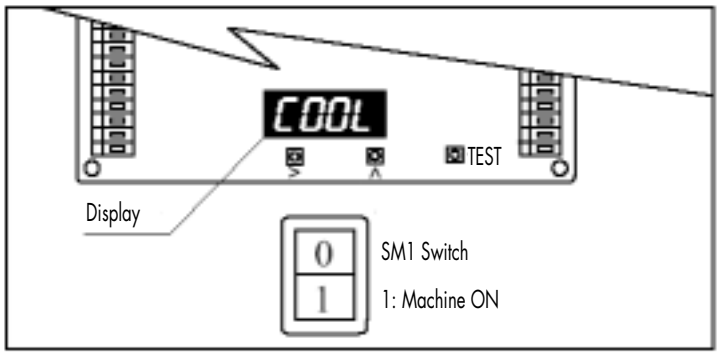
The AQU@LOGIC chillers are equipped with a new-generation microprocessor control system, with considerable intelligent control characteristics, in order to control the temperature of the water entering the machine.

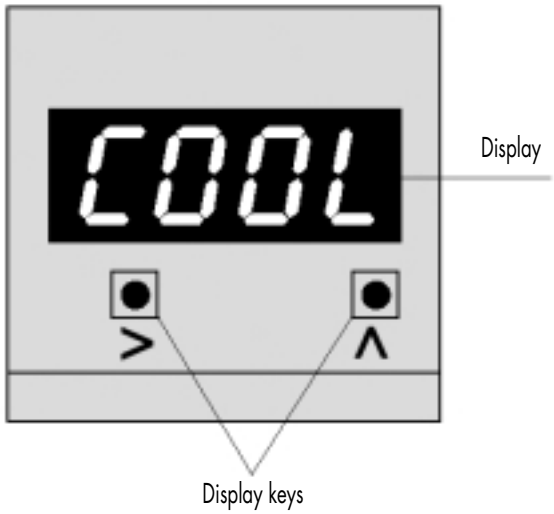
Main characteristics

- "User Friendly": simple and easy to use, only three keys allow you to access all the control functions, through tree-logic menus and sub-menus.
- Reliability: all the messages appear on 4 displays with 7 segments, ensuring perfect visibility also in poor conditions of visibility.
- Special TEST key to start the automatic AutoTest procedure of the machine.
- Intelligent control of the entering water temperature, which reduces the water storage requirements.
- Operating mode: Double Setpoint (Night Mode), which can be remotely selected:
  - to reduce power consumption or
  - to store water at a very low temperature and/or
  - to reduce noise
- Displays all the machine alarms.
- The last 10 alarms are stored (Log menu).
- Start/stop from remote contact.
- The alarm state is reported on the terminal board on the SPST contact.
- Counting of the hours of work (compressors and fans).
- Display and control of all the thermodynamic parameters of the machine (pressures, temperatures, undercooling, overheating, room temperature).
- Discharge and suction pressures controlled by transducers.
- Control of the compressor's maximum discharge temperature.
- Operating mode: load shedding, which can be remotely selected through a contact on the terminal board.

2 ELECTRONIC CONTROLS

2.1 KEYBORD AND DISPLAY





All the information is displayed on 4 displays with 7 segments.

Use the keys **>** and **^** to enter the display menus.

ON/OFF SWITCH SM 1

position **0**: the machine is OFF

position **1**: the machine is ON

FUNCTION OF KEY >

allows you to horizontally scroll the MENUS and to display the values of the different parameters.

FUNCTION OF KEY ^

allows you to vertically scroll the MENUS and the SUBMENUS and to increase the numeric value of the parameters.

FUNCTION OF THE KEY "TEST"

Starts an automatic testing procedure for all the main functions of the units.

2.2 DIP SWITCH

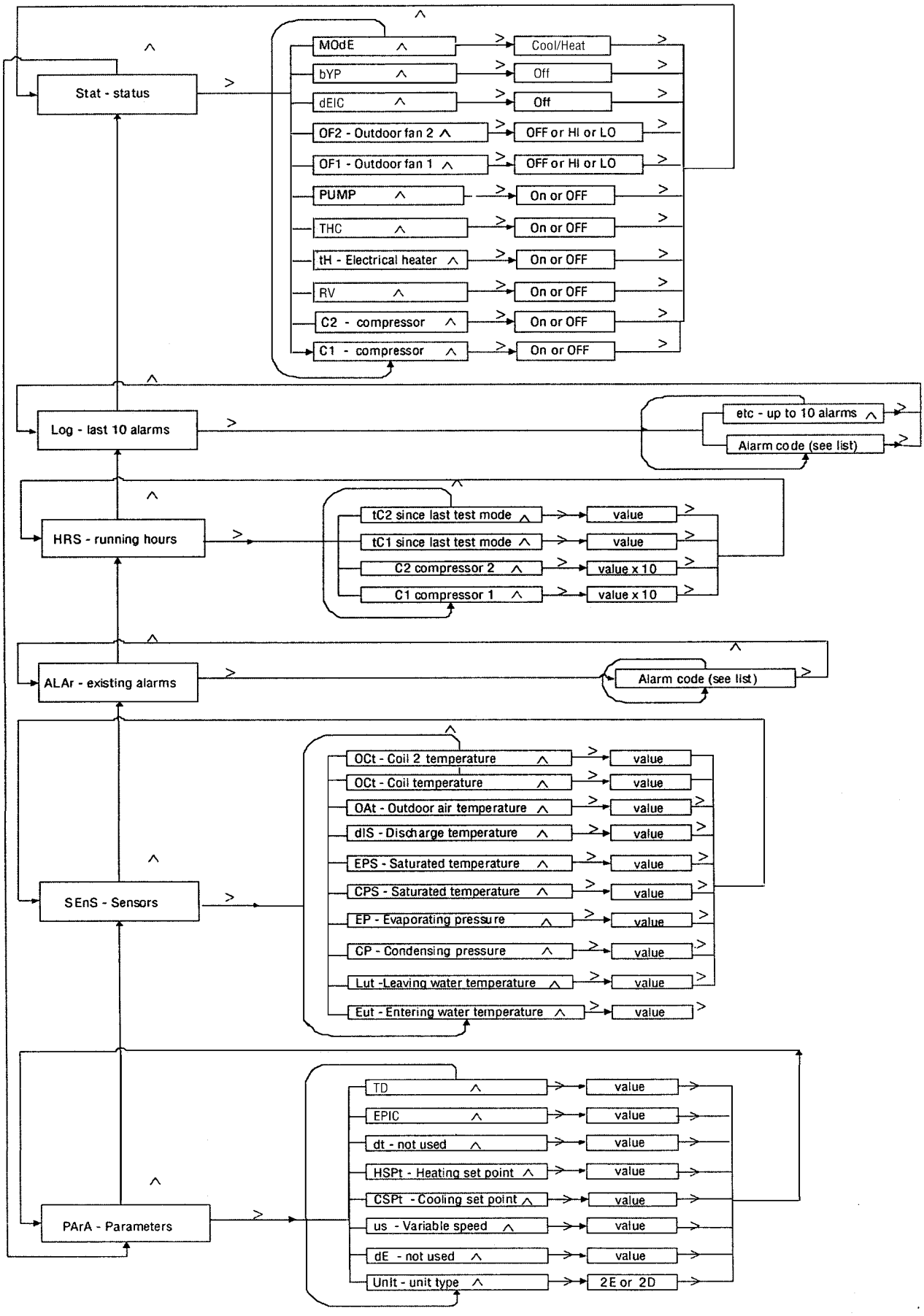
The control features 2 dip switch blocks: DSW1 with 12 dips and DSW2 with 8 dips.

THE DSW1 DIP SWITCH

DIP	OFF	ON	STANDARD
1	Pump ON only if the unit is ON	Pump always ON	OFF
2	Step ventilation	Continuous ventilation	OFF
3	Pump off in antifreeze protection	Pump on in antifreeze protection	ON
4	Discharge of comp. 1	Discharge of comp. 2	OFF
5	Normal	Slave	OFF
6	Room temp. compensation	No compensation	ON
7	Enable input 5 pump thermal switch	Disable input 5	pack unit = OFF no pack = ON
8	Forced defrost OFF	Forced defrost ON	OFF
9	serial address		OFF
10	serial address		OFF
11	serial address		OFF
12	serial address		OFF

THE DSW2 DIP SWITCH

DIP	OFF	ON	STANDARD
1	2E: COMP = COMP2 (20-30-35-80-120-130)	2D: COMP1 ≠ COMP2 (40-50-60-70 90-100-110)	OFF 20-25-30-35-80-120-130 **ON** 40-50-60-70-90-100-110
2	Emergency Ventil. of fan 2	Emergency Ventil. of fan 1	OFF 20-25-30-35
			ON with HP unit 40-50-60-70-80
3	Auto changeover ON	Auto changeover OFF	**ON**
4	Normal	Master	OFF
5	Cool only	Heat pump	cool only = OFF heat pump = **ON**
6	R407C	R22	R407C unit = OFF R22 unit = **ON**
7	1 Coil (20...80)	2 Coils (90...130)	ON/OFF
8	Not used	Not used	OFF


Stat - status
MOdE
Cool/Heat
bYP
Off
dEIC
Off
OF2 - Outdoor fan 2
OFF or HI or LO
OF1 - Outdoor fan 1
OFF or HI or LO
PUMP
On or OFF
THC
On or OFF
tH - Electrical heater
On or OFF
RV
On or OFF
C2 - compressor
On or OFF
C1 - compressor
On or OFF
Log - last 10 alarms
etc - up to 10 alarms
Alarm code (see list)
HRS - running hours
tC2 since last test mode
value
tC1 since last test mode
value
C2 compressor 2
value x 10
C1 compressor 1
value x 10
ALAr - existing alarms
Alarm code (see list)
SEnS - Sensors
OCt - Coil 2 temperature
value
OCt - Coil temperature
value
OAt - Outdoor air temperature
value
dIS - Discharge temperature
value
EPS - Saturated temperature
value
CPS - Saturated temperature
value
EP - Evaporating pressure
value
CP - Condensing pressure
value
Lut -Leaving water temperature
value
Eut - Entering water temperature
value
PArA - Parameters
TD
value
EPIC
value
dt - not used
value
HSPt - Heating set point
value
CSPt - Cooling set point
value
us - Variable speed
value
dE - not used
value
Unit - unit type
2E or 2D

3 PARA READING

Code Parameter	Meaning
Unit	2E or 2D (se dip1 of DSW2)
DE	not used
Vs	analog output fan speed
CSPT	Cooling Setpoint enabled
HSPT	Heating Setpoint enabled
dt	internal timer
EPIC	fixed internal parameter
td	last defrosting time

4 SENSOR READING

Code Display	Meaning
EWT	entering water temperature
LWT	leaving water temperature
CP	discharge pressure
EP	suction pressure
CPS	saturated discharge temperature
EPS	saturated suction temperature
Dis	compressor's discharge temperature
OAT	room air temperature
OCT 1	sensor temperature in coil 1
OCT 2	sensor temperature in coil 2

5 ALARM CODE READING

Code Display	Meaning
ALARM	code

6 HRS RUNNING HOURS

Code Parameter	Meaning
C1 COMPRESSOR 1	hours X 10
C2 COMPRESSOR 2	hours X 10
tC1	value
tC2	value

7 LOG LAST 10 ALARM

Code Parameter	Meaning
ALARM	code

8 STATUS READING

Code Display		Meaning	
C1	COMPRESSOR	Comp 1 on/off	
C2	COMPRESSOR	Comp 2 on/off	
RV	REVERSING VALVE	Rv on/off	ONLY HEAT PUMP
TH	ELECTRIC HEATER	Th on/off	
THC	ELECTRIC HEATER	Thc on/off	NOT USED
PUMP	WATER PUMP	Pump on/off	
OF 1	FAN 1	Fan 1 on/off	
OF 2	FAN 2	Fan 2 on/off	
dEIC		NOT USED	
bYP		NOT USED	
MODE	COOL/HEAT PUMP	Off cool	

9 MENU

ALARM

The ALARM menu displays the alarms of the unit that have been activated. Several alarms can be activated at the same time. The alarms are stored in a permanent LOG memory.
The LOg menu displays the last 10 alarms recorded.
The table below shows the codes and the description of the alarms:

Code	Description Alarm	Auto	Manual	Notes
ADC	Microprocessor error		●	
CPF	HP transducer failure, off scale	●		
EPF	LP transducer failure, off scale	●		
REF	refrigerant leak – low pressure	●		
CPnc	HP transducer failure, unchanged pressure	●		
EPnc	LP transducer failure, unchanged pressure	●		
CFC1	failure of compressor 1		●	wrong rotation
CFC2	failure of compressor 2		●	wrong rotation
EWTH	failure of return water sensor	●		short-circuit
EWTL	failure of return water sensor	●		not connected
LWTC	no variation in the leaving water temperature	●		
LWTH	failure of leaving water sensor	●		short-circuit
LWTL	failure of leaving water sensor	●		not connected
DISH	failure of compressors' discharge temperature sensor	●		short-circuit
DISL	failure of compressors' discharge temperature sensor	●		not connected
OATH	failure of air temperature sensor	●		short-circuit
OATL	failure of air temperature sensor	●		not connected
OC1H	failure of coil 1 temperature sensor	●		short-circuit
OC1L	temperature sensor failure, coil 1	●		not connected
OC2H	failure of coil 2 temperature sensor	●		short-circuit
0C2L	temperature sensor failure, coil 2	●		not connected
HPP	first HP protection	●		
HP	High pressure protection	●		
HPC	High pressure protection – blocked circuit		●	
LP	Low pressure protection	●		
DIS	compressors' discharge temperature too high		●	
LO	leaving water temperature too low	●		
HI	entering water temperature too high	●		
FS	differential water flow safety switch or pressure switch		●	
CF1	thermal protection of compressor 1	●		
CF2	thermal protection of compressor 2	●		
OF1	fans' thermal protection		●	
PF	pump's thermal protection		●	
LOu	low water volume	●		
EEP	microprocessor error		●	
JUMP	wrong DIP configuration		●	DIP check
ConF	wrong configuration		●	

10 ALARM DESCRIPTION

ADC
Microprocessor error

CPF
HP transducer out of scale

If CP input <0,5 volt for more than 1 minute faulty is presumed.

EPF
LP transducer out of scale

If EP input <0,5 volt for more than 1 minute faulty is presumed.

REF

If CP and EP <1 bar then that circuit is presumed to have a fault and the compressor is not started REF is displayed and put in the alarm LOG and the faulty output is closed.

CPnc
Transducer failure (cooling mode only)

Check for transducer failure only after the two compressors have stopped for at least 30s. A CP faulty is presumed if after 50s of compressor operation (C1 or C2 or both) CP has not changed by 0.5 bar but EP has changed correctly. Message only displayed is CPnc. No lock out.

EPnc
Transducer failure (cooling mode only)

Check for transducer failure only after the two compressors have stopped for 30s. An EP faulty is presumed if after 50s of compressor operation (C1 or C2 or both) EP has not changed by 0.5 bar but CP has changed correctly). Message only displayed is Epnc. No lock out.

CFC1-CFC2
Transducer failure (cooling mode only)

A compressor faulty is presumed if after 30s of compressor operation both CP has not increased by 0.5 bar and EP has not decreased by 0.5 bar. This fault results in lockout but only for the compressor, which has been started, if both compressors were started then both compressors will be locked out. Displayed fault is CFC1 for CC1 and CFC2 for CC2.

SENSOR FAILURE

The following thermistor faulties are possible, fault is displayed and faulty output is closed during the fault.
(a) Thermistor is disconnected (Temp < -40°C) fault is EWTL or LWTL or OATL or DISL or OC1L or OC2L
(b) Thermistor is short-circuited (Temp > 75°C) fault is EWTH or LWTH or OATH or DISH or OC1H or OC2H

HPP
First high pressure protection (heating and cooling modes) if pressure ratio is very high

One compressor is forced to OFF (for 2 minuts until CP <24 bar) by the above logic the alarm HPP is to be displayed, memorised in the alarm log and the faulty output is to be closed.
Even if one comp is stopped by HPP rule, when deice is neede, deice cycle starts with both comps.

HP
Second high pressure protection (heating and cooling modes)

If CP >27.0 bar both compressors is stopped immediately for 3 minutes and until CP <18 bar. If this protection cuts out 3 times in 30 minutes the circuit requires lockout reset to restart. The faulty output is ON and the display will show HP during high pressure protection.

HPC
Third high pressure protection (heating and cooling modes)

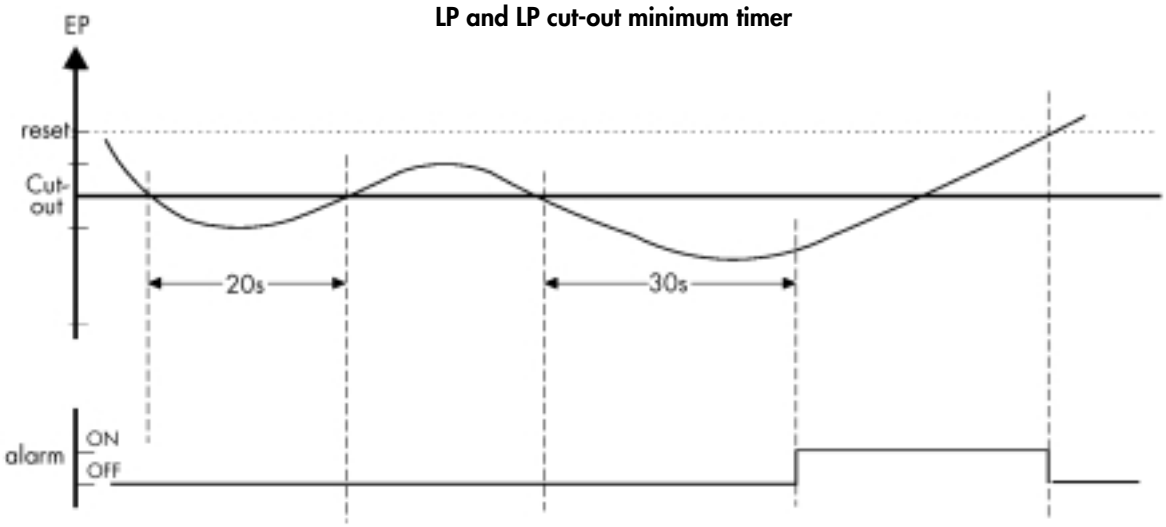
HPC / overload compressor input. CP >28.0 bar.
This input must stop the compressor immediately, signal a faulty HPC and lockout the compressor requiring a manual interventuion to rearm.

LP
Low pressure protection

This protection is by-passed during the first 60s of compressor operation.
Three types of faults are generated,
1. LP cutout which stops the compressor but allows it to restart
2. LP lockout which stops the unit and requires manual reset.
3. If EP<1.4 with both compressors off then the compressors are not started.

The low LP and LP cut-out alarms are only activated if EP passes the limit given by the above formulae for 30s (see diagram below).

LP and LP cut-out minimum timer



If this LP cutout protection cuts out the compressor 3 times during 20min of compressor operation a lockout occurs. The alarm "LP" will be shown on the display and memorised in the alarm log and the faulty output will close.

DIS
Discharge protection

General (except de-ice)
If DIS >125°C the CC2 compressor will stop immediately. CC2 will be restarted if DIS <105°C.

Heating mode de-ice
During de-ice and for 5 minutes after de-ice if DIS >130°C then the compressors will stop for 3 minutes and restart if DIS <100°C.

LO
Leaving water temperature too low

If LWT < LWTM compressor 1 stopped until LWT > LWTM+3 the alarm LO is displayed but the faulty output remain in off.
If LWT < LWTM-1 compressor 1 and compressor 2 stopped and the faulty output switched to on.
The compressors are allowed to restart when LWT > LWTM+3.
If either or both conditions occur 3 time during 30 minuts period then a lockout resed occurs.

HI
High water temperature inlet (cooling mode only)

This protection is not active for 30min after compressor ON.
If EWT is greater than EWTM for 30min then stop the unit on lockout and signal HI on the display and alarm lot and close the fault output.

FS
Flow switch

This protection is not active for 30s after the pump starts and is active only when the pump is ON. If the FS input opens (the device switch is normally close) the unit must stop immediately on lockout (including the pump) all minimum ON timers are to be by-passed.

The alarm FS is to displayed and put in the alarm log and the faulty output closed.

CF1 - CF2
Compressor thermal protection

When these inputs are open stop the corresponding compressor. If any fault occurs two times in 30minutes a lockout will occur. The alarm is displayed and the faulty output closed.

OF1
Fan thermal protection

When these inputs are open then the unit will stop immediately.
The alarm is displayed and the faulty output closes.

PF
Pump thermal protection

When these inputs are open then the unit will stop immediately.
The alarm is displayed and the faulty output closes.

LOu
Low water volume

Cooling mode
If DEWT <-4 with the compressor ON more than 4 times in 20 minutes (both compressors for two compressor units) then the alarm LOu will appear on the display and be memorised in the alarm log. The alarm output will not close.

Heating mode
If DEWT > 4 with the compressor ON more than 4 times in 20 minutes (both compressors for two compressor units) then the alarm LOu will appear on the display and be memorised in the alarm log. The alarm output will not close.

EPP
Microprocessor error

JUMP
Wrong Dip configuration

Conf
Tandem protection

If Conf parameter is setted to 0 in factory level, then every 30' of continuous running of both compressors, the comp 1 is stopped for 3' and then restarted.

Lockout reset

To reset the system after lockout the main power supply can be cut or the unit cycled to OFF mode for 5s. If the first compressor is locked out then the second compressor will take its place.

11 SERVICE LEVEL PARAMETERS

Press the two **>** and **^** keys at the same time and hold them down for 5 seconds; you will enter the following parameter list:

Display	Meaning	Value Min	Value Max	Step	Default
OPER	Operating mode	COOL	HEAT		COOL
CSP	Cooling Set-point	CSPL	23	0.5	12 °C
HSP	Heating Set-point	20	50	1	40 °C
gLy	Glycol percentage	0	50	5	0%
nigh	Configuration: night mode	1	4	1	2
COAL	CSPT compensation: min OAT	10	30	2	20 °C
COAH	CSPT compensation: max OAT	20	36	2	30 °C
CDCO	offset CSPT in compensation	0	8	1	6 °C
HDCO	offset HSPT in compensation	0	15	1	8
HOAL	HSPT compensation: min OAT	-10	10	1	-5 °C
HOAH	HSPT compensation: max OAT	0	20	1	10 °C
ACO	automatic change over	10	30	1	20 °C
nD	Differential CSPT Night mode (1-2)	0	15	1	2 °C
nFC	Condensation offset Night mode (2)	-4	4	1	2bar
V1	OFAN coefficient for FSC (cooling)	0	4	0.2	1
V2	OFAN coefficient for FSC (cooling)	0	0.7	0.05	0.50
V3	OFAN coefficient for FSC (heating)	5	30	1	19
V4	OFAN coefficient for FSC (heating)	0	3	0.1	0.6
Vlo	OFAN coefficient for FSC	0	3	0.1	2
LELA (*)	Lead Lag (compressor rotation)	OFF	ON	-	ON/OFF
F0	Access to factory level	0	9	1	0
F1	Access to factory level	0	9	1	0
F2	Access to factory level	0	9	1	0

* = depends on dip1 of DSW2

RESETTING THE LOG ALARM HISTORY

If you set the following values to the Service level:
F0 = 1, F1 = 1, F2 = 1 the list of recorded alarms (LOG) is reset.

12 FACTORY LEVEL

If you set the following values to the Service level:
F0 = 1, F1 = 7, F2 = 5 you can enter the list of the manufacturer's parameters:
after 20" automatically out of factory level

Display	Meaning	Value Min	Value Max	Step	Default
CSPL	Minimum cooling Set-point	-5	14	1	8 °C
FL	Ventilation step offset parameter	0	2	0.5	0 bar
DP	Defrost parameter (1=strong, 0=autoadaptive)	0	2	1	1
OFCS	Cooling ventilation	0	29	2	12 bar
OFHS	Heating ventilation step	5	20	2	7 bar
OFLS	1st cooling ventilation step	12	22	1	16 bar
OSL1	2nd cooling ventilation step	14	24	1	20 bar
OSL2	1st heating ventilation step	4	15	1	6 bar
OLH1	3rd cooling ventilation step	15	26	1	22 bar
OMH2	2nd heating ventilation step	3	10	1	5 bar
LOL	Suction pressure correction in cooling	0	1	0.2	0.4 bar
EWTn	EWTM max. entering water temperature	16	24	1	22 °C
EPh	Suction pressure correction in heating	0	1	0.1	0.3 bar (AQH 35: 0,2)
tde	Max defrosting time	2	10	1	5 min
dd	Delay defrost	10	60	5	35 (AQH 35: 30)
OCTe	End of strong defrosting for OCT	5	30	1	10 °C
CPe	End of autoadaptive defrosting for CP	Not used			
EPi	Start of strong defrosting	1.8	3.8	0.2	2.8 bar
LOAt	Coil resistor enabled (option)	0	15	0.5	7 °C
Conf	Tandem unload	0	1	1	0

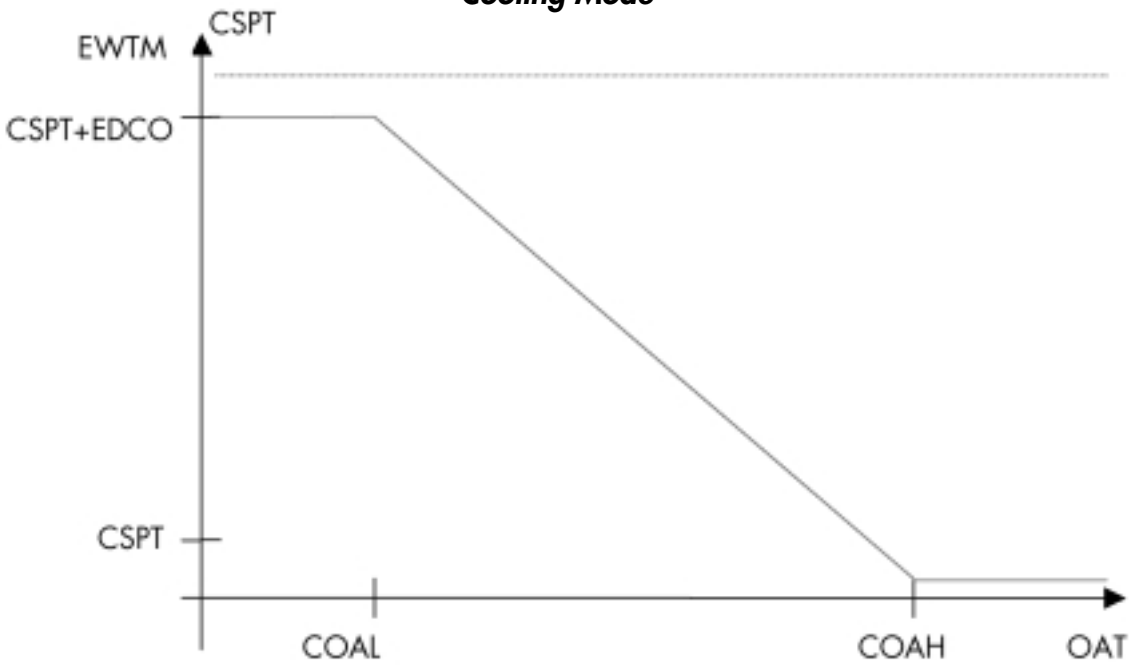
13 PRINCIPAL FUNCTION DESCRIPTION

13.1 OAT

Setpoints compensation using

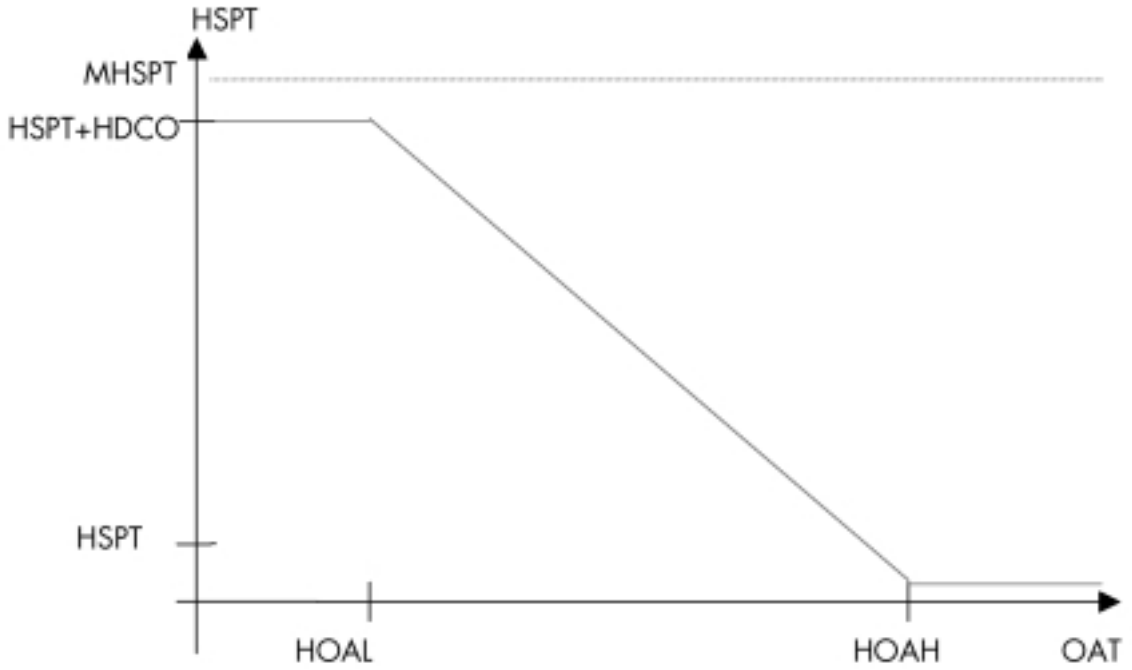
This mode is activated if the dip-switch compensation has been selected Dip 6 of DSW1

Cooling Mode



The value CSPT+CDCO cannot be greater than EWTN

Heating Mode

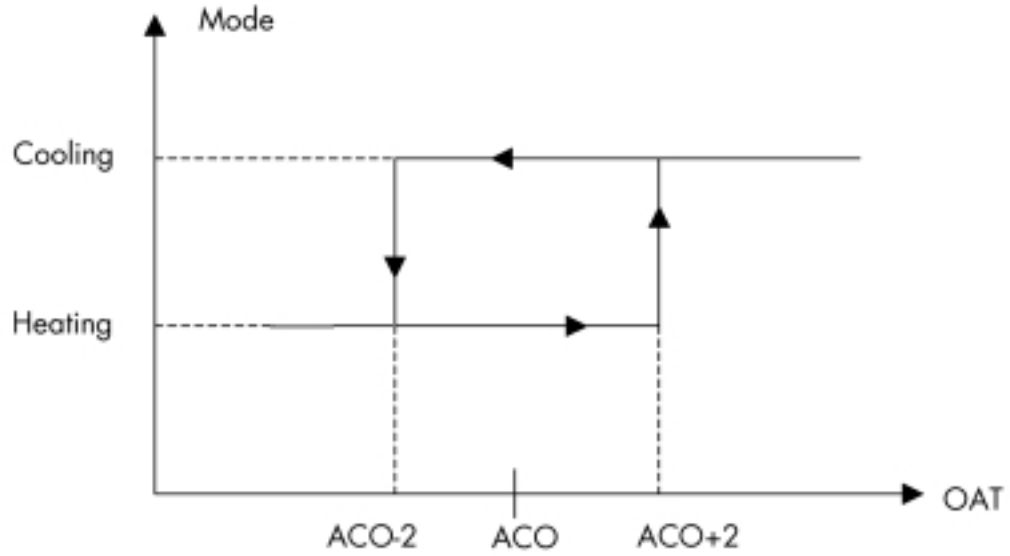


Remarks:

• The minimum and maximum water temperature limits must always respected (CSPL and EWTM) (HSPT and MHSPT)

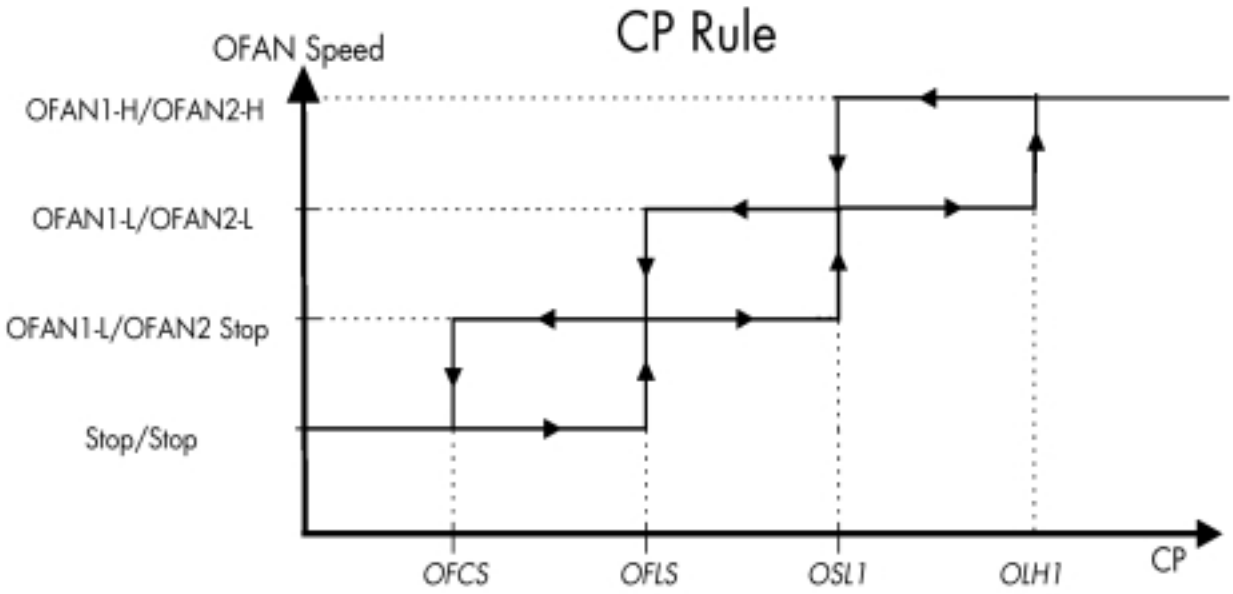
13.2 AUTOMATIC CHANGEOVER

This mode is activated if the dip-switch auto changeover has been selected Dip 3 of DSW2



The change over is possible only after che compressors has been OFF for 10 min.

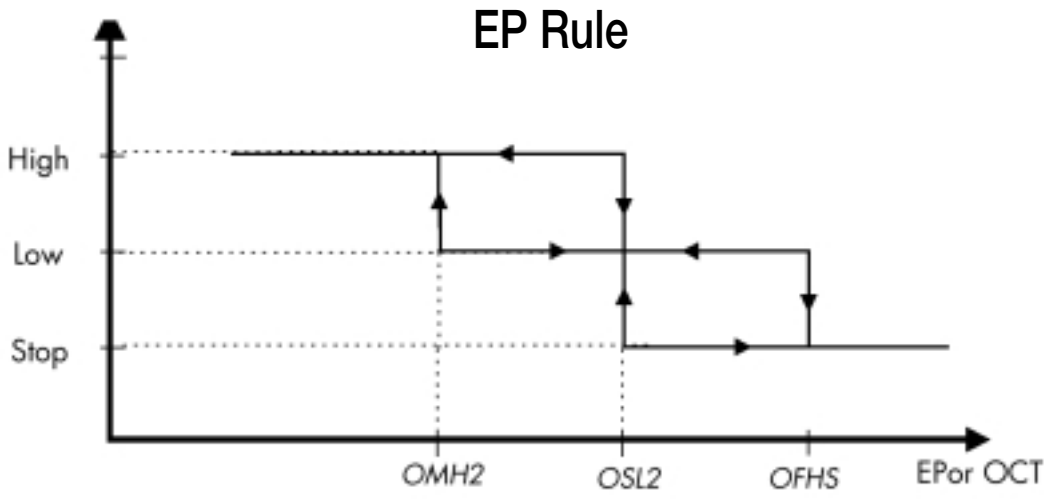
13.3 COOLING MODE



Unit config	BAR
OFCS	12
OFLS	16
OSL1	20
OLH1	22

The values of OFCS-OSL1-OFLS-OLH1 can be changed by queit mode (SEE night mode).

13.4 HEATING MODE



Unit config	BAR
OMH2	5
OSL2	6
OFHS	7

13.5 LELA

Lead lag strategy

This mode is selected with the dip-switch1 of DSW2
Each 200 hours of compressor operation, the controller will check the compressors timer. If it 20 hours differences, the controller will change the compressor association at the next start-up if both compressors have been off for minimum off time to balance the running hours. This is active only if the parameter **LELA** is active. **LELA** option has a lower priority than normal unit operation.

13.6 NIGHT OPERATING MODE (or DOUBLE SETPOINT)

The unit is in the Night or Double Setpoint operating mode when the terminals 9 and 10 are closed with a voltage-free contact – e.g. a timer.
You can select 4 operating modes in Night mode, through the "**nigh**" parameter.
Used parameters: nigh, ND, NFC.

1. COLD WATER STORAGE

nigh = 1: the setpoint is decreased by a value equal to the ND parameter. CSPT becomes CSPT-ND.

2. POWER CONSUMPTION REDUCTION

nigh = 2: in cooling mode, the setpoint is increased by a value = ND. CSPT becomes CSPT+ND.

in heating mode the setpoint is decreased by a value = NDCO. HSPT becomes HSPT-HDCO.

3. NOISE REDUCTION

nigh = 3: in cooling mode the fans' speed increase thresholds (in bars) are increased by a value = NFC.
In heating mode the fans' speed increase thresholds are decreased by a value = NFC/2.

4. POWER CONSUMPTION AND NOISE REDUCTION

nigh = 4: in this mode the unit works in the conditions described in points 2 and 3 at the same time.

5. LOAD SHEDDING

This function is activated by closing with a voltage-free contacts the terminals 11 and 12. The operation of a compressor is disabled in this operating mode.
You can choose the compressor to be disabled using the dip4 of DSW1 (see 2.2)

14 TEST PROCEDURE

Position the SM1 key on 0 (OFF). Press the TEST key and hold it down for 5 seconds to enter the TEST procedure. Press the arrow key to quit the TEST procedure.

14.1 TEST PROCEDURE (COOL ONLY)

EXCITED RELAY OUTPUT									
Step	C1	C2	Resistor	Alarm relay	OFAN1 low	OFAN2 low	OFAN1 high	OFAN2 high	Pump
t0									X
t1	X				X				X
t2	X				X	X			X
t3	X						X	X	X
t4	X	X					X	X	X
t5	X								X
t6							X	X	X
t7			X						X
t8				X					X

14.2 TEST PROCEDURE (HEAT PUMP)

EXCITED RELAY OUTPUT											
Step	C1	C2	Resistor	Alarm relay	OFAN1 low	OFAN2 low	OFAN1 high	OFAN2 high	Cycle reversal	RV2 bypass	Pump
t0											X
t1	X										X
t2	X				X	X					X
t3	X						X	X			X
t4	X	X					X	X			X
t5	X						X	X	X		X
t6	X	X						X	X		X
t7	X	X					X	X			X
t8	X	X									X
t9											X
tA			X								X
tB				X							X

15 AQL-AQH TROUBLE SHOOTING

The following table details possible unit faults, their probable cause and suggested remedies, for any other problems not immediately recognisable and/or technical assistance, call an authorised Technical Service Center.

Fault	Problable cause	Remedy
ADC Eprom error	Eprom out of eprom support	To insert the eprom in the eprom support
CPF CP Transducer failure out of range	High pressure transducer damaged Cut cable Connector loose Terminal block loose Wrong parts Transducer out of range Change transducer CP with transducer EP	To replace the transducer To check the cable To tighten the connector screws To tighten the terminal block screws To check the parts To replace the transducer To reverse the transducer
EPF EP Transducer failure out of range	Low pressure transducer damaged Cut cable Connector loose Terminal block loose Wrong parts Transducer out of range Change transducer CP with transducer EP	To replace the transducer To check the cable To tighten the connector screws To tighten the terminal block screws To check the parts To replace the transducer To reverse the transducer
REF Gas leak	Gas leak	To find and repair the leak
CPnc Faulty CP transducer no pressure variation	No high pressure variation Gas circuit empty Compressor damage High pressure transducer damaged	High air flow To charge the circuit To replace the compressor To replace the transducer
EPnc Faulty EP transducer no pressure variation	No low pressure variation Gas circuit empty Compressor damage Espansion valve broken Low pressure transducer damaged	To calibrate espansion valve To charge the circuit To replace the compressor To replace the espansion valve To replace the transducer
CFC 1 CP/EP No change Comp 1 no operating	Wrong rotation Fault the transducers EP-CP	To check the electrical connection To check DP-EP transducers
CFC 2 CP/EP No change Comp 2 no operating	Wrong rotation Fault the transducers EP-CP	To check the electrical connection To check DP-EP transducers
EWTH Entering water temperature sensor short circuit	Faulty sensor Cable in short circuit Sensor in short circuit	To replace the sensor To replace cable To replace sensor
EWTL Entering water temperature sensor	Faulty sensor Cut cable Sensor not connected	To replace the sensor To replace cable To check the electrical connection
LWTC Leaving water temperature sensor not change	Faulty sensor Cable in short circuit Cut cable Sensor out of the socket	To replace the sensor To replace cable To check cable To check the sensor socket

Fault	Problable cause	Remedy
LWTH Leaving water temperature sensor short circuit	Faulty sensor Cable in short circuit Sensor in short circuit	To replace the sensor To replace cable To replace sensor
LWTL Leaving water temperature sensor disconnected	Faulty sensor Cut cable Sensor not connected	To replace the sensor To replace cable To check the electrical connection
DISH Discharge temperature sensor short circuit	Faulty sensor Cable in short circuit Sensor in short circuit	To replace the sensor To replace cable To replace sensor
DISL Discharge temperature sensor disconnected	Faulty sensor Cut cable Sensor not connected	To replace the sensor To replace cable To check the electrical connection
OATH Outdoor air temperature sensor short circuit	Faulty sensor Cable in short circuit Sensor in short circuit	To replace the sensor To replace cable To replace sensor
OATL Outdoor air temperature sensor disconnected	Faulty sensor Cut cable Sensor not connected	To replace the sensor To replace cable To check the electrical connection
OC1H Coil 1 temperature sensor short circuit	Faulty sensor Cable in short circuit Sensor in short circuit	To replace the sensor To replace cable To check sensor
OC1L Coil 1 temperature sensor disconnected	Faulty sensor Cut cable Sensor not connected	To replace the sensor To replace cable To check the electrical connection
OC2H Coil 2 temperature sensor short circuit	Faulty sensor Cable in short circuit Sensor in short circuit	To replace the sensor To replace cable To check sensor
OC2L Coil 2 temperature sensor disconnected	Faulty sensor Cut cable Sensor not connected	To replace the sensor To replace cable To check the electrical connection
HPP First high pressure compressors protection	<u>COOL</u> Fan stop Low ventilation Fan thermal contact open High gas charge Coil dirty Coil obstruct Faulty high pressure transducer <u>HEAT</u> Low water flow Wrong pump Dirty filter Dirty exchanger High circuit pressure drop	 To check the fan To check the fan speed To reset the contact To check the gas charge To clean the coil To check the installation position To replace the transducer To check the pump To check the pump size To clean the filter To clean the exchanger To check the plant pressure drop

Fault	Problable cause	Remedy
HP Second high pressure compressors protection	COOL Fan stop Low ventilation Fan thermal contact open High gas charge Coil dirty Coil obstruct Faulty high pressure transducer HEAT Low water flow Wrong pump Dirty filter Dirty exchanger High circuit pressure drop	 To check the fan To check the fan speed To reset the contact To check the gas charge To clean the coil To check the installation position To replace the transducer To check the pump To check the pump size To clean the filter To clean the exchanger To check the plant pressure drop
HPC High pressure cut out	COOL Fan stop Low ventilation Fan thermal contact open High gas charge Coil dirty Coil obstruct Faulty high pressure transducer HEAT Low water flow Wrong pump Dirty filter Dirty exchanger High circuit pressure drop	 To check the fan To check the fan speed To reset the contact To check the gas charge To clean the coil To check the installation position To replace the transducer To check the pump To check the pump size To clean the filter To clean the exchanger To check the plant pressure drop
LP Low pressure limit cut out	Gas circuit empty Gas leak Low pressure transducer damaged	To charge the circuit To repair the circuit leak To replace the transducer
DIS High temperature discarge compressor	Low gas charge High gas charge Faulty sensor Motor compressor faulty Out of limit condition of work	To check the gas charge To check the gas charge To replace the sensor To check the compressor motor To check the operation limit
LO Low temperature water leaving	Low water flow Water filter dirty Wrong pump	To check the pump and plant To clean the water filter To check the pump size
HI High temperature water inlet	Small refrigerator capacity Sensor EWT out of the socket	To check the plant thermal load To check the sensor socket
FS Flow switch	Water pump stop Water pump blocked Pump thermal contact open Flow switch blocked	To check the pump To release the pump To reset the thermal contact and to check the scale To release the flow switch

Fault	Problable cause	Remedy
CF1 Compressor 1 Thermal protection	Motor compressor faulty Compressor thermal contact open Wrong charge Wrong electrical cable connection & phase missing	To check the compressor motor To reset the thermal contact To check the gas charge To check the electrical connection, to tighten the terminal block screws
CF2 Compressor 2 Thermal protection	Motor compressor faulty Compressor thermal contact open Wrong charge Wrong electrical cable connection & phase missing	To check the compressor motor To reset the thermal contact To check the gas charge To check the electrical connection, to tighten the terminal block screws
OF1 Fan Thermal protection	Fan stop Fan thermal contact open Fan blocked Wrong electrical cable connection & phase missing	To check the motor To reset the thermal contact and to check the scale To release the fan To check the electrical connection, to tighten the terminal block screws
PF Pump Thermal protection	Motor pump blocked Pump thermal contact faulty Wrong electrical cable connection & phase missing	To check the motor To reset the thermal contact and to check the scale To check the electrical connection, to tighten the terminal block screws
Lou Low water volume	Water volume under the limit	To check the water volume and the plant
EEP Eprom damage	Eprom damage	To change eprom
Jump Wrong DIP configuration	Wrong Dip switch position	To check the dip switch position
ConF Wrong configuration	Wrong configuration	To check the configuration with spec.

16 AQH LOW PRESSURE LOGIC ALARM

1) If EP < (0.0011.OAT^2+0.1009.OAT+2.4162)*Eph we have allarm LP OAT=Air ambient
2) Alarm reset is possible if EP > (0.0029*OAT^2+0.1664*OAT+4.099)
3) Alarm LP is Auto reset for 3 times after manual reset and LOG indication Eph=0,1+1,0 Factory default=0,8
4) If both compressors are in OFF and EP<1,4 bar, the compressors do not start never

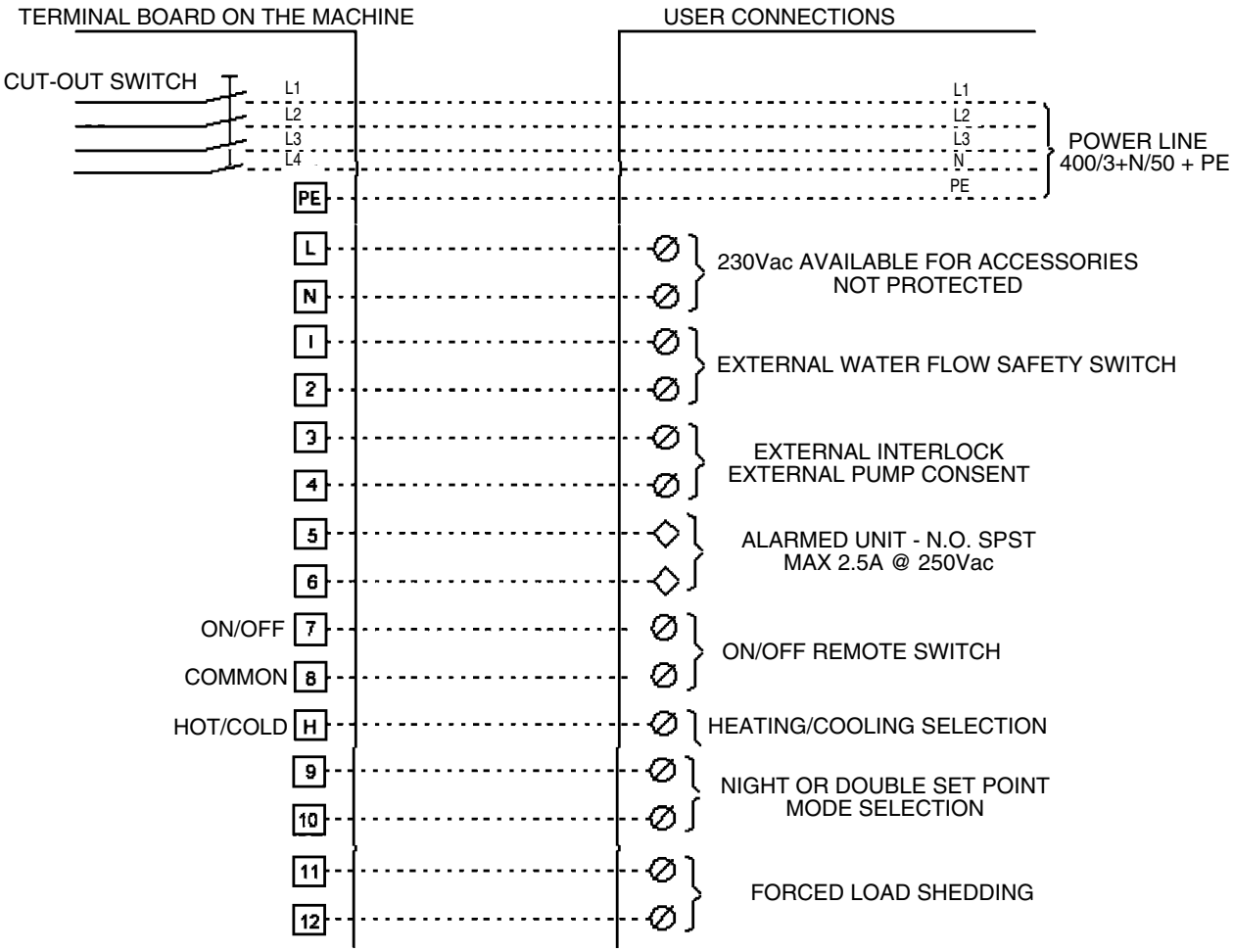
Eph											
0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1**	**OAT**	**Reset**
LP limite (bar EP)										°C	bar
0,15	**0,30**	**0,46**	**0,61**	**0,76**	**0,91**	**1,06**	**1,21**	**1,37**	**1,52**	**-10**	**2,73**
0,16	0,32	0,48	0,64	0,80	0,96	1,12	1,28	1,44	1,60	-9	2,84
0,17	0,34	0,50	0,67	0,84	1,01	1,18	1,34	1,51	1,68	-8	2,95
0,18	0,35	0,53	0,71	0,88	1,06	1,23	1,41	1,59	1,76	-7	3,08
0,19	0,37	0,56	0,74	0,93	1,11	1,30	1,48	1,67	1,85	-6	3,21
0,19	0,39	0,58	0,78	0,97	1,16	1,36	1,55	1,75	1,94	-5	3,34
0,20	0,41	0,61	0,81	1,02	1,22	1,42	1,62	1,83	2,03	-4	3,48
0,21	0,42	0,64	0,85	1,06	1,27	1,49	1,70	1,91	2,12	-3	3,63
0,22	0,44	0,67	0,89	1,11	1,33	1,55	1,78	2,00	2,22	-2	3,78
0,23	0,46	0,69	0,93	1,16	1,39	1,62	1,85	2,08	2,32	-1	3,94
0,24	**0,48**	**0,72**	**0,97**	**1,21**	**1,45**	**1,69**	**1,93**	**2,17**	**2,42**	**0**	**4,10**
0,25	0,50	0,76	1,01	1,26	1,51	1,76	2,01	2,27	2,52	1	4,27
0,26	0,52	0,79	1,05	1,31	1,57	1,84	2,10	2,36	2,62	2	4,44
0,27	0,55	0,82	1,09	1,36	1,64	1,91	2,18	2,46	2,73	3	4,62
0,27	0,57	0,85	1,13	1,42	1,70	1,99	2,27	2,55	2,84	4	4,81
0,29	0,59	0,88	1,18	1,47	1,77	2,06	2,36	2,65	2,95	5	5,00
0,31	0,61	0,92	1,22	1,53	1,84	2,14	2,45	2,76	3,06	6	5,20
0,32	0,64	0,95	1,27	1,59	1,91	2,22	2,54	2,86	3,18	7	5,41
0,33	0,66	0,99	1,32	1,65	1,98	2,31	2,64	2,96	3,29	8	5,62
0,34	0,68	1,02	1,37	1,71	2,05	2,39	2,73	3,07	3,41	9	5,83
0,35	**0,71**	**1,06**	**1,41**	**1,77**	**2,12**	**2,47**	**2,83**	**3,18**	**3,54**	**10**	**6,05**
0,37	0,73	1,10	1,46	1,83	2,20	2,56	2,93	3,29	3,66	11	6,28
0,38	0,76	1,14	1,51	1,89	2,27	2,65	3,03	3,41	3,79	12	6,51
0,39	0,78	1,17	1,57	1,96	2,35	2,74	3,13	3,52	3,91	13	6,75
0,40	0,81	1,21	1,62	2,02	2,43	2,83	3,24	3,64	4,04	14	7,00
0,42	0,84	1,25	1,67	2,09	2,51	2,92	3,34	3,76	4,18	15	7,25
0,43	0,86	1,29	1,72	2,16	2,59	3,02	3,45	3,88	4,31	16	7,50
0,44	0,89	1,33	1,78	2,22	2,67	3,11	3,56	4,00	4,45	17	7,77
0,46	0,92	1,38	1,84	2,29	2,75	3,21	3,67	4,13	4,59	18	8,03
0,47	0,95	1,42	1,89	2,37	2,84	3,31	3,78	4,26	4,73	19	8,31
0,49	**0,97**	**1,46**	**1,95**	**2,44**	**2,92**	**3,41**	**3,90**	**4,39**	**4,87**	**20**	**8,59**
0,50	1,00	1,51	2,01	2,51	3,01	3,51	4,02	4,52	5,02	21	8,87
0,52	1,03	1,55	2,07	2,58	3,10	3,62	4,13	4,65	5,17	22	9,16
0,53	1,06	1,60	2,13	2,66	3,19	3,72	4,26	4,79	5,32	23	9,46
0,55	1,09	1,64	2,19	2,74	3,28	3,83	4,38	4,92	5,47	24	9,76
0,56	1,13	1,69	2,25	2,81	3,38	3,94	4,50	5,06	5,63	25	10,07

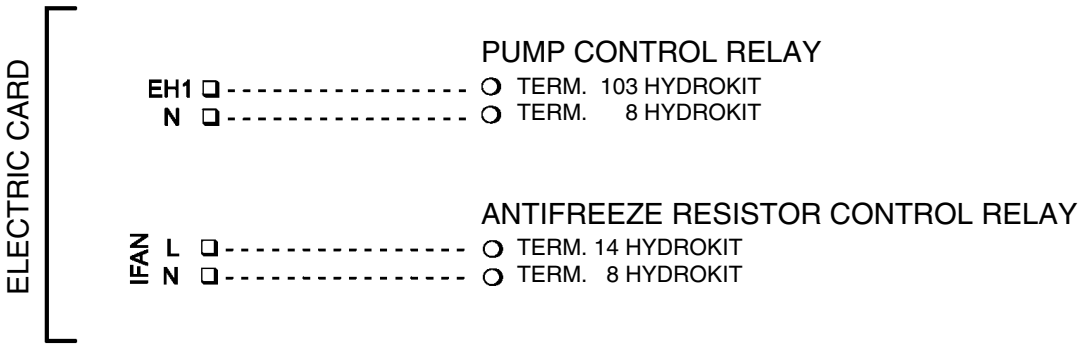
17 AQL LOW PRESSURE LOGIC ALARM

1) The Low pressure alarm is not fix but depend by the EWT (return water temperature)
2) Depend by the LOL value setted in the Factor level
3) Depend by the glycol % setted in PGI (Default 0%)
4) Alarm LP appear if for 30 second the value of EP < LP default
5) Alarm LP is Auto reset for 3 times after manual reset and LOG indication

LOL=	**0**	**LOL=**	**0,2**	**LOL=**	**0,4**	**LOL=**	**0,6**	**LOL=**	**0,8**	**LOL=**	**1**
LP limite (bar EP)	EWT	LP limite (bar EP)	EWT	LP limite (bar EP)	EWT	LP limite (bar EP)	EWT	LP limite (bar EP)	EWT	LP limite (bar EP)	EWT
3,18	8	2,98	8	2,78	8	2,58	8	2,38	8	2,18	8
3,32	9	3,12	9	2,92	9	2,72	9	2,52	9	2,32	9
3,47	10	3,27	10	3,07	10	2,87	10	2,67	10	2,47	10
3,62	11	3,42	11	3,22	11	3,02	11	2,82	11	2,62	11
3,77	**12**	**3,57**	**12**	**3,37**	**12**	**3,17**	**12**	**2,97**	**12**	**2,77**	**12**
3,91	13	3,71	13	3,51	13	3,31	13	3,11	13	2,91	13
4,06	14	3,86	14	3,66	14	3,46	14	3,26	14	3,06	14
4,21	15	4,01	15	3,81	15	3,61	15	3,41	15	3,21	15
4,35	16	4,15	16	3,95	16	3,75	16	3,55	16	3,35	16
4,50	17	4,30	17	4,10	17	3,90	17	3,70	17	3,50	17
4,65	18	4,45	18	4,25	18	4,05	18	3,85	18	3,65	18
4,79	19	4,59	19	4,39	19	4,19	19	3,99	19	3,79	19
4,94	20	4,74	20	4,54	20	4,34	20	4,14	20	3,94	20
5,09	21	4,89	21	4,69	21	4,49	21	4,29	21	4,09	21
5,24	22	5,04	22	4,84	22	4,64	22	4,44	22	4,24	22
5,38	23	5,18	23	4,98	23	4,78	23	4,58	23	4,38	23
5,53	24	5,33	24	5,13	24	4,93	24	4,73	24	4,53	24
5,68	25	5,48	25	5,28	25	5,08	25	4,88	25	4,68	25
5,82	26	5,62	26	5,42	26	5,22	26	5,02	26	4,82	26
5,97	27	5,77	27	5,57	27	5,37	27	5,17	27	4,97	27
6,12	28	5,92	28	5,72	28	5,52	28	5,32	28	5,12	28
6,27	29	6,07	29	5,87	29	5,67	29	5,47	29	5,27	29

Electrical connections of the AQL/AQH 20-35 units with Neuter

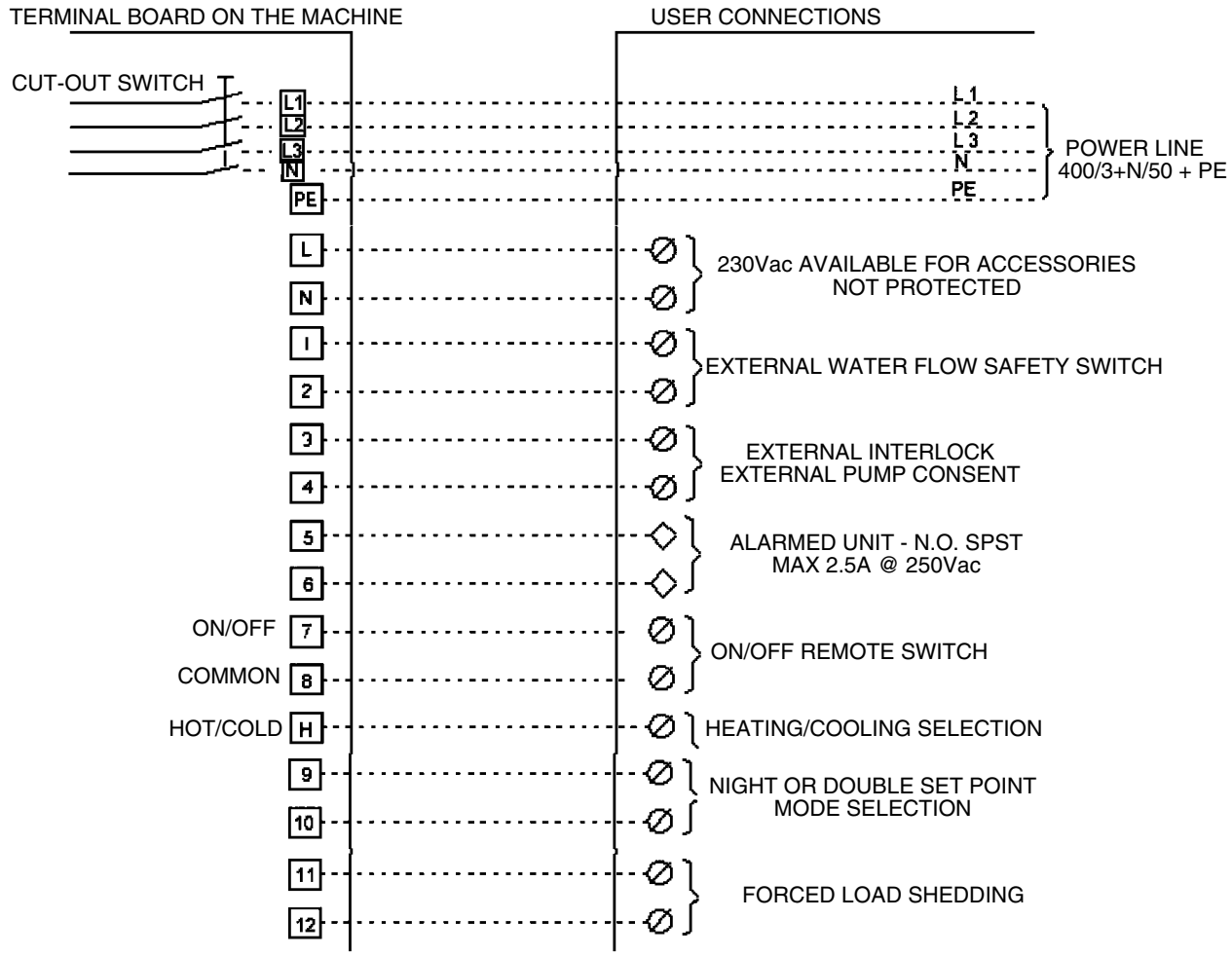


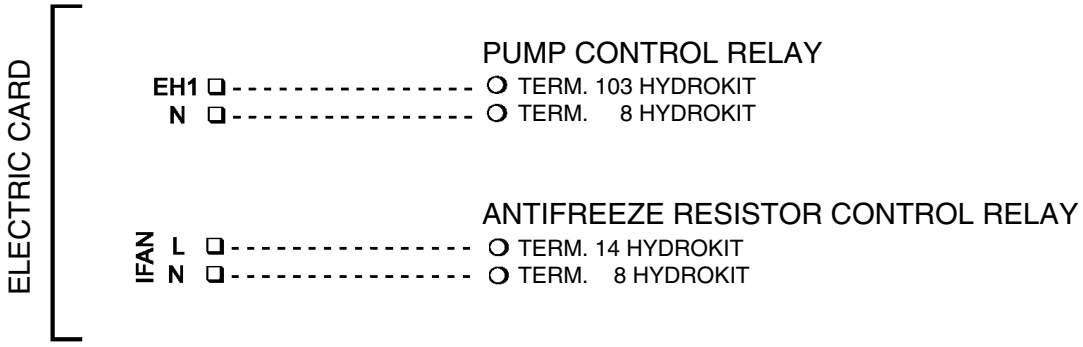


TERMINALS ON THE MACHINE TERMINALS OF THE EXTERNAL CONNECTIONS VOLTAGE-FREE CONTACTS

NOTE: always refer to the diagram on the machine

Electrical connections of the AQL/AQH 40-80 units with Neuter

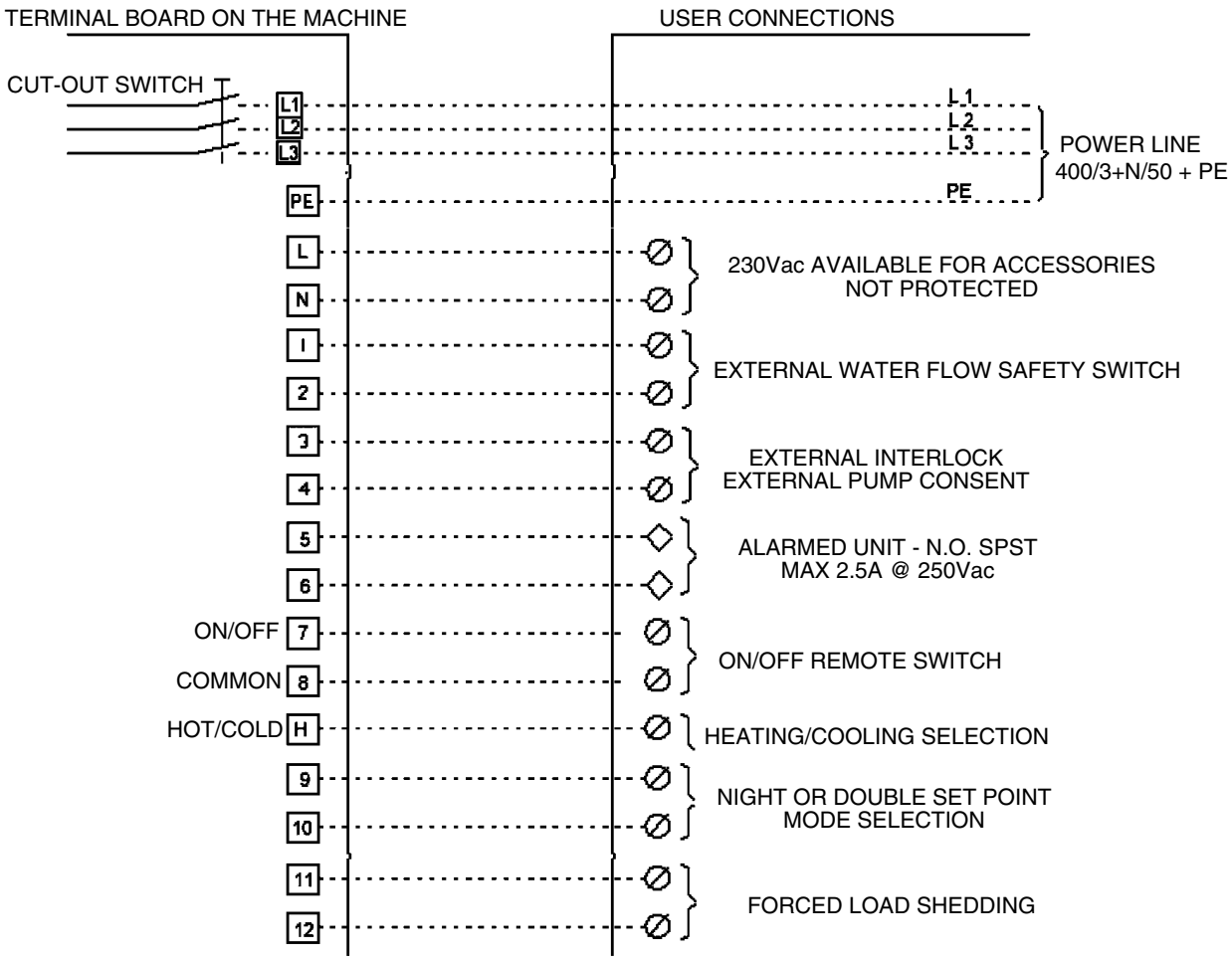


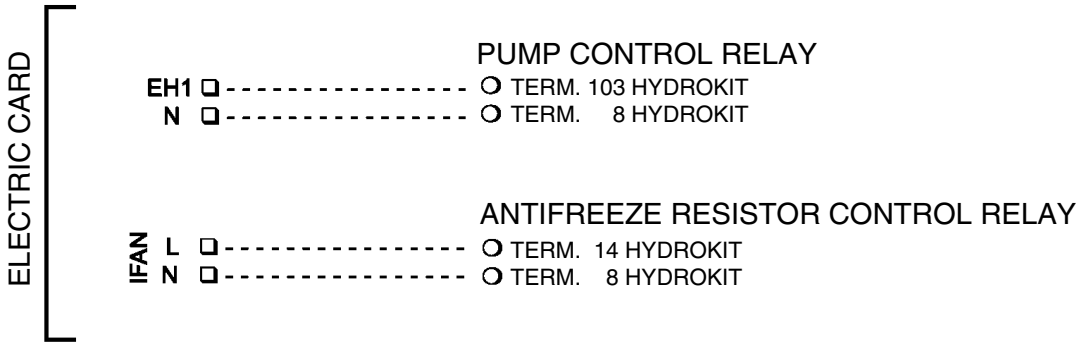


TERMINALS ON THE MACHINE TERMINALS OF THE EXTERNAL CONNECTIONS VOLTAGE-FREE CONTACTS

NOTE: always refer to the diagram on the machine

Electrical connections of the AQL/AQH 40-80 units without Neuter

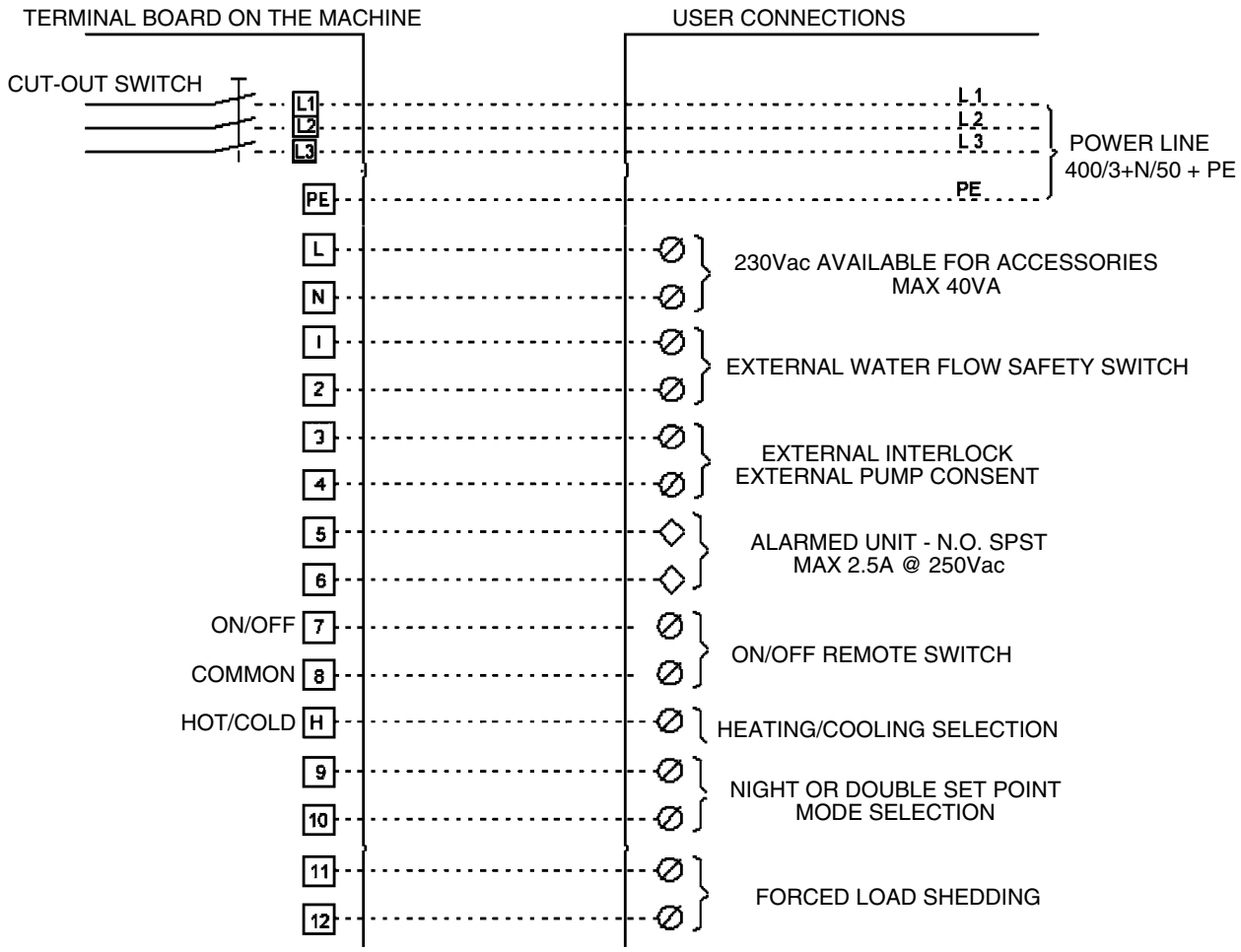


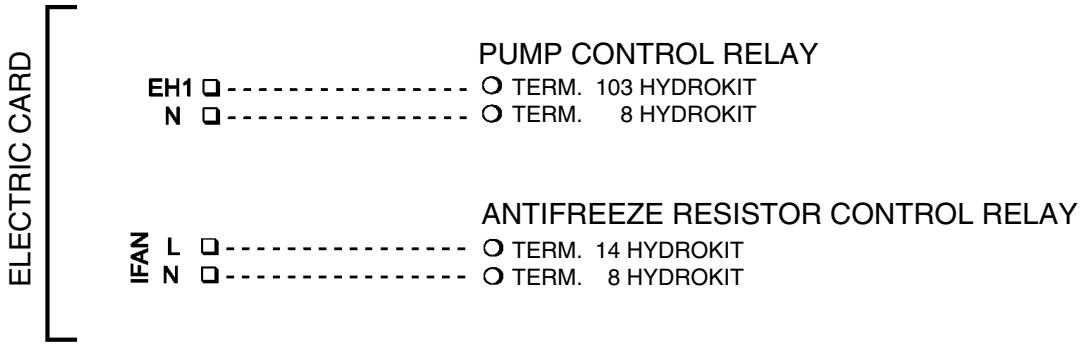


TERMINALS ON THE MACHINE TERMINALS OF THE EXTERNAL CONNECTIONS VOLTAGE-FREE CONTACTS

NOTE: always refer to the diagram on the machine

Electrical connections of the AQL/AQH 90-130 units without Neuter





TERMINALS ON THE MACHINE TERMINALS OF THE EXTERNAL CONNECTIONS VOLTAGE-FREE CONTACTS

NOTE: always refer to the diagram on the machine