# CONNECT 2

## Microchip and LCD display electronic regulation and signaling electronic module for liquid coolers and heat pumps

**CIAT**

**Controls manual**

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Translation of the original document

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# 1 - IMPORTANT RECOMMENDATIONS

Your unit is equipped with a microprocessor-controlled electronic circuit board. To ensure the correct operation of your machine, you must follow the rules listed below.

## 1.1 - Electrical power supply

**Remote control:** 230 V AC/50 Hz.

If the machine's remote control is powered separately (transformer not supplied), provide the following:

1 - A power supply line running **directly** from a distribution point (this line must be used **only** to supply power to the machine's remote control).

2 - This power supply line must be at least 1 metre away from all power lines (400 V).

## 1.2 - Board controller specifications

Board power input: 35 Watts.

Maximum allowable voltage and current per input/output:

253 V AC -3.15 A.

The board is powered by an onboard screw-on three-pin connector. The terminals are identified as follows:

1 - Live,

2 - Neutral,

3 - Earth.

Board fuse specifications:

Schurter UMT 250 V AC/3.15 A. Time lag: 10 × 3. Product code: 34031 0171.

Environmental conditions:
- In storage → 40/+80°C, 5/85% humidity without condensation.
- In use → 20/+70°C, 5/85% humidity without condensation.

Degree of pollution: 3.

## 1.3 - Warning

Read the instructions in the manual before attempting to service the product.

Before attempting to service the board, disconnect its power source and make sure that no voltage is present.

To prevent the risk of electric shock, access to the board should be impossible while it is energised.

Certain parts of the board (USB and Ethernet connectors) may be hot. Based on the ambient temperature, they could cause burns. As a result, avoid touching these connectors while they are connected.

**There is a risk of explosion if the battery is replaced by an incorrect type**

**Dispose of used batteries in accordance with local regulations.**

## 1.4 - Earthing

Compulsory (good earth quality in compliance with French standard NF C 15-100).

## 1.5 - Connection of sensors

Keep connection cables away from power lines (400 V) or a remote control line (230 V). In the case of distances of over 6 m, use a shielded cable connected to the earth on the unit.

Maximum distance: 25 m.

## 1.6 - Connection of communication buses and of the remote console

### 1.6.1 - Connection cable specifications
- Flexible cable – RS 485 connection
- Two shielded wires
- Capacitance between cables and shield: 120 pF/m
- Resistance: 56 Ω/km

### 1.6.2 - Connection of the shield
- Connect the shield on the BMS or micro-computer end to earth.
- Ensure bonding all the way to the last unit
- (the shield on the communication cable must be connected between each unit).
- Do not connect the shield to the earth connection on the units.
- The wires exiting the shield must be as short as possible (2 cm) on each unit.

### 1.6.3 - Cable routing
- The cable must be at least 30 cm away from all 230 V or 400 V cables along its entire length.
- If a 230 V or 400 V cable must be crossed with a computer cable, they must cross each other at a right angle.

## 1.7 - Connection of on/off inputs

■ **Distances of less than 30 metres:**
- Use a shielded cable. Keep the cable at least 30 cm away from all lines that could generate interference. Connect the shield to the earth on the unit. If several shielded cables are used, connect each shield separately (if the risk of interference persists, install a relay for each input).

■ **Distances of greater than 30 metres:**
- Install a relay for each input near the electronic circuit board (cable cross-section: 0.5 mm$^2$)

■ **Example connection diagram:**
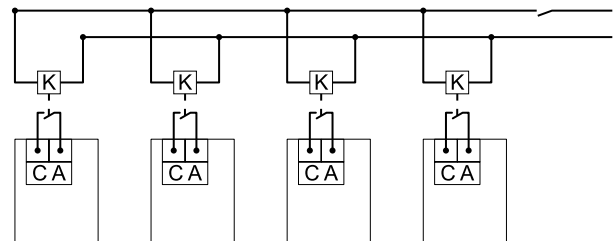


**K :** Auxiliary relay (fit near the electronic circuit board)
**CA :** Automatic operation control (on each machine)

# 2 - GENERAL

This controller is fitted as standard on water chillers (or water heaters) equipped with one or two refrigerating circuits and scroll compressors. It is fitted on water-to-water, air-to-water and reversible air-to-water units.

Depending on the configuration, the board provides the following functions:
- Control of chilled water or hot water temperatures.
- Continuous monitoring of operating parameters.
- Diagnostics and fault storage.
- Setpoint drift based on the outdoor temperature (in heating and cooling modes).
- Communication with the console (remote or local) and the additional boards (fault reporting, BMS communication, Ethernet link for PC).

# 3 - COMPOSITION

The controller consists of:
- One control and display panel fitted on the unit.
- One non-reversible circuit = one main board.
- One reversible circuit = one main board + one additional board (No. 1) → rotary switch in position 1.
- Two non-reversible circuits = one main board + one additional board (No. 2) two circuits → Rotary switch in position 1.
- Two reversible circuits = one main board + one additional board (No. 2) two circuits → Rotary switch in position 1.
  + one additional board (No. 2), two circuit changeover → Rotary switch in position 2.
- One auxiliary electric heater control board = additional board 1 → Rotary switch in position 2 (optional, ILD range).
- One remote console (optional).
- One relay board for operating states and faults (optional).

## 3.1 - Main control board for machines with one non-reversible refrigerating circuit
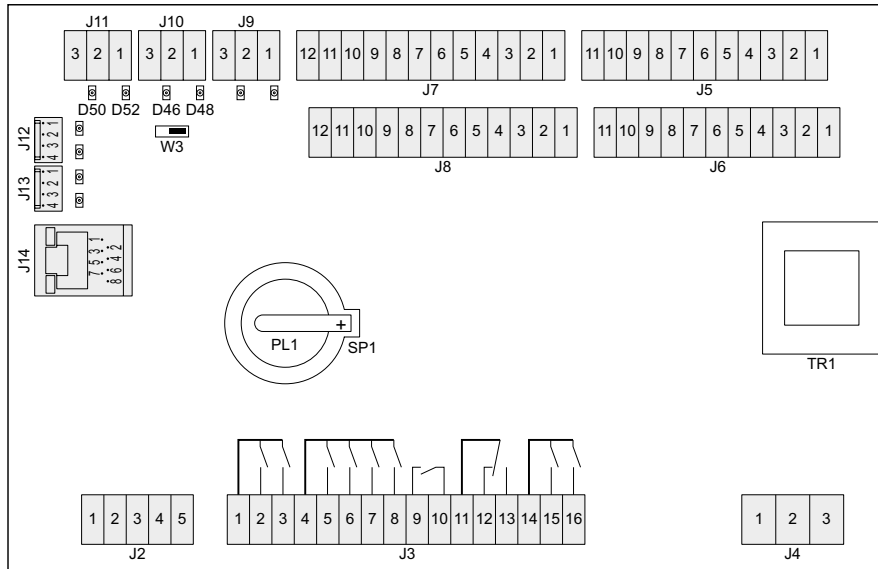


**SWITCH W3**
Résistance fin de ligne pour liaison RS485 2 fils, le switch doit être positionné, sur la gauche pour le dernier appareil de la boucle et sur la droite pour les autres.

**TERMINAL BLOCK J2 (analogue outputs)**
1-2 0-10 V output 1 two-way valve or three-way valve if unit type (P2) = water-to-water.
  or circuit 1 fan speed if unit type (P2) = air-to-water
  or reversible air-to-water when P10 = centrifugal.
  or air damper control if unit type (P2) = air-to-water
  or reversible air-to-water when P10 = centrifugal and P20 = yes.
3-4 0-10 V output 2 (Compressor INVERTER if P7 = INVERTER)
4-5 0-10 V output 3 (variable speed pumps).

**TERMINAL BLOCK J3 (on/off inputs)**
1 Stage control common
2 Stage 1, circuit 1 control
3 Stage 2, circuit 1 control
or if P7 = INVERTER (compressor shut off order to driver)
4 Common for fans, heater and heat trace cable
5 Circuit 1, fan 1 control
6 Circuit 1, fan 2 control
7 Heater control
8 Heat trace cable control
9-10 Configurable control based on P111:
- Max. power
- Boiler
- Cooling/Heating
11 Fault output common
12 NC contact for fault output
13 NO contact for fault output
14 Common for pumps
15 Pump 1 control
16 Pump 2 or reversing valve control, circuit 1

**TERMINAL BLOCK J4 (power supply)**
1 230 V board power supply - Line
2 230 V board power supply - Neutral
3 Earth

**TERMINAL BLOCK J5 (on/off inputs)**
1-2 Motor fault, stage 1, circuit 1
2-3 Motor fault, stage 2, circuit 1
4-5 Manual reset fault, HP, circuit 1
5-6 Expansion valve fault, circuit 1
7-8 Phase controller fault
8-9 Water flow fault
10-11 Pump 1 fault

**TERMINAL BLOCK J6 (on/off inputs)**
1-3 Pump 2 fault
2-3 Automatic operation control
4-6 Setpoint 1/setpoint 2 selection
5-6 Heating/cooling selection if unit type (P2) = water-to-water
or fan fault if unit type (P2) = air-to-water
or reversible air-to-water
7-9 Stage 1, circuit 1 load shedding control
8-9 Stage 2, circuit 1 load shedding control
10-11 Recovery control

**TERMINAL BLOCK J7 (analogue inputs)**
1-2 10 K outdoor temperature sensor
2-3 10 K water inlet temperature sensor, heat exchanger 1
4-5 10 K water outlet temperature sensor, heat exchanger 1
5-6 10 K hot water temperature sensor if unit type (P2) = water-to-water
or exchanger amb. temp. if unit type (P2) = air-to-water
or reversible air-to-water
7 +24 V power supply for pressure sensors
8 0-10 V input for water inlet sensor on circuit 1
9 0-10 V input for water outlet sensor on circuit 1
10 Common for pressure sensors
11 4 20 mA remote setpoint
12 Setpoint common

**TERMINAL BLOCK J8 (analogue inputs)**
1-2 Refrigerant temperature sensor, circuit 1
2-3 10 K suction temperature sensor, circuit 1
4-5 10 K liquid temperature sensor, circuit 1
6-7 50 K discharge temperature sensor, stage 1, circuit 1
7-8 50 K discharge temperature sensor, stage 2, circuit 1
9 +5 V power supply for pressure sensor
10 0-5 V input - HP sensor
11 0-5 V input - LP sensor
12 Common for pressure sensors

**TERMINAL BLOCK J9**
Bus connection for chiller or MULTI controller unit

**TERMINAL BLOCK J10**
Remote control console, relay board bus connection – Drycooler controller

**TERMINAL BLOCK J11**
BMS link

**TERMINAL BLOCK J12**
Local console link

**TERMINAL BLOCK J13**
Link for additional boards

**TERMINAL BLOCK J14**
Ethernet link for PC

**On/off input specifications: 24 V - 15 mA**

**On/off output specifications: 250 V - 2 A**

## 3.2 - Additional board 1

### 3.2.1 - Rotary switch set to position 1 - One circuit reversal use or recovery frost protection

**TERMINAL BLOCK J1**
Flash Memory connector

**TERMINAL BLOCK J2**
Link with motherboard or another additional board

**TERMINAL BLOCK J3**
Link with another additional board

**TERMINAL BLOCK J4 (on/off inputs)**
1-2 Heating/cooling selection input if unit type (P2) = reversible air-to-water
and number of circuits (P3) = 1
2-3 Available
4-5 Available

**TERMINAL BLOCK J5 (on/off inputs)**
1 Common to all outputs
2 Circuit 1 reversing valve control
3 Circuit 1 pressure balance valve control
4 Recovery frost protection heat trace cable
5 Reverse rotation control for fans

**TERMINAL BLOCK J6 (analogue inputs)**
1-2 Temperature sensor, coil A, circuit 1
2-3 Temperature sensor, coil B, circuit 1
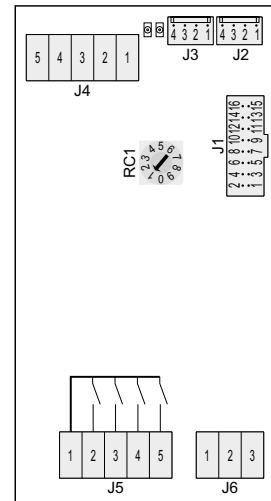


### 3.2.2 - Rotary switch set to position 2 - Use of electric auxiliary heaters

**TERMINAL BLOCK J1**
Flash Memory connector

**TERMINAL BLOCK J2**
Link with motherboard or another additional board

**TERMINAL BLOCK J3**
Link with another additional board

**TERMINAL BLOCK J4 (on/off inputs)**
1-2 Programmable input (P113)
2-3 Fault 1, electric stages
4-5 Fault 2, electric stages

**TERMINAL BLOCK J5 (on/off inputs)**
1 Common to all outputs
2 Electric stage 1 output
3 Electric stage 2 output
4 Electric stage 3 output
5 Electric stage 4 output

**TERMINAL BLOCK J6 (analogue inputs)**
1-2 Available
2-3 Available

# 3 - COMPOSITION

## 3.3 - Additional board 2

### 3.3.1 - Rotary switch set to position 1 🕐 - Two circuit use

**TERMINAL BLOCK J1**
Flash Memory connector

**TERMINAL BLOCK J2 (on/off inputs)**
1-2 Motor fault, stage 1, circuit 2
2-3 Motor fault, stage 2, circuit 2
4-5 Manual reset fault, HP, circuit 2
5-6 Expansion valve fault, circuit 2
7-8 Load shedding input, stage 1, circuit 2
8-9 Load shedding input, stage 2, circuit 2

**TERMINAL BLOCK J3 (on/off inputs)**
1 Common for stages 1 and 2, circuit 2
2 Stage 1, circuit 2 control
3 Stage 2, circuit 2 control
4 Common for fan stages
5 Stage 1, circuit 2 fan control
6 Stage 2, circuit 2 fan control
7 Stage 3, circuit 1 fan control if coil type
(P11) = split
or stage 1, common fan if coil type
(P11) = mixed
8 Stage 3, circuit 2 fan control
if coil type (P11) = split
or stage 3, common fan if coil type
(P11) = mixed

**TERMINAL BLOCK J4 (analogue inputs)**
1-2 10 K water outlet temperature sensor, heat exchanger 2
2-3 10 K manifold water outlet temperature sensor
4-5 10 k refrigerant temperature sensor, circuit 2
5-6 50 K Discharge temperature 3 or 2 if 2 circuits and 1 stage per circuit (P3 =1) (stage 1, circuit 2)
7-8 50 K sensor, discharge temperature 4 (stage 2, circuit 2)
8-9 Circuit 2 suction temperature
J4-10, J5-1 Circuit 2 liquid temperature

**TERMINAL BLOCK J5 (analogue inputs)**
1 Common
2 Available
3 +5 V power supply for pressure sensors
4 0-5 V input for HP sensor on circuit 2
5 0-5 V input for LP sensor on circuit 2
6 0 V power supply, HP-LP pressure sensors
7 +24 V power supply for water pressure sensors
8 0-10 V input for water inlet circuit on exchanger 2
9 0-10 V input for water outlet circuit on exchanger 2
10 0 V power supply for water pressure sensors

### TERMINAL BLOCK J6 (analogue outputs)
1 0-10 V output for circuit 2 fan
2 Common for outputs
3 0-10 V output for common fan, circuits 1 and 2

**TERMINAL BLOCK J7**
Link with motherboard or another additional board

**TERMINAL BLOCK J8**
Link with another additional board

### 3.3.2 - Rotary switch set to position 2 🕑 - Two circuit reversal use

**TERMINAL BLOCK J1**
Flash Memory connector

**TERMINAL BLOCK J2 (on/off inputs)**
1-2 Heating/cooling selection input if unit type (P2) = reversible air-to-water
and number of circuits (P3) = 2
2-3 Available
4-5 Available
5-6 Available
7-8 Available
8-9 Available

**TERMINAL BLOCK J3 (on/off inputs)**
1 Common for reversing valves
2 Circuit 1 reversing valve control
3 Circuit 2 reversing valve control
4 Common for balance valves
5 Circuit 1 balance valve control
6 Circuit 2 balance valve control
7 Reverse rotation control for circuit 1 fans
8 Reverse rotation control for circuit 2 fans

**TERMINAL BLOCK J4 (analogue inputs)**
1-2 Temperature sensor, coil A, circuit 1
2-3 Temperature sensor, coil B, circuit 1
4-5 Temperature sensor, coil C, circuit 1
5-6 Temperature sensor, coil D, circuit 1
7-8 Temperature sensor, coil A, circuit 2
8-9 Temperature sensor, coil B, circuit 2
8-10 Temperature sensor, coil C, circuit 2

**TERMINAL BLOCK J5 (analogue inputs)**
1-2 Temperature sensor, coil D, circuit 2
3 +5 V power supply - Available
4 0-5 V input - Available
5 0-5 V input - Available
6 0 V power supply - Available
7 +24 V power supply - Available
8 0-10 V input - Available
9 0-10 V input - Available
10 0 V power supply - Available

**TERMINAL BLOCK J6 (analogue outputs)**
1 0-10 V output - Available
2 Common for 0-10 V output - Available
3 0-10 V output - Available

**TERMINAL BLOCK J7**
Link with motherboard or another additional board

**TERMINAL BLOCK J8**
Link with another additional board
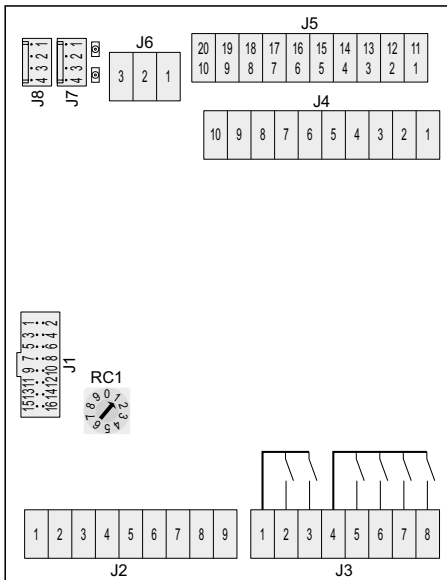
## 3.4 - Control and display console

LCD

Confirm button

Cancel button

On/Off button

Setpoint 1/ Setpoint 2 button

Heating/ Cooling selection button

General fault LED

Circuit fault LED

Reset

Power LED
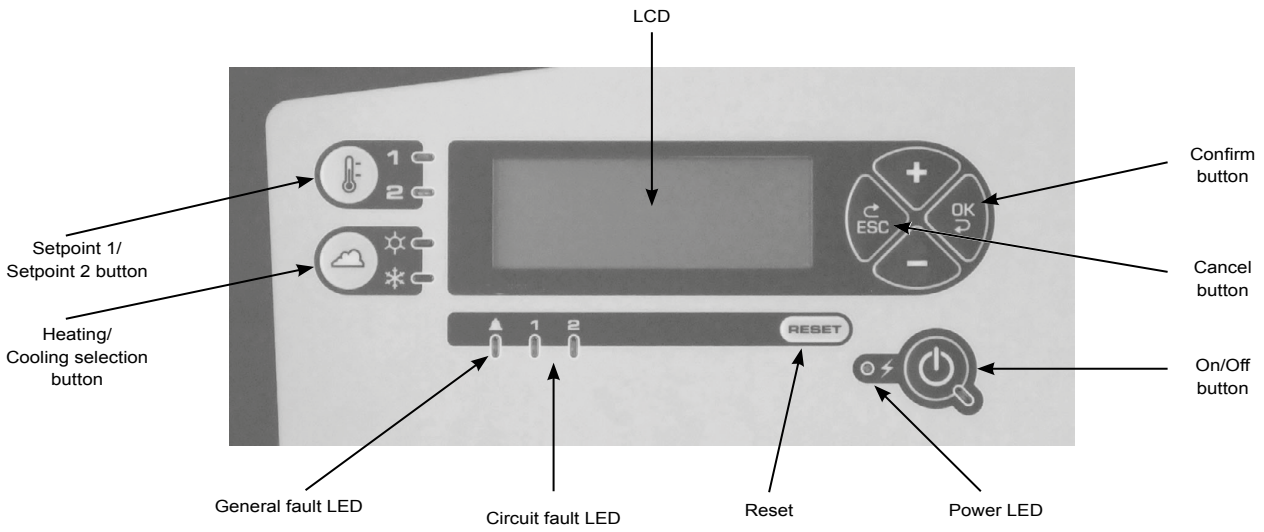
The local console and the remote control console have the same front.

### Mounting dimensions (in mm) of remote control console

235

35

153

Ø 5

28

10

Ø 10

120

80
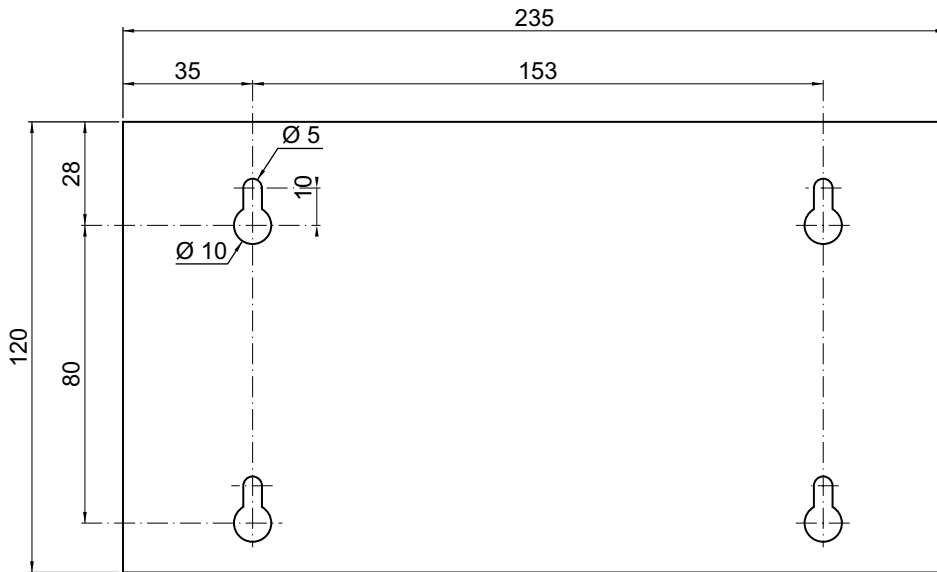
## 3.5 - Connection via RS485 serial port for CMS or control console and Multi controller unit



CHILLER/ HEAT PUMP
main board

MULTI GROUP CONTROL
main board

Unit 2

To additional board

Local console

Installed on unit

RS-485 link to BMS
(Modbus protocol)

Remote control console

230 V
+10 %
-10 %

Optional

Shield

Cables for EIA – 485 link
(Compatible with RS485)

Main relay board 1

To additional relay board ADD3

UNIT
DRYCOOLER CONTROL board

Local console

⚠ Starting from version V09.00, the DRYCOOLER CONTROL connection, is changing from J11 switch W3 to J9 switch W4

CHILLER/ HEAT PUMP & CHILLER
CONTROL main board

Unit 1

To additional board

RJ45 ETHERNET connection towards M to M or CMS

Local console

Installed on unit

RS485 PLC CMS or M 2 M

Two-wire RS485, max. length: 1000 m

For connection to a CMS, refer to document 3991062

Identification of Modbus connection terminals
1 → A or +
2 → B or –
3 → Earth (shield).

## 3.6 - Relay boards

The dry contacts on the relay boards make it possible to remotely view the states of the stages that are on and all the fault states on the unit.
For more information, see document 3991061 provided in the KIT

# 4 - DESCRIPTION

## 4.1 - Main board

Main board for units with one non-reversible refrigerating circuit:

■ **Analogue inputs:**
- Acquire signals measured by temperature sensors.
- Acquire signals measured by pressure by sensors.

■ **On/Off inputs:**
- Acquire operating state signals from surrounding electromechanical components.

■ **Actions:**
- Comparison of setpoint and water temperature to calculate which stages are to be turned on or off.
- Management of the protections for the machine's self-adjusting operation.

■ **Outputs:**
- Control stage control.
- Pump control.
- General fault.

■ **The board also features:**
- An "end-of-line resistance" switch.

## 4.2 - Expansion (additional) boards 1 and 2

These boards are used for units with two reversible refrigerating circuits.

They manage the inputs/outputs on the second circuit or required for reversing the circuits.

■ **Analogue inputs:**
- Acquire signals measured by temperature sensors.
- Acquire signals measured by pressure by sensors.

■ **On/Off inputs:**
- Acquire operating state signals from surrounding electromechanical components.

■ **Outputs:**
- Control stage control.

## 4.3 - Man-Machine Communication

■ **Local console:**
- The controls on the local console are enabled regardless of the value of P103.
- Acknowledgment of faults is possible.

■ **Remote control console:**
- All parameters may be read depending on the authorised access level.
- All unit controls are enabled if P103 = remote or BMS.
- In this case, the following parameters may be accessed for modification:
- On/Off.
- Cooling/Heating.
- All adjustment parameters are locked, depending on the authorised access level, except for the first 11 if P103 = local.
- Acknowledgment of faults is not possible.
- Test mode is possible.

■ **CMS:**
- All parameters (except P100, P103, P104 and P105) are accessible in read mode.
- All parameters (except P1 to P99, P100, P103, P104 and P105) are accessible in write mode. However, access to parameters P1 to P99 is possible when P99 is unlocked on the machine's local console.
- Acknowledgment of faults is not possible.

**NOTE : All the registers (see communication protocol) appear regardless of the value of P103.**
To enable write mode, P103 must be set to 'remote or BMS'.
To be able to switch between heating and cooling, P119 must be set to 'cooling/heating' via the console.
To be able to switch between setpoints 1 and 2, P120 must be set to '2' via the console.

**Locking the console:**

⚠ **Available only on the local console on the unit.**

The factory setting for the console is 'unlocked'.

The lock status is saved in the event of a mains power failure.

If lock mode is enabled while modifying a parameter, any modifications made are aborted and the controller is reset to its initial value.

To lock the console, simultaneously hold down the + and – buttons for 5 seconds (possible in any menu on the console).

The following message appears on the screen for 5 seconds then machine state reappears.

```
                    C  O  N  S  O  L  E
                    L  O  C  K  E  D
```

All modifications from the local console are then inhibited.

Any attempts to make modifications will cause the above message to appear for 3 seconds.

To unlock the console, simultaneously hold down the + and - buttons for 5 seconds. The following message appears on the screen for 3 seconds:

```
                    C  O  N  S  O  L  E
                    U  N  L  O  C  K  E  D
```

# 5 - ACCESS LEVELS

The CHILLER/HEAT PUMP controller features three parameter access levels:
- Level 1: Users
- Level 2: Technicians/Maintenance
- Level 3: Manufacturer's technicians (full access)

## 5.1 - Selecting an authorised access level

Authorised access levels are selected in menu 14 (ACC. LEVEL SELECT.). The following screen appears:

```
   C O N T R O L L E R   I N   L E V E L   X
1 4 - 1   A C C E S S   T O   L E V E L   2
1 4 - 2   A C C E S S   T O   L E V E L   3

```

- Level 3 provides automatic access to all levels (Manufacturer's technicians).
- Level 2 provides access to levels 1 and 2 only (Technicians/Maintenance and Manufacturer's technicians).
- Level 1 provides access to level 1 only (all users).

## 5.2 - Accessing the various access levels

### 5.2.1 - Restricting access to level 1 only

- Access level 2 is the default access level.
- If you are in a higher level and you want to restrict access to level 1 only, simultaneously hold down the **ESC** and **OK** buttons for 10 seconds.
- No password is needed to access level 1. The setpoint adjustment range is **+** or **−** 5 K lower than in the higher access levels.
- The restriction messages remain displayed in access level 1. Operating messages in optimised mode are visible only in access levels 2 and 3.
- Restriction of access to level 1 only is stored in memory in the event of a mains power failure.

### 5.2.2 - Access to level 2:

- A numeric code must be entered to access level 2:
- The following menu for entering this code appears when LEVEL 2 is selected:

```
      L E V E L   2
  A C C E S S   C O D E
        * * * *

```

- Using the **+** and **−** buttons, replace this first symbol (*) by the first character in the code and press **Enter**. Do the same for the second, third and fourth symbols. When the last character is entered and **Enter** is pressed, the following menu appears:

```
      L E V E L   2
  N E W   A C C E S S   C O D E
        * * * *

```

- To select a new access code, proceed as described above. When the last character is entered and **Enter** is pressed, the screen displays the menu below followed by the main menu.

```
      L E V E L   2
N E W   C O D E   S A V E D


```

- If you do not want to change the level 2 access code, press **ESC** to exit the new access code menu and go back to the main menu.
- If you have changed your access code but have forgotten it, you can reset it to the original code by entering the LEVEL 2 ACCESS CODE menu and simultaneously holding down the **+** and **Reset** buttons for 10 seconds.

### 5.2.3 - Access to level 3

A non-modifiable numeric code must be entered to access level 3:
- The following menu for entering this code appears when LEVEL 3 is selected:

```
              L  E  V  E  L      3
        A  C  C  E  S  S      C  O  D  E
                    *   *   *   *
```

- Using the **+** and **–** buttons, replace this first symbol (*) by the first character in the code and press **Enter**. Do the same for the second, third and fourth symbols. When the last character is entered and **Enter** is pressed, the main menu appears.

### 5.2.4 - Restricting access from level 3 to level 2

To restrict access from level 3 to level 2 only, go to the following menu:

```
1  4  -  1      A  C  C  E  S  S      T  O      L  E  V  E  L      2
```

Press **Enter**. The following menu appears:

```
        A  C  C  E  S  S      T  O      L  E  V  E  L      2
        O  N  L  Y
                    Y  E  S  /  N  O
```

To restrict the controller to access level 2, select 'Yes' and press **Enter**.

### 5.2.5 - Displaying the access codes on the controller after incorrectly entering the access codes:

- The digits in the access codes are replaced by the* symbol. When the **+** or **–** buttons are pressed, this symbol is replaced by the digit 0. The digits in the code can then be selected using the **+** or **–** buttons.
  The * symbol appears when the digit is confirmed by pressing **Enter**.
- The following message appears for 5 seconds if the access code is not entered correctly:

```
        W  R  O  N  G      C  O  D  E
```

- When an access level is changed, the following message is displayed for 5 seconds:

```
      A  C  C  E  S  S      L  E  V  E  L      X
```

### 5.3 - Configuring access levels on the controller

- All three access levels on all the boards are accessible for a total of 20 hours of 'on' time after the controller is first turned on. During this period any defective boards may be removed and their replacement boards configured and checked to ensure correct operation of machine.
  This time period will be automatically cancelled if a user switches to level 1 or level 2 before it ends.
  When the time period ends, level 2 will be authorised unless the person commissioning the system chooses to restrict access by the end user to level 1.
- If access level 3 is authorised in order to adjust the machine parameters and, for indeterminate reasons, it is left accessible to all users, only level 2 access will be possible after a period of 4 hours.
- Commissioning of the machine can be prohibited simply by setting parameter P99 to 'No' in level 2.

**Only those with the level 2 access code may re-enable commissioning of the machine.**

### 5.4 - Management of the numeric codes for accessing levels 2 and 3

- Access to level 3 is direct for anyone with a PC running the program needed to communicate with the chiller/heat pump controller and who connects to the board.
- **Access to levels 2 and 3 is restricted to the manufacturer's service technicians. Please contact your local branch.**

# 5 - ACCESS LEVELS

## 5.5 - Classification of the menus and their functions

■ **Level 1:**

► **Menu :**

Setpoint, machine status, measured values, control parameters, operation parameters, fault memory, hourly scheduling, communication and access level selection.

► **Fonction :**

all functions accessible via the console: On/Off, **Reset**, Heating/Cooling selection; Setpoint 1/2 selection

■ **Level 2 :**

► **Menu :**

all level 1 menus + test mode and master/slave operation

■ **Level 3 :**

► **Menu :**

all level 2 menus + electronic expansion valve

# 6 - LIST OF PARAMETERS

ACCESS LEVEL :  1 = Access to **USER** parameters (level 1 parameters only)
2 = Access to visible and editable parameters (level 1 and 2 parameters). EDITABLE numeric code.
3 = Access to **Manufacturer's** ᴛᴇᴄʜɴɪᴄɪᴀɴ parameters (level 1, 2 and 3 parameters). UNEDITABLE numeric code

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| | | | **configuration of the machine** | | |
| 3 | 1 | Refrigerant type | R407C, R134a, R404a, R22, R410A | R410 A | |
| 3 | 2 | Unit type | 1-Water-to-Water 2-Air-to-Water 3-Reversible air-to-water | 2 | |
| 3 | 3 | Number of circuits | 1-2 | 1 | |
| 3 | 4 | Number of stages on circuit 1 | 1 ou 2 | 1 | |
| 3 | 5 | Number of stages on circuit 2 | 0, 1, 2 | 0 if P3 = 1 1 if P3 = 2 | Hidden if P3 = 1 |
| 3 | 6 | Number of evaporators | 1 if P3 = 1, 1 if P3 = 1 and P2 = air-to-water 2 if P3 = 2 | 1 if P3 = 1 2 if P3 = 2 | |
| 3 | 7 | Compressor supplier | Maneurop - Copeland - Inverter | Copeland | |
| 3 | 8 | Heat exchanger suppliers | EXL - Swep - Swep double - Alfa laval | EXL | - If P03 = 1 and P06 = 1, then P08 = EXL or SWEP - If P03 = 2 and P06 = 2, then P08 = EXL or SWEP If P03 = 2 and P06 = 1, then P08 = ALFA LAVAL or SWEP DOUBLE |
| 3 | 9 | Stage 2 shut-down time delay | 1 to 10 s | 2 s | Si P4 = 2 |
| 3 | 10 | Fan type | Centrifugal - Propeller – Available pressure | Propeller | Si P2 = 2, 3 |
| 3 | 11 | Coil type | Intertwined - Split - Mixed | Intertwined | If P3 = 2, P10 = pressure , P2 = 2, 3 |
| 3 | 12 | Pressure balance solenoid valve | No - Yes | No | If P2 = reversible air-to-water |
| 3 | 13 | Tandem type | Balanced Yes/No | Yes | |
| 3 | 14 | Number of coil sensors per circuit | 1,2 or 4 | 1 if P3 (No. of circuits) = 1 2 if P3 = 2. | |
| 2 | 15,1 | Measurement of electrical value | Yes/No | No | |
| 2 | 15,2 | Electrical network type | 1BL,2BL,3BL,4BL and 4NBL | 3BL | If P15,1 = Yes |
| 2 | 16 | Primary CT rating | 5 to 1000 A in increments of 1 | 400 A | If P15,1 = Yes |
| 2 | 17 | Secondary CT rating | 1 or 5 A | 5 A | If P15,1 = Yes |
| | | | **Option** | | |
| 2 | 20 | All-season operation | No - Yes | Yes | If P2 = 2, 3 |
| 2 | 21 | Variable speed drive | 1 - Without 2 - With acoustic optimisation 3 - With energy optimisation | Without | If P2 = 2, 3 P10 = Propeller Value 3 accessible only if P42 = VCM |
| 2 | 22 | Electric auxiliary heaters | No - Yes | No | If P2 = 1 or 3 |
| 2 | 25 | Number of pumps delivered | 0-1-2 if P2 = 2 and 0-1 if P2 = 3 | 0 | Visible if P2 = 2 or 3 |
| 2 | 26 | 0-10 V configurable output | V2V - V3V | V2V | 2WV, Visible if P2 = water/water and P3 = 1 3WV, Visible if P2 = water/water |
| 2 | 27 | Pump controlled by operation of boiler | Yes/No | No | Visible if P2 = 3 and P111 = Boiler |
| 2 | 28 | Master/slave control of two machines | Yes/No | No | |
| 2 | 29 | Total recovery | Yes/No | No | If P2 = 2 |
| 2 | 29,1 | Frost protection during heat recovery | Yes/No | No | |
| | | | **Breakdown** | | |
| 3 | 30 | High pressure, HP 1 sensor | 10 to 50 b (resolution: 0,1) | 34 45 with R410A | |
| 3 | 31 | Low pressure, HP 1 sensor | -1 to 10 b (resolution: 0,1) | -0,5 0 with R410A | |
| 3 | 32 | High pressure, HP 2 sensor | 10 to 50 b (resolution: 0,1) | 34 45 with R410A | If P3 = 2 |
| 3 | 33 | Low pressure, HP 2 sensor | -1 to 10 b (resolution: 0,1) | -0,5 0 with R410A | If P3 = 2 |

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| | | | | **Option** | |
| **Breakdown (continued)** | | | | | |
| 3 | 36 | High pressure, LP 1 sensor | 10 to 50 b (resolution: 0,1) | 34<br>45 with R410A<br>17,3 b if<br>P42 = VCM | |
| 3 | 37 | Low pressure, LP 1 sensor | -1 to 10 b (resolution: 0,1) | -0,5<br>0 with R410A | |
| 3 | 38 | High pressure, LP 2 sensor | 10 to 50 b (resolution: 0,1) | 34<br>45 with R410A<br>17,3 b if<br>P42 = VCM | If P3 = 2 |
| 3 | 39 | Low pressure, LP 2 sensor | -1 to 10 b (resolution: 0,1) | -0,5<br>0 with R410A | If P3 = 2 |
| 3 | 42 | Electronic expansion valve | No/ALCO/VCM | No | |
| 3 | 43 | Superheat protection | Yes/No | No | |
| 3 | 44 | Minimum superheat | 0 to 5 K (resolution: 0,1) | 0,5 K | If P43 = Yes |
| 3 | 45 | Maximum overheating | 10 to 20 K (resolution: 0,1) | 15.0 K | If P43 = Yes |
| 3 | 50 | SCP (runtime + off) | 3 to 10 min. (resolution: 1) | 5 | |
| 3 | 51 | Discharge temperature limit | 60 to 145°C (resolution: 1) | 145°C if Cop.**<br>135°C if Man.**<br>125°C if R410A<br>and P7 = Cop** | |
| 3 | 52 | Water line frost protection limit | -25 to 6°C (resolution: 0,1) | 2 if P1 = R22,<br>4 if P1 = 407C,<br>R134a, R404 and 3 if<br>R410A | P52 ≥ 2 °C if P22 = Yes |
| 3 | 53 | Δ for refrigerant frost protection limit/P52 | 2 to 15 K (resolution: 0,1) | 10<br>5 with R410A<br>7 if P7 = INVERTER | Refrigerant frost protection limit = P52-P53, if P08 ≠ SWEP DOUBLE |
| | | Δ for the frost limit on LP saturation temperature | | | If P08 = SWEP DOUBLE |
| 3 | 54 | HP fault threshold | 15 to 45 b (resolution: 0,1) | 27,5 if P1 =<br>R407C or R22<br>19 if P1 = R134a<br>24 if P1 = R404a<br>40,2 b if R410A | |
| 3 | 55 | LP fault threshold | 0,1 to 5 b (resolution: 0,1) | If P2 = 3: 0,5 b<br>If P2 ≠ 3:<br>(1,5 b if P1 = R22,<br>R407C, R404a) and<br>(0,5 b if P1 = R134a)<br>2,5 b with R410A | |
| 3 | 58 | LP slope factor | 0 to 5 b (resolution: 0,5) | 1 | If P2 = 1, 2 or 3 |
| 3 | 59 | Water outlet temperature slope factor | 0 to 1 (resolution: 0,1) | 0 if P2 = 1<br>0,5<br>if P2 = 2 and 3 | If P2 = 1, 2, 3 |
| 3 | 63 | Minimum HP limit | 5 to 25 b (resolution: 0,1) | 13 if<br>R22-R407C<br>8b with R134a<br>15 b with R404a<br>18 b with R410A | If P2 = water-to-water |
| 3 | 64 | Optimised frost protection | Yes - No | Yes | If P1 = R410A, P2 = 2 or 3 |
| 3 | 65 | Delta T/Heat exchanger type | 0 - 10 | 0 | If P64 = Yes: confirm |
| 3 | 66 | Start-up time delay | 0 to 300 seconds | 120s | If P7 = INVERTER |
| 3 | 67 | Oil warming time delay | Yes/No | Yes | If P7 = INVERTER |
| 3 | 98 | Outdoor temperature sensor active | Yes/No | No | |
| 2 | 99 | Parameter locking | No - Yes | No | |

** Cop. = Copeland ; Man. = Maneurop

# 6 - LIST OF PARAMETERS

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| | | | **Configuration Client** | | |
| 2 | 100 | Language | F - GB - D - SP - I | F | |
| 2 | 101 | Date | DAy/MOnth/YEar | | |
| 2 | 102 | Hour | HOurs/MInutes | | |
| 1 | 103 | Control type | Local - remote (BMS) | Local | |
| 2 | 104 | Leak detection | Yes - No | NO | |
| 2 | 104,1 | Leak detection time delay | 0 to 5 min | 1 min | If P104 = Yes |
| 2 | 108 | Pump 2 control | Depending on control mode / Depending on On/Off if P2 = 1 | Depending on On/Off | Visible if P2 = 1 |
| 2 | 109 | Pump 2 'on' time delay | 15 to 90 seconds (resolution: 5 seconds) | 15 | Visible if P2 = 1 and P108 = f (Control) |
| 2 | 111 | Configurable output | Max. power/Boiler/Cooling-heating / Helping on all faults on air-to-water only | P max | |
| 2 | 112 | Number of electric stages | 1 to 4 | 2 | Visible if P22 = Yes |
| 2 | 113 | Configurable input | Disabled/Load shedding/Override | Disabled | Visible if P22 = Yes |
| 3 | 115 | Exchanger frost detection enabled | Yes - No | Yes | Visible if P2 = 1, 2, 3 |
| 3 | 116 | Drycooler link | Yes - No | No | |
| 2 | 117 | Power input limitation | No permanent – Yes by on/off input – Yes by bus | No | P 15,1 = Yes |
| 2 | 118,1 | Maximum power level | 15 to 400 kW | 200 | P 15,1 = Yes and P117 ≠ No |
| **Setpoint Management** | | | | | |
| 1 | 119 | Operating mode | 1 - Cooling<br>2 - Heating<br>3 - Cooling/heating via console<br>4 - Cooling/heating via on/off input<br>5 - Automatic cooling/heating based on outdoor temperature | Cooling | If P2 = 1 or 3 = All<br>If P2 = 2 = Cooling only |
| 1 | 120 | Number of setpoints | 1 - 2 via console - 2 via on/off input - 3 Setpoint managed by 4 20 mA signal | 1 | |
| 1 | 121 | Cooling setpoint 1 | P52 + 1 K at 30°C (resolution: 0,1) | 20 | If P2 = 1, 2 or 3 P119 ≠ Heating |
| 1 | 122 | Cooling setpoint 2 | P52 + 1 K at 30°C (resolution: 0,1) | 15 | If P120 = 2, P2 = 1, 2 or 3, |
| 1 | 123 | Heating setpoint 1 | 20 to 60°C (resolution: 0,1) | 25 | P119 ≠ Heating |
| 1 | 124 | Heating setpoint 2 | 20 to 60°C (resolution: 0,1) | 20 | P119 ≠ Cooling |
| 1 | 125,1 | Low setpoint (4 20 mA) during cooling: | P52 + 3 K at 30°C | P52 + 3 | Displayed if P120 = 3 and in cooling mode |
| 1 | 125,2 | Low setpoint (4 20 mA) during heating: | 10 to 60°C | 20 | Displayed if P120 = 3 and in heating mode |
| 1 | 126,1 | High setpoint (4 20 mA) in cooling mode: | P125,1 ± 5 K at 30°C with minimum value of P52 + 3 | 20 | Displayed if P120 = 3 and in cooling mode |
| 1 | 126,2 | High setpoint (4 20 mA) in heating mode: | P125,2 ± 5 K at 60°C with minimum value of 10°C. | 40 | Displayed if P120 = 3 and in heating mode |
| 1 | 127 | Cooling setpoint adjustment = f (out. temp.) | No - Yes | Yes | If P2 = 1, 2 or 3 and P119 ≠ Heating |
| 1 | 128 | **Outdoor temperature** at start of drift | 20 to 55°C (resolution: 1) | 25 | If P127 = Yes |
| 1 | 129 | **Outdoor temperature** at end of drift | P128 + 5 K at 60°C (resolution: 1) | 35 | If P127 = Yes |
| 1 | 130 | Maximum setpoint at end of drift | P52 + 1 K at 30°C (resolution: 0,1) | 10 | If P127 = Yes |
| 1 | 131 | Heating setpoint adjustment = f (out. temp.) | No - Yes | Yes | If P2 = 1 or 3 and P119 ≠ Cooling |
| 1 | 132 | **Outdoor temperature** at start of drift | 20 to 55°C (resolution: 1) | 16 | If P131 = Yes |
| 1 | 133 | **Outdoor temperature** at end of drift | -25 to P132 - 5 K (resolution: 1) | -7 | If P131 = Yes |
| 1 | 134 | Maximum setpoint at end of drift | Highest setpoint if P120 ≠ 1 or setpoint if P120 = 1 at 60°C (resolution: 0,1) | 45 | If P131 = Yes |
| 1 | 135 | Minimum boiler drift setpoint | 30 to 55°C | 50°C | If P111 = Boiler |
| 1 | 136 | Maximum air temperature in automatic heating mode | - 5 to 25°C (resolution 1) | 16 | If P119 = 5 |
| 1 | 137 | Minimum air temperature in automatic cooling mode | P136 + 2 to 40°C (resolution: 1) | 20 | If P119 = 5 |

# 6 - LIST OF PARAMETERS

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| | | | **Control** | | |
| 2 | 141 | Control mode | 1- Return<br>3- Water supply<br>4- Supply with compensation | 1 | |
| 2 | 142 | Water loop winter protection | No - Yes | NO | Visible if P2 = 1 and P141 = 1 and heating mode<br>Visible if P2 = 1 and cooling mode<br>Visible if P2 = 2 or 3 |
| 2 | 143 | Stage differential | 0,5 to 5 K (resolution: 0,5) | 2<br>1,5 | If P141 = 1, 2<br>if P7 = INVERTER |
| 2 | 144 | Interstage differential | 0,5 to 5 K (resolution: 0,5) | 1,5 | |
| **Supply with compensation by return** | | | | | |
| 2 | 145 | P coefficient | 0,3 to 2 (resolution: 0,1) | 1 | If P141 = 3, 4 and P7 ≠ INVERTER |
| 2 | 146 | I coefficient | 0 to 1 (resolution: 0,1) | 0 | If P141 = 3, 4 and P7 ≠ INVERTER |
| 2 | 147 | D coefficient | 0 to 1 (resolution: 0,1) | 0 | If P141 = 3, 4 and P7 ≠ INVERTER |
| 2 | 148 | T coefficient | 10 to 240 seconds (resolution: 10) | 60 | If P141 = 3, 4 and P7 ≠ INVERTER |
| 2 | 150 | Compensation of coefficient | 0,1 to 1 (resolution: 0,1) | 0,5 | If P141 = 4 |
| 2 | 151 | Compensation of time | 5 to P148-2 (resolution: 1) | 10 | If P141 = 4 |
| **For storage control** | | | | | |
| 3 | 154 | Storage | Yes/No | No | If P119 ≠ 2, P120 ≠ 1 and P120 ≠ 4 |
| 3 | 155 | ΔT of control | 0,5 to 10°C (resolution: 0,5) | 5 | If P154 = Yes |
| **Defrosting** | | | | | |
| 3 | 157 | Temperature at start of defrosting | -5 to 0°C (resolution: 0,5) | -2 | If P2 = 3 |
| 3 | 158 | Temperature at end of defrosting | 10 to 30°C (resolution: 1) | 15 if R407C otherwise 25 | If P2 = 3 |
| 3 | 159 | Frosting time calculation | Fixed time Optimised | Optimised | If P2 = 3 |
| 3 | 160 | Fixed time | 30-45-60 | 45 | If P2 = 3 |
| 3 | 161 | Coil frosting factor | 0 to 2 (resolution: 0.01) | 0,3 | If P159 = Optimised |
| 3 | 162 | ΔT correction based on outdoor temperature | 0 to 1 (resolution: 0.01) | 0,2 | If P159 = Optimised |
| 3 | 163 | CP off time delay for defrosting cycle | 0 to 5 min. | 60 s | P2 = 3<br>if P7 ≠ INVERTER |
| 3 | 164 | ΔP defrosting HP interlocking fan | 1 to 20 b (resolution: 0,5) | 2 | If P2 = 3, (P HPR = P54 - P164) |
| 3 | 165 | DHP differential | 1 to 5 b (resolution: 0,5) | 2 | If P2 = 3 |
| 3 | 166 | Defrosting HP control coefficient | 1 to 5 b (resolution:1) | 3 | If P21 ≠ 1 |
| **Charge limit** | | | | | |
| 2 | 171 | Maximum return temperature, stage 2 | 20 to 50°C (resolution: 1) | 35 | If P4 + P5 ≥ 2 and P119 ≠ Heating |
| | | | **Fan management** | | |
| 2 | 180 | Number of HP control stages per circuit | 1 to 2 if P3 = 1<br>2 to 4 if P3 = 2 and P11 = intertwined<br>2 or 3 if P3 = 2 and P11 = split<br>3 if P3 = 2 and P11 = mixed | 1 si P3 = 1<br>2 si P3 = 2 et P11 = imbriqué<br>2 si P3 = 2 et P11 = séparé<br>3 si P3 = 2 et P11 = mixte | Visible if P2 = 2 or 3 +<br>P10 = propeller |
| 2 | 181 | HP control setpoint | 12 to 17 b (resolution: 0,5) if P1 = R407C or R22<br>14 to 20 b (resolution: 0,5) if P1 = R404a<br>7 to 13 b (resolution: 0,5) if P1 = R134a<br>19 to 27 b (resolution: 0,5) if P1 = R410A<br>13,4 to 27 b if P7 = INVERTER | 12<br><br>14<br>7<br>19 | Visible if P2 = 3 or P2 = 2 +<br>P10 = propeller |
| 2 | 182 | Outdoor air temperature, forced HP | 10 to 40 (resolution: 1) | 25 | Visible if P2 = 3 or 2<br>+ P10 = propeller |
| 2 | 183 | Stage differential, HP control | 2 to 8 b (resolution: 0,5) | 4 | Visible if P2 = 3 or 2<br>+ P10 = propeller |
| 2 | 184 | Interstage differential, HP control | 0,5 to 3 (resolution: 0,5)<br>2 to 4 (resolution: 0,5) | 1<br>3 | Visible if P2 = 3 or 2<br>+ P10 = propeller<br>If P180 = 1 (Low noise function) |

# 6 - LIST OF PARAMETERS

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| | | | **High Pressure Control** | | |
| 3 | 191 | Low Noise operation | Yes - No | No | If P1 = R410A and P2 = 2, 3 or 4 and P180 = 1 |
| 2 | 192 | Max. fan speed threshold | 5 to 10 V | 8.0 5,6 V if P7 = INVERTER | - If P7 ≠ Inverter and P10 = Pressure (P21 = 2 or 3, P180 = 1 and hidden) If P7 = Inverter and P21 = Yes |
| 3 | 193 | Shifting of HP setpoint during total recovery | 5 to 14 (resolution: 0,5) | 8 if P21 = 1 12 if P21 = 2 or 3 | If P29 = Yes |
| 3 | 195 | ΔP for power reduction | 0,1 to 1 b (resolution: 0,1) | 0,3 | If P4 = P5 ≠ 1 |
| 3 | 196 | ΔP return to normal condensation control | 0,1 to 2 b (resolution: 0,1) | 1 1,5 with R410A | Visible if P2 = 3 or 2 + P10 = propeller |
| 2 | 197 | Value at 0 V | 19 to 28 if P26 = 2WV 10 to 25°C if P26 = 3WV | 19b 20°C | Visible if P2 = Water-to-Water and P3 = 1 Visible if P2 = Water-to-Water |
| 2 | 198 | Value at 10 V | 28 to 39 if P26 = 2WV 25 at 40°C if P26 = 3WV | 28b 30°C | Visible if P2 = Water-to-Water and P3 = 1 Visible if P2 = Water-to-Water |
| **Limits** | | | | | |
| 3 | 220 | Outdoor temperature, unit winter protection | 2 to 10°C (resolution: 1) | 2 | If cooling and P142 = Yes If P2 = Air-to-water |
| 3 | 222 | Outdoor temperature differential, unit winter protection | 1 to 10 K (resolution: 1) | 2 | If cooling and P142 = Yes If P2 = Air-to-water |
| 3 | 225 | Minimum outdoor air temperature in Heating mode | -25 to 5°C (resolution: 1) | -10 -20 | If P119 ≠ cooling and P2 = 3 If P7= INVERTER |
| 3 | 225,1 | Maximum outdoor air temperature in Cooling mode | 35 to 50°C (resolution: 1) | DISABLED | |
| 3 | 225,2 | Maximum outdoor air temperature in Heating mode | -5 to +25°C (resolution: 1) | DISABLED | if P2 = water-to-water and reversible air-to-water when P119 ≠ 1 |
| 3 | 225,3 | Température mini air extérieur en FROID | 20 to +25°C (resolution: 1) | DISABLED | if P2 = water-to-water and reversible air-to-water when P119 ≠ 2 |
| 3 | 226 | Outdoor temperature Boiler operation authorisation | P225 at 25°C if P2 = 3 and P119 ≠ cooling 20 to 25°C if P2 = 1 and P119 ≠ cooling | 5 | (resolution: 1) |
| 2 | 230 | On authorisation, stage 1 circuit 1 | No - Yes | Yes | |
| 2 | 231 | On authorisation, stage 2 circuit 1 | No - Yes | Yes | If P4 = 2 |
| 2 | 232 | On authorisation, stage 1 circuit 2 | No - Yes | Yes | If P3 = 2 |
| 2 | 233 | On authorisation, stage 2 circuit 2 | No - Yes | Yes | If P5 = 2, P3 = 2 |
| 2 | 235 | On authorisation, electric stage 1 | No - Yes | Yes | If P22 = Yes |
| 2 | 236 | On authorisation, electric stage 2 | No - Yes | Yes | If P22 = Yes |
| 2 | 237 | On authorisation, electric stage 3 | No - Yes | Yes | If P22 = Yes |
| 2 | 238 | On authorisation, electric stage 4 | No - Yes | Yes | If P22 = Yes and P112 = 4 |
| **Read-only** | | | | | |
| 1 | 250 | LED test | | | |
| 1 | 251 | Control setpoint | | | If P141 ≠ 5 and ≠ 6 |
| 1 | 252 | Outdoor air temperature | | | |
| 1 | 255 | Water inlet temperature, heat exchanger 1 | | | |
| 1 | 256 | Water outlet temperature, heat exchanger 1 | | | |
| 1 | 257 | Hot water inlet temp., condenser | | | If P2 = 1 and P141 = 1 |
| 1 | 258 | Hot water outlet temp., condenser | | | If P2 = 1 and P141 = 3 |
| 1 | 259 | Refrigerant temperature, circuit 1 coils A-B C-D | | | If P2 = 3 If P2 = 3 and P14 = 2 If P2 = 3 and P14 = 4 |
| 1 | 260 | Refrigerant temperature, heat exchanger 1 | | | If P2 = 1 or 2 |
| 1 | 261 | Manifold water outlet temperature | | | If P6 = 2 - P2 = 1, 2 or 3 |
| 1 | 262 | Water outlet temperature, heat exchanger 2 | | | If P6 = 2 |
| 1 | 263 | Refrigerant temperature, circuit 2 coils A-B C-D | | | If P2 = 3 and P3 = 2 If P2 = 3 and P3 = 2 and P14 = 2 If P2 = 3 and P3 = 2 and P14 = 4 |
| 1 | 264 | Refrigerant temperature, heat exchanger 2 | | | If P2 = 1 or 2 and if P6 = 2 |
| 1 | 265 | Exchanger ambient temperature | | | If P2 = Air-to-water |
| 1 | 266 | Calculated frosting time, circuit 1 | | | If P2 = 3, |
| 1 | 267 | Calculated frosting time, circuit 2 | | | If P2 = 3 and P3 = 2 |

# 6 - LIST OF PARAMETERS

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| **Read-only (continued)** | | | | | |
| 1 | 268 | Value of reference ΔT for defrosting of circuit 1 | | | If P159 = Optimised |
| 1 | 269 | Value of reference ΔT for defrosting of circuit 2 | | | If P159 = Optimised and P3 = 2 |
| 1 | 270 | Controller action time delay | | | |
| 1 | 271 | DHP on differential | | | If P2 = 3 |
| 1 | 273,1 | Supply voltage | | | If P15,1 = Yes |
| 1 | 274,1 | Machine current input | | | If P15,1 = Yes |
| 1 | 275,1 | Machine power input | | | If P15,1 = Yes |
| 1 | 276,1 | Electrical power consumed | | | If P15,1 = Yes |
| 1 | 285 | Runtime in heating mode | | | If P119 ≠ Cooling |
| 1 | 286 | Runtime in cooling mode | | | If P119 ≠ Heating |
| 1 | 287 | Pump 1 runtime (in hours) | | | |
| 1 | 288 | Pump 2 runtime (in hours) | | | If (P2 = 1) or P25 = 2 |
| 1 | 289 | No. of times P99 set to "No" | | | |
| 1 | 290 | No. of water flow cut-offs in 1 hour | | | Visible if (cooling and P2 = 1) or if P2 = 3 or if P2 = 2 and P25 ≠ 2 |
| 1 | 291 | Leak detected in circuit 1 | | | Visible if P104 = Yes |
| 1 | 291,1 | Leak detected in circuit 2 | | | Visible if P104 = Yes |
| **Circuit 1** | | | | | |
| 1 | 300 | Circuit 1 HP | | | |
| 1 | 300,1 | Circuit 1 HP control setpoint | | | If P3 = 1 or 2 and P11 = Intertwined |
| 1 | 301 | Circuit 1 condensation temperature | See appendix | | |
| 1 | 302,1 | Discharge temperature 1 | | | |
| 1 | 302,2 | Discharge temperature 2 | | | If P4 = 2 |
| 1 | 303,1 | Desuperheat on discharge 1 | P302,1 - P301 | | |
| 1 | 303,2 | Desuperheat on discharge 2 | P302,2 - P301 | | If P4 = 2 |
| 1 | 304 | Circuit 1 LP | | | |
| 1 | 305 | Circuit 1 evaporation temperature | See appendix | | |
| 1 | 306 | Circuit 1 suction temperature | °C | | |
| 1 | 307 | Circuit 1 superheat | °C | | |
| 1 | 308 | Number of HP1 cut-offs in 24 hours | | | |
| 1 | 309 | Number of LP1 cut-offs in 24 hours | | | |
| 1 | 310 | Number of starts, stage 1, circuit 1 | | | |
| 1 | 311 | Runtime (in hours), stage 1, circuit 1 | | | |
| 1 | 312 | SCP, stage 1, circuit 1 | | | |
| 1 | 313 | Number of starts, stage 2, circuit 1 | | | If P4 = 2 |
| 1 | 314 | Runtime (in hours), stage 2, circuit 1 | | | If P4 = 2 |
| 1 | 315 | SCP, stage 2, circuit 1 | | | If P4 = 2 |
| 1 | 322 | No. of water line frost protection cut-offs, circuit 1 | | | |
| 1 | 323 | No. of refrigerant line frost protection cut-offs, circuit 1 | | | If P2 ≠ 3 |
| 1 | 324,1 | No. of cut-offs caused by discharge temperature 1 in 24 hours | | | |
| 1 | 324,2 | No. of cut-offs caused by discharge temperature 2 in 24 hours | | | If P4 = 2 |
| 1 | 325 | Opening of circuit 1 expansion valve | % | | If P42 = VCM and P3 = 1 |
| 1 | 326 | Circuit 1 liquid temperature | °C | | If P2 = 1 or 2 or (3 + cooling mode) |
| 1 | 327 | Circuit 1 subcooling | °C | | If P2 = 1 or 2 or (3 + cooling mode) |
| 1 | 328 | No. of cut-offs caused by C1 electronic expansion valve fault in 24 hours | | | If P42 = ALCO |
| **Circuit 2** | | | | | |
| 1 | 330 | Circuit 2 HP | | | If P3 = 2 |
| 1 | 330,1 | Circuit 2 HP control setpoint | | | If P3 = 2 and P11 ≠ Intertwined |
| 1 | 331 | Circuit 2 condensation temperature | See appendix | | If P3 = 2 |
| 1 | 332,1 | Discharge temperature 3<br>Discharge temperature 2 | °C | | If P3 = 2 and P4 = 2<br>If P3 = 2 and P4 = 1 |
| 1 | 332,2 | Discharge temperature 4 | °C | | If P3 = 2 and P5 = 2 |
| 1 | 333,1 | Desuperheat on discharge 3<br>Desuperheat on discharge 2 | P332,1 - P331 | | If P3 = 2 and P4 = 2<br>If P3 = 2 and P4 = 1 |

# 6 - LIST OF PARAMETERS

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| **Circuit 2 (continued)** | | | | | |
| 1 | 333,2 | Desuperheat on discharge 4 | P332,2 - P331 | | If P3 = 2 and P5 = 2 |
| 1 | 334 | Circuit 2 LP | | | If P3 = 2 |
| 1 | 335 | Circuit 2 evaporation temperature | See appendix | | If P3 = 2 |
| 1 | 336 | Circuit 2 suction temperature | °C | | If P3 = 2 |
| 1 | 337 | Circuit 2 superheat | °C | | If P3 = 2 |
| 1 | 338 | Number of HP2 cut-offs in 24 hours | | | If P3 = 2 |
| 1 | 339 | Number of LP2 cut-offs in 24 hours | | | If P3 = 2 |
| 1 | 340 | Number of starts, stage 1, circuit 2 | | | If P3 = 2 |
| 1 | 341 | Runtime (in hours). Stage 1, circuit 2 | | | If P3 = 2 |
| 1 | 342 | SCP, stage 1, circuit 2 | | | If P3 = 2 |
| 1 | 343 | Number of starts, stage 2, circuit 2 | | | If P3 = 2, P5 = 2 |
| 1 | 344 | Runtime (in hours). Stage 2, circuit 2 | | | If P3 = 2, P5 = 2 |
| 1 | 345 | SCP, stage 2, circuit 2 | | | If P3 = 2, P5 = 2 |
| 1 | 352 | No. of water line frost protection cut-offs, circuit 2 | | | If P3 = 2 and P2 ≠ 4, 5 |
| 1 | 353 | No. of refrigerant line frost protection cut-offs, circuit 2 | | | |
| 1 | 354,1 | No. of cut-offs caused by discharge temperature 2 in 24 hours<br>No. of cut-offs caused by discharge temperature 3 in 24 hours | | | If P3 = 2 and P4 = 1<br>If P3 = 2 and P4 = 2 |
| 1 | 354,2 | No. of cut-offs caused by discharge T° 4 in 24 hours | | | If P3 = 2 and P5 = 2 |
| 1 | 355 | Opening of circuit 2 expansion valve | % | | P42 = VCM and P3 = 2 |
| 1 | 356 | Circuit 2 liquid temperature | °C | | If [P2 = 1 or 2 or (3 + cooling mode)] and P3 = 2 |
| 1 | 357 | Circuit 2 subcooling | °C | | If [P2 = 1 or 2 or (3 + cooling mode)] and P3 = 2 |
| 1 | 358 | No. of cut-offs caused by C1 electronic expansion valve fault in 24 hours | | | If P42 = ALCO |
| | | **Entrées** | | | |
| 1 | 400 | Automatic machine operation control | Open/Closed | | |
| 1 | 402 | Setpoint 1/Setpoint 2 selection | Open/Closed | | If P120 = 2 via On/Off control |
| 1 | 403 | Water flow check | Open/Closed | | |
| 1 | 404 | Fan fault check | Open/Closed | | If P2 ≠ 1 or 5 |
| 1 | 405 | Cooling/Heating input check | Open/Closed | | If P119 = Cooling/Heating via On/Off control |
| 1 | 406 | Phase controller | Open/Closed | | |
| 1 | 407 | Recovery operating mode selection | Open/Closed | | If P29 = Yes |
| 1 | 408 | Check of fault input for auxiliary electric heater 1 | Open/Closed | | If P22 = Yes |
| 1 | 409 | Check of fault input for auxiliary electric heater 2 | Open/Closed | | If P22 = Yes |
| 1 | 410 | Check of configurable auxiliary electric heater input | Open/Closed | | If P22 = Yes |
| 1 | 414 | Check of override/load shedding input 1 | Open/Closed | | |
| 1 | 415 | Check of override/load shedding input 2 | Open/Closed | | If P4 = 2 |
| 1 | 416 | Check of override/load shedding input 3 | Open/Closed | | If P3 = 2 |
| 1 | 417 | Check of override/load shedding input 4 | Open/Closed | | If P5 = 2 |
| 1 | 418 | Check of manual HP1 pressure switch input | Open/Closed | | |
| 1 | 419 | Check of stage 1, circuit 1 fault input | Open/Closed | | |
| 1 | 420 | Check of stage 2, circuit 1 fault input | Open/Closed | | If P4 = 2 |
| 1 | 422 | Check of manual HP2 pressure switch input | Open/Closed | | If P3 = 2 |
| 1 | 423 | Check of stage 1, circuit 2 fault input | Open/Closed | | If P3 = 2 |
| 1 | 424 | Check of stage 2, circuit 2 fault input | Open/Closed | | If P5 = 2 |
| 1 | 425 | Check of fault input for circuit 1 electronic expansion valve | Open/Closed | | If P42 = ALCO |
| 1 | 426 | Check of fault input for circuit 2 electronic expansion valve | Open/Closed | | If P42 = ALCO |
| | | **Outputs** | | | |
| 1 | 430 | Pump 1 control state | On/Off | | |
| 1 | 431 | Pump 2 control state | On/Off | | If (P2 = 1) or P25 = 2 |
| 1 | 432 | State of circuit 1 Y/C control output | On/Off | | If P2 = 3 |
| 1 | 433 | State of circuit 2 Y/C control output | On/Off | | If P2 = 3 and P3 = 2 |
| 1 | 435 | State of heat trace cable control output | On/Off | | If P2 ≠ 1 (water-to-water) |
| 1 | 436 | State of heater control output | On/Off | | If P2 ≠ 1 (water-to-water) |

# 6 - LIST OF PARAMETERS

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| | | **Outputs (continued)** | | | |
| 1 | 437 | State of recovery heat trace cable control output | On/Off | | If P2 ≠ 1 (water-to-water) and P29,1 = Yes |
| 1 | 438 | State of maximum power output | On/Off | | If P111 = Max. power |
| 1 | 439 | State of boiler output | On/Off | | If P111 = Boiler |
| 1 | 440 | State of cooling/heating output | On/Off | | If P111 = Cooling/Heating |
| 1 | 441 | State of HP control output, stage 1, circuit 1 | On/Off if P21 = without High Temperature mode/Low Noise mode/Off if P191 = acoustic | | If P21 = without, P2 = 2, 3 |
| 1 | 442 | State of HP control output, stage 2, circuit 1 | On/Off | | If P180 = 2 and P3 = 1, P2 = 2, 3 |
| 1 | 443 | State of HP control output, stage 1, circuit 2 | On/Off | | If P180 = 1 and P3 = 2, P2 = 2, 3 |
| 1 | 444 | State of HP control output, stage 2, circuit 2 | On/Off | | If P180 = 2 and P3 = 2, P2 = 2, 3 |
| 1 | 445 | State of HP control output, stage 3, circuit 1 or State of HP control output, common stage 1 | On/Off | | If P180 = 3 and P3 = 2, P11 = split, P2 = 2, 3 or If P180 = 3 and P3 = 2, P11 = mixed |
| 1 | 446 | State of HP control output, stage 3, circuit 2 or State of HP control output, common stage 3 | On/Off | | If P180 = 3 and P3 = 2, P11 = split, P2 = 2, 3 or If P180 = 3 and P3 = 2, P11 = mixed |
| 1 | 447 | Driving voltage, stage 1, HP control | 0-10 V | | If P21 = 2 or 3 and P11 = Intertwined |
| 1 | 448 | Driving voltage, stage 1, circuit 1, HP control | 0-10 V | | If P21 = 2 or 3 and P11 = split or mixed |
| 1 | 449 | Driving voltage, stage 1, circuit 2, HP control | 0-10 V | | If P21 = 2 or 3 and P11 = split or mixed |
| 1 | 450 | Driving voltage, common stage 1, HP control | 0-10 V | | If P21 = 2 or 3 and P11 = Mixed |
| 1 | 451 | State of circuit 1 balance valve output | On/Off | | If P12 = Yes |
| 1 | 452 | State of circuit 2 balance valve output | On/Off | | If P12 = Yes |
| 1 | 530 | State of electric stage 1 | On/Off | | If P22 = Yes |
| 1 | 531 | State of electric stage 2 | On/Off | | If P22 = Yes |
| 1 | 532 | State of electric stage 3 | On/Off | | If P22 = Yes |
| 1 | 533 | State of electric stage 4 | On/Off | | If P22 = Yes and P112 = 4 |
| 1 | 535 | Air blade percentage information | 0-100 % | | If P20 =Yes and P10 = Centrifugal |
| 1 | 555 | CPU version number | | | |
| 1 | 556 | Console version number | * | | |
| 1 | 557 | Version number of circuit 2 board | | | If P3 = 2 |
| 1 | 558 | Version number of changeover board | | | If P2 = reversible air-to-water |
| 1 | 559 | Version number of auxiliary heater board | | | If P22 = Yes |
| 1 | 560 | Version number of circuit 1 expansion valve | XX.YY VCM XX.YY | | If P42 = VCM and P3 = 1 |
| 1 | 561 | Version number of circuit 2 expansion valve | XX.YY VCM XX.YY | | If P42 = VCM and P3 = 2 |
| 1 | 570 | "SO" order number" | | | To be entered via a PC |
| 1 | 571 | MO number | | | To be entered via a PC |
| 1 | 572 | Machine identification name | | | To be entered via a PC |
| 1 | 573 | Machine identification number | | | To be entered via a PC |
| | | **Electronic Expansion Valve** | | | |
| **Circuit 1** | | | | | |
| 3 | 601 | Circuit 1 valve type | EX4 - EX5 - EX6 - EX7 - EX8 | EX4 | If P42 = VCM and P3 = 2 |
| 3 | 602 | Circuit 1 superheat setpoint | 0,5 to 30°C | 6 | If P42 = VCM and P3 = 1 |
| 3 | 603 | Circuit 1 MOP point | Yes - No | No | If P42 = VCM and P3 = 1 |
| 3 | 604 | Circuit 1 MOP value | + 5 to 25°C | 15 | If P42 = VCM, P603 = Yes and P3 = 1 |
| 3 | 605 | Opening of C1 valve when air conditioning started | 10 to 100 % | 50 | If P42 = VCM and P3 = 1 |
| 3 | 606 | Opening of C1 valve when heat pump started | 10 to 100 % | 20 | If P42 = VCM and P3 = 1 and P2 = reversible air-to-water |
| 3 | 607 | Opening time at start-up, C1 | 1 to 60 seconds | 5 | If P42 = VCM and P3 = 1 |
| 3 | 608 | Circuit 1 slow mode | Yes/No | No | If P42 = VCM and P3 = 1 |
| **Circuit 2** | | | | | |
| 3 | 611 | Circuit 2 valve type | EX4 - EX5 - EX6 - EX7 - EX8 | EX4 | If P42 = VCM and P3 = 2 |
| 3 | 612 | Circuit 2 superheat setpoint | 0,5 to 30°C | 6 | If P42 = VCM and P3 = 2 |
| 3 | 613 | Circuit 2 MOP point | Yes - No | No | If P42 = VCM and P3 = 2 |
| 3 | 614 | Circuit 2 MOP value | + 5 to 25°C | 15 | If P42 = VCM and P609 = Yes and P3 = 2 |
| 3 | 615 | Opening of C2 valve when air conditioning started | 10 to 100 % | 50 | If P42 = VCM and P3 = 2 |

| Access level | No. | Description | Setting | Default | Display conditions |
|---|---|---|---|---|---|
| **Circuit 2 (continued)** | | | | | |
| 3 | 616 | Opening of C2 valve when heat pump started | 10 to 100 % | 20 | If P42 = VCM and P3 = 2 and P2 = reversible air-to-water |
| 3 | 617 | Opening time at start-up, C2 | 1 to 60 seconds | 5 | If P42 = VCM and P3 = 2 |
| 3 | 618 | Circuit 2 slow mode | | | If P42 = VCM and P3 = 2 |
| **COMMUNICATION** | | | | | |
| 1 | 700 | Communication protocol | BUS MODE | BUS MODE | |
| 1 | 701 | Transmission speed | Adjustable: 4800, 9600 baud or 9600 jbus | 9600 baud | |
| 1 | 702 | Parity | Without, even or odd | Without | |
| 1 | 703 | Number of stop bits | 1 or 2 | 1 | |
| 1 | 704 | Swapped real number format | Yes or No | Yes | |
| 1 | 705 | Bus number | 0 to 255 | 1 | |
| **Master/Slave (2 machines) if p28 = yes** | | | | | |
| 2 | 800 | Master machine on loop | Yes/No | No | If P28 = Yes |
| 2 | 801 | Backup machine | Yes/No | No | If P28 = Yes |
| 2 | 802 | Switch backup machine | Yes/No | No | If P28 = Yes |
| 2 | 803 | Name of backup machine | Master/Slave | Slave | If P28 = Yes |
| 2 | 804 | Loop control type | CASCADE or PARALLEL or PROGRESSIVE | CASCADE | If P28 = Yes |
| 2 | 805 | Machine differential | 0,5 to 5°C | 1,5 | If P28 = Yes |
| 2 | 806 | Differential between machines | 1 to 10°C | 4.0 | If P28 = Yes |
| 2 | 807 | Maximum differential, additional machine | 1 to 10°C | 0.0 | if P801 = Yes |
| 2 | 808 | Time delay between machines | 0 to 60 min. | 1 | If P28 = Yes |
| 2 | 809 | Machine 1 'on' authorisation | Yes/No | Yes | If P28 = Yes |
| 2 | 810 | Machine 2 'on' authorisation | Yes/No | Yes | If P28 = Yes |
| 2 | 811 | Pump turned off by control | No Yes, except for one Yes, machine off | No | |
| **Maintenance** | | | | | |
| 2 | 900 | F gas tightness check reminder | No -03-06-12 months | No | |
| 2 | 901 | F gas check reset | | | If P900 ≠ No |
| 2 | 910 | Maintenance check reminder | No –in hours-in months | No | |
| 2 | 911 | Maintenance check frequency | 1 to 9999 hrs 1 to 99 months | 2000 hrs 12 months | If P910 is in hours If P910 is in months |
| 2 | 912 | Maintenance check reset | | | |

# 7 - MANAGEMENT OF THE DRYCOOLER CONTROLLER PARAMETERS

Setting parameter P116 (Drycooler link) to "Yes" provides access to all Drycooler controller parameters in read/write mode only if a bus connection has been created between the two items of equipment

```
1 3 -       D R Y C O O L E R
```

- Menu 13 allows all information about the Drycooler controller to be displayed on the heat pump or chiller console without having the console mounted on the Drycooler.
- The Drycool controller parameters are preceded by the letter A to differentiate them from those of the heat pump or chiller controller.
- If a Drycooler equipped with its console is connected to a chiller or a heat pump and P116 is set to 'Yes', neither console has priority over the other.
- If menu 13 remains open for 1 hour and no buttons are pressed during this time, the screen switches to the controller menu for the chiller or heat pump.
- Parameter A99 (lock parameters) cannot be set to 'No' via the chiller or heat pump console.
- Parameter A116 (CW unit link) is not accessible via the chiller or heat pump console because setting A116 to 'No' will delete the link with the Drycooler console.
- Parameter A250 is not accessible because the LED test on the chiller or heat pump console is performed via parameter P250 on the controller of said console.
- The forced fan operation function on the console is not accessible via the chiller or heat pump console.

# 8 - CONTENTS OF THE MENUS

The ° symbol stands for °C in the electronic programming system.

Analogue values are displayed with one decimal place. The hundreds digit may be replaced by a negative sign when appropriate.

A selection symbol flashes at the left of the display.

Holding down the **+** or **–** buttons will cause increasingly faster scrolling (and change the units) in the list of parameters or when modifying parameter values.

## 8.1 - MAIN menu

Scrolling through menus occurs line by line.

The **+** button is used to increment values and the **–** button is used to decrement values.

The first square at the top left flashes.

```
1 - S E T P O I N T S
2 - S T A T U S     O F    M A C H I N E S

3 - M E A S U R E D    V A L U E S
4 - M A C H I N E . P A R A M E T E R S

5 - A D J U S T M E N T . P A R A M E T E R S
6 - R E A D I N G . P A R A M E T E R S

7 - F A U L T    M E M O R Y
8 - T E S T    M O D E

9 - P R O G R A M M I N G
1 0 - E L E C T R O    E X P A N S I O N    V A L

1 1 - C O M M U N I C A T I O N
1 2 - M A S T E R / S L A V E

1 3 - D R Y C O O L E R
1 4 - A C C E S S    L E V E L    S E L E C T .
```

## 8.2 - SETPOINTS menu

This menu gives quick access to settings for the control setpoints depending on the control mode and the selected operating mode.

```
P x x x    S T P    1    C O O L I N G
                         - x x . x  °
P x x x    S T P    2    C O O L I N G
                         - x x . x  °
P x x x    S T P    1    H E A T I N G
                         - x x . x  °
P x x x    S T P    2    H E A T I N G
                         - x x . x  °
```

To move from parameter to parameter, press the **+** or **–** buttons. The letter **P** flashes when a parameter is selected.

To change the value of a selected parameter, press **OK**. The value can be changed when the cursor flashes at the bottom right. Use the **+** button to raise the value, and the **-** button to lower it. When finished, press **OK** to confirm or **ESC** to cancel the changes.

When returning to menu 1 the last parameter consulted is displayed.

## 8.3 - MACHINE STATUS menu

To enter the MACHINE STATUS menu, use the **+** or **–** buttons to position the cursor on 2 then press **OK**.

# 8 - CONTENTS OF THE MENUS

### 8.3.1 - Main table

This screen reappears automatically after one hour if

No general faults occur, no controls are activated (via the console, modem, etc.), no general faults are reported and no automatic controls are closed:

```
D D / M M / Y Y                          h h / m m
R E T U R N    T E M P . : - x x . x °
S E T P O I N T           : - x x . x °        ↓
   ⊖ 1 O F F ⊖ 2 O N   ⊖ 3 S C P   ⊖ 4 S C P
```

The ↓ aarrow appears if there is another message.
- If a general fault occurs on the main machine, the messages are displayed on lines 2 and 3 in the following order of importance :

```
          M A C H I N E    O F F
       W A T E R    F L O W    F A U L T
```

```
W A T E R    F L O W    F A U L T
X    C U T ( S )    I N    1 H
```

```
          M A C H I N E    O F F
       O U T    T E M P .    T O O    L O W
```

```
          M A C H I N E    O F F
       O U T    T E M P .    T O O    H I G H
```

```
          M A C H I N E    O F F
       P H A S E    C T R L L R    F A U L T
```

```
    C O M P R E S S O R
    D R I V E R    F A U L T
```
{ If P7 = INVERTER

```
O U T .    T E M P .    S E N S O R    F A U L T
                    J 7 / 1 - 2
```
{ If machine off

```
C O N S E N S E R    I N L E T
S E N S O R    F A U L T        J 7 / 5 - 6
```

```
C O N S E N S E R    O U T L E T
S E N S O R    F A U L T        J 7 / 5 - 6
```

```
M A N I F . W A T E R    O U T L E T
S E N S O R    F A U L T    A D D 2    J 4 / 2 - 3
```
{ If machine off

```
E X C H . 1    W A T E R    O U T L E T
S E N S O R    F A U L T        J 7 / 2 - 3
```

```
M A C H I N E    O F F
O P E R A T I N G    M O D E    C H A N G E
```

If an automatic operation control is activated → the On/Off LED flashes:

```
M A I N T A I N    W A T E R    L O O P
    T E M P E R A T U R E    A T    3 0 °
```

```
   W A T E R    C I R C U L A T I O N
P U M P    F O R C E D    O N
```

```
U N I T    S T O P    B Y
R E M O T E    C O N T A C T
```

```
       M A C H I N E    O F F
       O N / O F F
```

# 8 - CONTENTS OF THE MENUS

### 8.3.2 - MACHINE STATUS table

This table appears only if any of the following messages must be displayed using the ↑and ↓ buttons.

The messages are displayed in the following order of priority:

```
          M A C H I N E   S T A T U S
     F A N   F A U L T
```

```
P U M P   1   O N
                              X X S
```

```
P U M P   2   O N
                              X X S
```

```
W A T E R   R E T U R N   T .   L I M I T
P O W E R   R E D U C .
```

```
  E X C H A N G E R   A M B .   T E M P .
     D U R I N G   F R O S T   P R O T E C .
```

```
N O .   O F   S T A G E S   T O   B E
S H U T   O F F :                 X
```

```
U N I T   D I S C H . T .   L I M I T
O P T I M I S E D   O P E R A T I O N
```

```
E L E C   A U X   C T R L
     O U T   T E M P .   T O O   L O W
```

```
W A T E R   T E M P .   R I S I N G
F O R   D E F R O S T I N G
```

```
O U T .   T E M P .   S E N S O R   F A U L T
                    J 7 / 1 - 2
```

```
M A N I F . W A T E R   O U T L E T
S E N S O R   F A U L T   A D D 2   J 7 / 2 - 3
```

```
E X C H A N G E R   A M B I E N T   T E M P .
S E N S O R   F A U L T   J 7 / 5 - 6
```

```
H P   P R E S S U R E   C O N T R O L
S T A G E   1   O N L Y
```

```
S E L F - R E G U L A T I N G
C O N T R O L   M O D E
```

### 8.3.3 - Table of "MACHINE STATUS circuit x fault" messages:

This table appears only if any of the following messages must be displayed using the ↑ and ↓ buttons.

The messages are displayed in the following order of priority:

```
     C I R C U I T   2   O F F
     L I N K   F A U L T
```

```
     M O T O R   F A U L T
     S T A G E   X   C I R C U I T   X
```

```
     C I R C U I T   B R E A K   X
     W A T E R   F R O S T   F A U L T
```

```
C I R C   X   H 2 0   F R O S T   F A U L T
X   C U T ( S )   I N   2 4 H
```

```
     C I R C U I T   B R E A K   X
R E F R I G .   F R O S T   F A U L T
```

```
C I R C   X   R E F   F R O S T E   F A U L T
X   C U T ( S )   I N   2 4 H
```

```
      C I R C U I T   B R E A K   x
            H P   F A U L T
```

```
H P   F A U L T   C I R C   x   x x m n
   X   C U T ( S )   I N   2 4 H
```

```
      C I R C U I T   B R E A K   x
         M A N U A L   H P   F A U L T
```

```
      C I R C U I T   B R E A K   x
            L P   F A U L T
```

```
C I R C U I T   x   L P   F A U L T
X   C U T ( S )   I N   2 4 H
```

```
         S T A G E   x   O F F
         D I S C H A R G E   F A U L T
```

```
         C I R C U I T   B R E A K   x
      D E F R O S T I N G   I M P O S S I B L E
```

```
D . T E M P   F A U L T   x   x x m n
   X   C U T ( S )   I N   2 4 H
```

```
         C I R C U I T   X   O F F
         E X P .   V A L V E   F A U L
```
If P42 ≠ NO

```
      F A U L T   O N   E X V   X
         X   C U T S   I N   2 4 H
```
If P42 ≠ NO

```
B O A R D   L I N K   F A U L T
   C I R C U I T   X   E X V
```
If P42 = VCM

```
M O T O R   F A U L T
   C I R C U I T   X   E X V
```
If P42 = VCM

```
         C I R C U I T   X   O F F
      M I N .   S U P E R H E A T   F A U L T
```

```
         C I R C U I T   X   O F F         C X
      M A X .   S U P E R H E A T   F A U L T
```

```
M I N   S U P E R H E A T   F A U L T   C X   X
   X   C U T ( S )   I N   1 H
```

```
M A X   S U P E R H E A T   F A U L T   C X
   X   C U T ( S )   I N   1 H
```

```
E X C H . 1   W A T E R   I N L E T
   S E N S O R   F A U L T   J 7 / 2 - 3
```

```
E X C H . x   W A T E R   O U T L E T
   S E N S O R   F A U L T   J X / X - X
```

```
SUCTION  TEMP.  SENSOR
  FAULT  CIRC.x  Jx/xx-xx
```

```
EXCH.x  REFR.  FROST
PROT.  SENS.  FAULT  Jx/x-x
```

```
COIL  x  CIRCUIT  x
  SENSOR  FAULT  Jx/x-x
```

```
D.TEMP.  SENSOR  X  FAULT
                 Jx/x-x
```

```
LIQUID  TEMP.  SENSOR
FAULT  CIRC   .x  Jx/xx-xx
```

```
XP  x  SENSOR  FAULT
     INLET  Jx/xx-xx
```

```
STAGE  CIRCUITx  AT
  MIN.  STOP   xxmnxxs
```

```
SHORT-CYCLE  PROTECTION
STAGEx  CIRx  xxmnxxs
```

```
STAGE  x  CIRCUIT  x
FORCED  OFF
```

```
STAGE  x  CIRCUIT  x
TURNING  OFF
```

Informational messages:

```
CX  REFRIG  FROST  LIM.
POWER  REDUC.
```

```
CIRC.x  WATER  FROST  LIM.
POWER  REDUC.
```

```
CIRCUIT  x  HP  LIMIT
PWR  REDUCTION   xxmn
```

```
CIRC.X  D.TEMP  LIMIT
REDUCTION        xxmn
```

```
CIRC.x  MIN.  HP  LIM.
POWER  REDUC.
```

```
HP  PRESSURE  CONTROL
STAGE  1  ONLY
```

```
CIRCUIT  X
       BEING  DEFROSTED
```

### 8.3.4 - Electric stages table:

```
E L E C .   S T A G E S   S H U T   O F F
B Y   L O A D   S H E D D I N G   I N P U T
```

```
E L E C .   S T A G E S   O V E R R I D D E N
B Y   O V E R R I D E   I N P U T
```

```
E L E C T R I C   S T A G E   F O R C E D
O F F   x
```

## 8.4 - Measured values menu

To access the MEASURED VALUES menu, use the **+** or **–** buttons to position the cursor on 3, then press **OK** (the list of submenus can then be accessed).

Position the cursor on **CIRCUIT 1** or **CIRCUIT 2** then press **OK**. The values for the circuit selected appear.

Use the **+** and **–** buttons to scroll through the tables at a rate of three rows at a time.

Arrows in the reading can be ignored. The square at the bottom right flashes for the reading.

Press the **ESC** button to return to the main menu.

**Exemple :**

Visible if P3 = 2
```
C I R C U I T   1
C I R C U I T   2
```

**For circuit 1:**

```
C L G   R E T U R N   C T R L                    ↑
C T R L   S T P :   - x x . x °
W A T E R   I N L E T :   - x x . x °              ↓
```
Visible if P141 = 3
```
W A T E R o r M A N   O U T L E T : x x . x °
```

```
H P 1 : x x x . x b   C O N   T : + x x . x °  ↑
B P 1 : x x x . x b   E V A   T : + x x . x °
S U C T I O N   T .   x : + x x . x °              ↓
```

```
O V E R H E A T   1           :   x x . x °      ↑
D I S . T 1 : x x x °   D I S . T 2 : x x x °
O U T D O O R   T . : - x x . x °                  ↓
```

Visible if P3 = 2
```
W A T E R   O U T L E T   1 : - x x . x °        ↑
W A T E R   O U T L E T   2 : - x x . x °
M A N .   W A T E R   O U T : - x x . x °          ↓
```
Visible if P3 = 2 and if P141 ≠ 3

Visible if P3 = 2 and if P141 ≠ 3

Visible if water-to-water and operating mode ≠ heating
```
R E F R I G .   T .   1         + x x . x °    ↑
L I Q U I D   T E M P .   1   + x x . x °
H O T   W A T E R   T .   - x x . x                ↓
```
Visible if P2 = 1 or 2, or 3 + cooling mode

**For circuit 2 :**

The menu for circuit 2 is the same as for circuit 1, but with the digit 1 replaced by the digit 2. Thus, discharge temperature **REF 1** becomes **REF 2** (or 3 depending on the number of compressors per circuit) and **REF 2** becomes **discharge 4**

Message on first row:

```
H O T   S U P P L Y   C T R L                    ↑
H O T   R E T U R N   C T R L                    ↓
C L G   R E T U R N   C T R L                    ↑
S T O R A G E   C T R L                          ↓
C O M P E N S A T I O N   C T R L                ↑
```

## 8.5 - MACHINE PARAMETERS menu

To access the MACHINE PARAMETERS menu, use the **+** or **–** buttons to position the cursor on 4 then press **OK**.

The display shows the list of configuration parameters.

Use the **+** and **–** buttons to scroll through the tables at a rate of two rows at a time.  To modify a parameter the configuration must be unlocked (via parameter P99). This turns off the machine.

■ **To change a value:**

Press **OK** to enter the parameter. Use the **+** or **–** buttons to increment or decrement the value of the parameter then press OK to confirm the changes. Press **OK** to save the change or **ESC** to cancel. When a parameter value is being changed, the square at the bottom right should flash.

In the case of parameters, the letter **P** flashes.

The text in messages scrolls in a loop.

Numerical values (with adjustment ranges), however, do not scroll in a loop.

If a parameter is locked (P99 = yes), the ⣿ symbol is displayed at the top left.

To return to the main menu, press the **ESC** button repeatedly.

```
4 - M A C H I N E . P A R A M E T E R
```

If the user tries to access a locked parameter, the following message appears for 2 seconds before the parameter is redisplayed:

```
P A R A M E T E R    L O C K E D
M O D I F I C A T I O N . I M P O S S I B L E
```

Once the user sets the "locking" parameter to "NO", the text is marked Pxx and the button symbol disappears. The following parameters can then be accessed:

Refrigerant type:

```
P 0 1    R E F R I G E R A N T :
                                 R 4 0 7 c

P 0 1    R E F R I G E R A N T :
                                 R 1 3 4 a

P 0 1    R E F R I G E R A N T :
                                 R 4 1 0 a

P 0 1    R E F R I G E R A N T :
                                 R 2 2
```

Unit type:

```
P 0 2    U N I T :
W A T E R - T O - W A T E R

P 0 2    U N I T :
A I R - T O - W A T E R

P 0 2    U N I T :
R E V E R S I B L E    A I R - T O - W A T E R
```

Number of circuits:

```
P 0 3    N U M B E R    O F    C I R C U I T S
                                             1

P 0 3    N U M B E R    O F    C I R C U I T S
                                             2
```

Number of stages per circuit:

```
P x x    N O .    O F    S T A G E S    O N
C I R C U I T    x                           1

P x x    N O .    O F    S T A G E S    O N
C I R C U I T    x                           2
```

Number of evaporators:

| P O 6 | N O . | O F | E V A P O R A T O R S |
|---|---|---|---|
| | | | 1 |
| P 0 6 | N O . | O F | E V A P O R A T O R S |
| | | | 2 |

Compressor suppliers:

| P 0 7 | C O M P R E S S O R | |
|---|---|---|
| | | M A N E U R O P |
| P 0 7 | C O M P R E S S O R | |
| | | C O P E L A N D |
| P 0 7 | C O M P R E S S O R | |
| | | I N V E R T E R |

Heat exchanger suppliers:

| P 0 8 | E X C H A N G E R | |
|---|---|---|
| | | E X L |
| P 0 8 | E X C H A N G E R | |
| | | S W E P |
| P 0 8 | E X C H A N G E R | |
| | | S W E P   D O U B L E |
| P 0 8 | E X C H A N G E R | |
| | | A L F A   L A V A L |

Fan type:

| P 1 0 | T Y P E   V E N T I L A T E U R | |
|---|---|---|
| | | H E L I C O I D A L |
| P 1 0 | T Y P E   V E N T I L A T E U R | |
| | | C E N T R I F U G E |
| P 1 0 | T Y P E   V E N T I L A T E U R | |
| | | P R E S S I O N |

Coil type:

| P 1 1 | F A N   T Y P E | |
|---|---|---|
| | | P R O P E L L E R |
| P 1 1 | F A N   T Y P E | |
| | | C E N T R I F U G A L |
| P 1 1 | F A N   T Y P E | |
| | | P R E S S U R E |

Presence of balance solenoid valve:

| P 1 2 | B A L A N C E | |
|---|---|---|
| S V | | Y E S |
| P 1 2 | B A L A N C E | |
| S V | | N O |

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Tandem type:

```
  P 1 3   B A L A N C E D   T A N D E M
C O M P R E S S O R                         Y E S

  P 1 3   B A L A N C E D   T A N D E M
C O M P R E S S O R                          N O
```

Number of coil sensors per circuit:

```
  P 1 4   N U M B E R   O F C O I L S E N S O R
P E R   C I R C U I T                          1

  P 1 4   N U M B E R   O F C O I L S E N S O R
P E R   C I R C U I T                          2

  P 1 4   N U M B E R   O F C O I L S E N S O R
P E R   C I R C U I T                          4
```

All-season operation:

```
  P 2 0   A L L - S E A S O N
O P E R A T I O N                            N O

  P 2 0   A L L - S E A S O N
O P E R A T I O N                           Y E S
```

Variable speed control board:

```
  P 2 1   V A R I A B L E   S P E E D
                            W I T H O U T

  P 2 1   V A R I A B L E   S P E E D
A C O U S T I C   O P T I M I S A T I O N

  P 2 1   V A R I A B L E   S P E E D
E N E R G Y   O P T I M I S A T I O N
```

Electric auxiliary heater board:

```
  P 2 2   E L E C T R I C   A U X I L I A R Y
H E A T E R S                       N O

  P 2 2   E L E C T R I C   A U X I L I A R Y
H E A T E R S                       Y E S
```

Number of pumps:

```
  P 2 5   N U M B E R   O F   P U M P S
S U P P L I E D                              0

  P 2 5   N U M B E R   O F   P U M P S
S U P P L I E D                              1

  P 2 5   N U M B E R   O F   P U M P S
S U P P L I E D                              2
```

0-10 V configurable output:

```
  P 2 6   0 - 1 0 V   P R O G R A M M A B L E
O U T P U T               2 - W A Y   V A L V E

  P 2 6   0 - 1 0 V   P R O G R A M M A B L E
O U T P U T               3 - W A Y   V A L V E
```

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Pump controlled by operation of boiler:

```
P 2 7      P U M P   C O N T R O L L E D
B Y   B O I L E R                      N O

P 2 7      P U M P   C O N T R O L L E D
B Y   B O I L E R                     Y E S
```

Master/slave control of two machines:

```
P 2 8   M A S T E R   S L A V E
2   M A C H I N E S                    N O

P 2 8   M A S T E R   S L A V E
2   M A C H I N E S                   Y E S
```

Total recovery:

```
P 2 9   T O T A L
R E C O V E R Y                        N 0

P 2 9    R E C U P E R A T I O N
R E C O V E R Y                       Y E S
```

Frost protection for recovery option:

```
P 2 9 . 1   H E A T   R E C O V .   E X C H .
F R O S T   P R O T E C T I O N        N O

P 2 9 . 1   H E A T   R E C O V .   E X C H .
F R O S T   P R O T E C T I O N       Y E S
```

HP1/HP2 sensor high pressure:

Same with LP (Low Pressure) }

```
P x x   H P x   S E N S O R
H I G H   V A L U E               x x . x b
```

Same with LP (Low Pressure) HP1/HP2 sensor low pressure:

Same with LP (Low Pressure) }

```
P x x   H P x   S E N S O R
L O W   V A L U E                 x x . x b
```

Compressor short-cycle protection:

```
P 5 0   C O M P R E S S O R   S H O R T
C Y C L E   P R O T E C T I O N    x x m n
```

Discharge temperature limit:

```
P 5 1   D I S C H A R G E   T E M P .
L I M I T                         x x x °
```

Water line frost protection limit:

```
P 5 2   H 2 O   F R O S T   P R O T .
L I M I T                       - x x , x °
```

Refrigerant frost protection differential

Gives the freon frost limit = water frost limit – this differential

If P08≠SWEP double:

```
P 5 3   R E F R I G E R A N T   F R O S T
P R O T .   D I F F .              x x K

P 5 3   L P   S A T .   T E M P .   F R O S T
P R O T .   D I F F .              x x K
```

HP fault threshold:

```
P 5 4   H P   F A U L T   T H R E S H O L D
                                  x x . x b
```

LP fault threshold:

```
  P 5 5    L P    F A U L T    T H R E S H O L D
                                     x x . x b
```

LP slope factor:

```
  P 5 8    L P    S L O P E
F A C T O R                              x . x
```

Water outlet T slope factor:

```
  P 5 9    W A T E R    O U T L E T
T . S L O P E    F A C T O R             x . x
```

LP fault threshold:

```
  P 6 3    M I N .    H P    T H R E S H O L D
                                   x x x . x b
```

Outdoor temperature sensor active :

```
  P 9 8    O U T D O O R    T E M P E R A T U R E
S E N S O R        A C T I V E       N O
```

Parameter locking:

```
  P 9 9    L O C K
                                         N O


  P 9 9    L O C K
                                         Y E S
```

## 8.6 - ADJUSTMENT PARAMETERS menu

To access the ADJUSTMENT PARAMETERS menu, use the **+** or **–** buttons to position the cursor on 5 then press **OK**.

The display shows the list of control parameters.

Example:

```
  P x x    S T A G E
D I F F E R E N T I A L          x x . x K
```

Pressing on the **+** and **–** buttons scrolls through the parameters two lines at a time.

■ **To change a value:**

Press **OK** to enter the parameter. Use the **+** or **–** buttons to increment or decrement the value of the parameter then press **OK** to confirm the changes or **ESC** to cancel.

To return to the main menu, press the **ESC** button repeatedly.

```
5 – A D J U S T M E N T . P A R A M E T E R S
```

Language :

```
P 1 0 0    L A N G U A G E
                              F R A N C A I S

P 1 0 0    L A N G U A G E
                              E N G L I S H

P 1 0 0    L A N G U A G E
                              D E U T S C H

P 1 0 0    L A N G U A G E
                              E S P A Ñ O L

P 1 0 0    L A N G U A G E
                            N E D E R L A N D S

P 1 0 0    L A N G U A G E
                              I T A L I A N O

P 1 0 0    L A N G U A G E
                              P Y C C K
```

Control type:

```
P 1 0 3   C O N T R O L   T Y P E
                          L O C A L

P 1 0 3   C O N T R O L   T Y P E
          R E M O T E   ( B M S ,   e t s . )
```

Pump 2 control:

Based either on the control or on the On/Off status of the unit }

```
P 1 0 8   P U M P   2   C O N T R O L
          F U N C T I O N ( C T R L )

P 1 0 8   P U M P   2   C O N T R O L
          F U N C T I O N ( O N / O F F )
```

Pump 2 'on' time delay:

```
P 1 0 9   P U M P   2   O N
T I M E   D E L A Y               x x S
```

Configurable output:

```
P 1 1 1   P R O G R A M M A B L E   O N / O F F
O U T P U T   M A X .   P O W E R
```

```
P 1 1 1   P R O G R A M M A B L E   O N / O F F
O U T P U T                       B O I L E R

P 1 1 1   P R O G R A M M A B L E   O N / O F F
O U T P U T   C O O L I N G / H E A T I N G
```

Number of electric stages:

```
P 1 1 2   N O .   O F   E L E C T R I C
S T A G E S                             0
```

Configurable input:

```
P 1 1 3   P R O G R A M M A B L E   I N P U T
A U X .   H E A T E R   D I S A B L E D

P 1 1 3   P R O G R A M M A B L E   I N P U T
L O A D   S H E D   A U X .       H E A T E R

P 1 1 3   P R O G R A M M A B L E   I N P U T
O V E R R I D E   A U X .       H E A T E R
```

Activation fonction gel échangeur :

```
P 1 1 5   E X C H   F R O S T   P R O T E C .
E N A B L E D                           Y E S
```

Liaison avec régulateur du Drycooler :

```
P 1 1 6   L I N K   W I T H
D R Y C O O L E R                       Y E S
```

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Mode de fonctionnement :

```
P119   OPERATION
                          COOLING

P119   OPERATION
                          HEATING

P119   OPERATION
     HTG / CLG  VIA  CONSOLE

P119   OPERATION
      CLG / HTG  VIA  ON / OFF

P119   OPERATION
AUTO  CLG / HTG / OUT  TEMP.
```

Number of setpoints:

```
P120   NO.  OF  SETPOINTS
                          1

P120   NO.  OF  SETPOINTS
     2  VIA  CONSOLE  OR  BMS

P120   NO.  OF  SETPOINTS
      2  VIA  ON / OFF  INPUT

P120   NO.  OF  SETPOINTS
        VIA  4 - 20  MA  INPUT
```

Cooling setpoint 1:

```
P121   COOLING  SETPOINT  1
                      - xx , x °
```

Cooling setpoint 2:

```
P122   COOLING  SETPOINT  2
                      - xx , x °
```

Heating setpoint 1:

```
P123   HEATING  SETPOINT  1
                      - xx , x °
```

Heating setpoint 2:

```
P124   HEATING  SETPOINT  2
                      - xx , x °
```

Adjustment of the cooling setpoint based on the outdoor temperature:

```
P127   COOLING  STP  BASED
ON ( Text )                  YES

P127   COOLING  STP  BASED
ON ( Text )                  NO
```

Start of drift in cooling mode:

```
P128   DRIFT  START
COOLING                    xx °
```

End of drift in cooling mode:

```
P129   DRIFT  END
COOLING                    xx °
```

Maximum setpoint at end of drift in cooling mode:

```
 P 1 3 0   MAX   STP   AT   DRIFT
END  COOLING                    x x °
```

Adjustment of the heating setpoint based on outdoor the temperature:

```
 P 1 3 1   HEATING   STP   BASED
ON ( Text )                     OUI

 P 1 3 1   HEATING   STP   BASED
ON ( Text )                     NON
```

Start of drift in heating mode:

```
 P 1 3 2   DRIFT   START
HEATING                         x x °
```

End of drift in heating mode:

```
 P 1 3 3   DRIFT   END
HEATING                         x x °
```

End of drift setpoint in heating mode:

```
 P 1 3 4   MAX   STP   AT   DRIFT
END   HEATING                   x x °
```

Control mode :

Water supply control with compensation by water return

```
P 1 4 1   REGULATION   TYPE
                     ON   INLET

P 1 4 1   REGULATION   TYPE
                     ON   OUTLET

P 1 4 1   REGULATION   TYPE
   ON   OUTLET+COMPENSATION
```

Water loop winter protection:

```
 P 1 4 2   WATER   LOOP   WINTER
PROTECTION                      YES

 P 1 4 2   WATER   LOOP   WINTER
PROTECTION                      NO
```

■ **Return and supply control:**

Stage differential:

```
 P 1 4 3   STAGE
DIFFERENTIAL                  x . x K
```

Interstage differential:

```
 P 1 4 4   INTERSTAGE
DIFFERENTIAL                  x . x K
```

Proportional coefficient:

```
 P 1 4 5   P .   COEFFICIENT
                             x . x
```

Integral coefficient:

```
 P 1 4 6   I .   COEFFICIENT
                             x . x
```

Derivative coefficient:

```
 P 1 4 7   D .   COEFFICIENT
                             x . x
```

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Time coefficient:

```
 P 1 4 8    T .   C O E F F I C I E N T
                                    x x x s
```

Control with compensation:

```
 P 1 5 0    C O M P E N S A T I O N
C O E F F I C I E N T                 x . x
```

```
 P 1 5 1    C O M P E N S A T I O N
T I M E                             x x x s
```

Storage control:

```
 P 1 5 4    S T O R A G E
C O N T R O L                         Y E S
```

```
 P 1 5 4    S T O R A G E
C O N T R O L                          N O
```

```
 P 1 5 5    S T O R A G E   C T R L
D I F F E R E N T I A L       x . x   K
```

## ■ Defrosting:

Temperature at start of defrosting:

```
 P 1 5 7    T E M P E R A T U R E   S T A R T
D E F R O S T I N G             – x x , x °
```

Temperature at end of defrosting:

```
 P 1 5 8    T E M P E R A T U R E   E N D
D E F R O S T I N G             – x x , x °
```

Frosting type:

```
 P 1 5 9    F R O S T I N G   T Y P E
                         F I X E D   T I M E
```

```
 P 1 5 9    F R O S T I N G   T Y P E
                         O P T I M I S E D
```

Frosting cycle time:

```
 P 1 6 0    F R O S T I N G   T I M E
F I X E D                           x x m n
```

Frosting factor:

```
 P 1 6 1    F R O S T I N G
F A C T O R                           0 . 3
```

Correction with respect to the reference outdoor temperature during optimised frosting:

```
 P 1 6 2    C O R R E C T I O N   T O   R E F
O U T D O O R   T E M P               0 . 2
```

Time delay for turning off the compressors during defrosting:

```
 P 1 6 3    C O M P   O F F   T I M E D E L A Y
D U R I N G   D E F R O S T       x x x S
```

Differential for turning on the fans during defrosting:

```
 P 1 6 4    H P   O N   D I F F
D E F R O S T I N G               x x . x b
```

Differential for shutting off the fans during defrosting:

```
 P 1 6 5    H P   O F F   D I F F
D E F R O S T I N G               x x . x b
```

Charge limit function:

```
  P 1 7 1   M A X   W A T E R   T E M P .
S T A G E   2   L O A D   S H E D - x x , x °
```

Load shedding via ON/OFF input:

```
  P 1 7 5   T Y P E   O F   L O A D   S H E D .
V I A   O N / O F F   I N P U T       A U T O
```

```
  P 1 7 5   T Y P E   O F   L O A D   S H E D
V I A   O N / O F F   I N P U T . S E L E C T .
```

■ **Fan control:**

Number of fan stages:

```
  P 1 8 0   N O .   O F   H P   C T R L
S T A G E S / C I R C U I T             X
```

HP control setpoint:

```
  P 1 8 1   H P   C O N T R O L
S E T P O I N T             x x , x b
```

Outdoor air temperature, forced fan operation:

```
  P 1 8 2   O U T .   A I R   T E M P .
F O R C E D   F A N S         x x , x °
```

Fan stage differential:

```
  P 1 8 3   H P   C T R L   S T A G E
D I F F E R E N T I A L       x . x b b
```

Fan interstage differential:

```
  P 1 8 4   H P   C T R L   I N T E R S T A G E
D I F F E R E N T I A L       x . x b b
```

■ **High Pressure control:**

Low Noise operation:

```
  P 1 9 1   L O W   N O I S E
O P E R A T I O N             Y E S
```

```
  P 1 9 1   L O W   N O I S E
O P E R A T I O N             N O
```

Maximum fan speed threshold:

```
  P 1 9 2   S E U I L   M A X I   V T E S S E
T H R E S H O L D         x x . x V
```

Shifting of HP setpoint during recovery:

```
  P 1 9 3   H P   S T P   S H I F T
R E C O V E R Y             x x . x b
```

Differential used to reduce power before cutting off the HP:

```
  P 1 9 5   H P   D I F F .   F O R
P O W E R   R E D U C .         x . x b
```

Differential used to return to normal condensing pressure control:

```
  P 1 9 6   H P   D I F F .   H P   R E T U R N
C O N D   P R E S S   C T R L     x . x b
```

Value at 0 V:

```
  P 1 9 7   O U T P U T   L I N K   T O   P 2 6
V A L U E   A T   0 V         x x . x b
```

Value at 10 V:

```
  P 1 9 8   O U T P U T   L I N K   T O   P 2 6
V A L U E   A T   1 0 V         x x . x b
```

Outdoor temperature at which the heating elements are turned on:

```
  P 2 2 0    O U T .    T E M P E R A T U R E
W I N T E R    P R O T E C .          - x x , x °
```

Differential used to shut off these heating elements:

```
  P 2 2 2    O U T .    T E M P .    D I F F .
W I N T E R    P R O T E C .          - x x , x °
```

Minimum air temperature for operation in heating mode:

```
  P 2 2 5    M I N .    A I R    T E M P .    I N
H E A T I N G    M O D E            - x x °
```

Maximum air temperature for operation in cooling mode:

```
  P 2 2 5 . 1    M A X .    A I R    T E M P . I N
C O O L I N G    M O D E            - x x °
```

Maximum air temperature for operation in heating mode:

```
  P 2 2 5 . 2    M A X .    A I R    T E M P .
I N    H E A T I N G    M O D E        - x x °
```

Minimum  air temperature for operation in cooling mode:

```
  P 2 2 5 . 3    M I N .    A I R    T E M P .
I N    C O O L I N G    M O D E        - x x °
```

Air temperature at which the electric auxiliary heaters or boiler may be turned on:

```
  P 2 2 6    O U T .    T E M P .
A U X I L .    A U T H .    O N        - x x °
```

Authorisation for compressor stages to turn on:

```
  P 2 3 0    S T A G E 1    C I R C U I T 1
O N                              Y E S

  P 2 3 1    S T A G E 2    C I R C U I T 1
O N                              Y E S

  P 2 3 2    S T A G E 1    C I R C U I T 2
O N                              Y E S

  P 2 3 3    S T A G E 2    C I R C U I T 2
O N                              Y E S
```

Same when 'No' }

Authorisation for electric stages to turn on:

```
  P 2 3 5    E L E C T R I C    S T A G E 1
O N                              Y E S

  P 2 3 6    E L E C T R I C    S T A G E 2
O N                              Y E S

  P 2 3 7    E L E C T R I C    S T A G E 3
O N                              Y E S

  P 2 3 8    E L E C T R I C    S T A G E 4
O N                              Y E S
```

Same when 'No' }

Electronic expansion valve:

```
  P 6 0 1    C I R C U I T    1
V A L V E    T Y P E                  E X 4
```

```
  P 6 0 2    C I R C U I T    1
S U P E R H E A T    S T P            6 ° C
```

```
 P 6 0 3   C I R C U I T   1
M O P   P O I N T                         Y E S
```

```
 P 6 0 4   C I R C U I T   1
M O P   V A L U E                       1 5 ° C
```

```
 P 6 0 5   %   O P N G   C 1   E X V
S T A R T   A I R   C O N           X X X %
```

```
 P 6 0 6   %   O P N G   C 1   E X V
S T A R T   H E A T   P U M P       X X X %
```

```
 P 6 0 7   O P E N I N G   T I M E
S T A R T - U P   C 1                 X X S
```

```
 P 6 0 8   C I R C U I T   1
S L O W   M O D E                     N O N
```

```
 P 6 1 1   C I R C U I T   2
V A L V E   T Y P E                   E X 4
```

```
 P 6 1 2   C I R C U I T   2
S U P E R H E A T   S T P             6 ° C
```

```
 P 6 1 3   C I R C U I T   2
M O P   P O I N T                     Y E S
```

```
 P 6 1 4   C I R C U I T   2
M O P   V A L U E                   1 5 ° C
```

```
 P 6 1 5   %   O P N G   C 2   E X V
S T A R T   A I R   C O N           X X X %
```

```
 P 6 1 6   %   O P N G   C 2   E X V
S T A R T   H E A T   P U M P       X X X %
```

```
 P 6 1 7   O P E N I N G   T I M E
S T A R T - U P   C 2                 X X S
```

```
 P 6 1 8   C I R C U I T   2
S L O W   M O D E                     N O
```

■ **Communication:**

Control type:

```
 P 1 0 3   C O N T R O L   T Y P E
                             L O C A L
```

```
 P 1 0 3   C O N T R O L   T Y P E
       R E M O T E   ( B M S ,   e t c . )
```

Communication protocol:

```
 P 7 0 0   C O M M U N I C A T I O N
P R O T O C O L   B U S   M O D E
```

Transmission speed:

```
 P 7 0 1   T R A N S M I S S I O N
S P E E D   4 8 0 0   b a u d s
```

Parity:

```
 P 7 0 2   P A R I T Y
                     W I T H O U T
```

# 8 - CONTENTS OF THE MENUS

Number of stop bits:

```
 P 7 0 3   N U M B E R   O F   S T O P
B I T S                                 1
```

Format of real numbers:

```
 P 7 0 4 S W A P P E D   R E A L   N U M B E R
F O R M A T                             Y E S
```

Bus number:

```
 P 7 0 5   B U S   N U M B E R
                                    0 0 0
```

■ **Master/slave configuration:**

```
 P 8 0 0   M A S T E R   M A C H I N E
O N   L O O P                           Y E S
```

```
 P 8 0 1   B A C K U P
M A C H I N E                           Y E S
```

```
 P 8 0 2   S W I T C H   B A C K U P
M A C H I N E                           Y E S
```

```
 P 8 0 3   B A C K U P   M A C H I N E
N A M E                               S L A V E
```

```
 P 8 0 4   L O O P   C O N T R O L
T Y P E                           P A R A L L E L
```

```
 P 8 0 5   M A C H I N E
D I F F E R E N T I A L           x x . x °
```

```
 P 8 0 6   D I F F E R E N T I A L
B T W N   M A C H I N E S         x x . x °
```

```
 P 8 0 7   M A X .   D I F F .
A D D I T I O N A L   M A C H .     x x °
```

```
 P 8 0 8   T I M E   D E L A Y
B T W N   M A C H I N E S     x x m n x x
```

```
 P 8 0 9   A U T H O R I S E
M A C H I N E   1   O N                 Y E S
```

```
 P 8 1 0   A U T H O R I S E
M A C H I N E   2   O N                 Y E S
```

## 8.7 - OPERATION PARAMETERS menu

To access the OPERATION PARAMETERS menu, use the **+** or **–** buttons to position the cursor on 6 then press **OK**.

The display shows the list of operation parameters.

Exemple :

```
 P x x x   E X C H . 1   I N L E T   W A T E R
T E M P .                       1 2 . 5 °
```

Pressing on the **+** and **–** buttons scrolls through the parameters two lines at a time.

The values of these parameters cannot be changed.

To return to the main menu, press the **ESC** button repeatedly.

```
6 – R E A D I N G . P A R A M E T E R S
```

# 8 - CONTENTS OF THE MENUS

LED test: used to turn on the console LEDs corresponding to the machine configuration:

```
P250    LED    TEST

```

Control setpoint:

```
P251    CONTROL
SETPOINT                        xx.x °
```

Outdoor air temperature:

```
P252    OUTDOOR    AIR
TEMPERATURE                     xx.x °
```

Water inlet temperature in heat exchanger on circuit 1:

```
P255    EXCH.1    WATER
INLET    TEMP.                  xx.x °
```

Water outlet temperature in heat exchanger on circuit 1:

```
P256    EXCH.1    WATER
OUTLET    TEMP.                 xx.x °
```

Hot water temperature at condenser inlet (water-to-water unit):

```
P257    WATER    TEMPERATURE
CONDENSER    INLET          xx.x °
```

Hot water temperature at condenser outlet (water-to-water unit):

```
P258    WATER    TEMPERATURE
CONDENSER    OUTLET         xx.x °
```

Circuit 1 coil temperature:

```
P259    CIRC.1    COIL    TEMP.
A:-xx.x °        B:-xx.x °
C:-xx.x °        D:-xx.x °
```

Circuit 1 coil temperature where P14 = 1:

```
P259    CIRC.1    COIL    TEMP.
                         -xx.x °
```

Refrigerant temperature on circuit 1 heat exchanger:

```
P260    EXCH.    1
REFR.    TEMP.              -xx.x °
```

Water temperature measured on manifold (case of two heat exchangers):

```
P261    MANIFOLD    WATER
OUTLET    TEMP.        -xx.x °
```

Water outlet temperature on circuit 2 heat exchanger:

```
P262    EXCH.2    WATER
OUTLET    TEMP.        -xx.x °
```

Circuit 2 coil temperature:

```
P263    CIRC.2    COIL    TEMP.
A:-xx.x °        B:-xx.x °
C:-xx.x °        D:-xx.x °
```

Refrigerant temperature on circuit 2 heat exchanger:

```
P264    EXCH.    2
REFR.    TEMP.              -xx.x °
```

Ambient temperature of heat exchanger:

```
P265    EXCHANGER
AMBIENT    TEMP.        -xx.x °
```

Calculated frosting time, circuit 1:

```
P266   CALCULATED   FROST.
TIME   CIRCUIT   1              xx mn
```

Calculated frosting time, circuit 2:

```
P267   CALCULATED   FROST.
TIME   CIRCUIT   2              xx mn
```

Value of referenced Delta-T for optimised defrosting on circuit 1:

```
P268   OPTI   DEFROSTING   C1
DTREF=xx.x°      DTD=xx.x°
```

Value of referenced Delta-T for optimised defrosting on circuit 2:

```
P269   OPTI   DEFROSTING   C2
DTREF=xx.x°      DTD=xx.x°
```

Control time delay:

```
P270   CONTROLLER
TIME   DELAY                   xxx s
```

Heating mode runtime (in hours):

```
P285   HEATING   MODE
RUNTIME                        xxxxxx H
```

Cooling mode runtime (in hours):

```
P286   COOLING   MODE
RUNTIME                        xxxxxx H
```

Pump 1 runtime (in hours):

```
P287   PUMP   1
RUNTIME                        xxxxxx H
```

Pump 2 runtime (in hours):

```
P288   PUMP   2
RUNTIME                        xxxxxx H
```

Number of times P99 set to 'No':

```
P289   NO.   TIMES   P99
SET   TO   'NO'                xxxxxx
```

Number of water flow cut-offs in 1 hour:

```
P290   NO.   WATER   FLOW
CUTS                   IN   1H   x
```

■ **Circuit 1 information:**

Circuit 1 High Pressure value:

```
P300   HP1   PRESSURE
                       xx.x b
```

Value of calculated High Pressure control setpoint:

```
P300.1   HP1   CONTROL
SETPOINT                 xx.x b
```

Circuit 1 condensing temperature value resulting from the previous pressure level and the refrigerant selected:

```
P301   CIRCUIT   1
COND.   TEMP.              xx.x°
```

Stage 1, circuit 1 discharge temperature value:

```
P302.1   DISCHARGE
TEMPERATURE   1            xxx°
```

Stage 2, circuit 1 discharge temperature value:

```
P302.2   DISCHARGE
TEMPERATURE   2            xxx°
```

Desuperheat temperature on discharge 1 (= discharge temperature – condensation dew point temperature) :

```
 P303.1   DISCHARGE   1
DESUPERHEAT  1        xx.x °
```

Desuperheat temperature on discharge 2 (= discharge temperature – condensation dew point temperature) :

```
 P303.2   DISCHARGE   2
DESUPERHEAT  2        xx.x °
```

Circuit 1 Low Pressure value:

```
 P304   LP1  PRESSURE
                      xx.x b
```

Circuit 1 evaporating temperature value resulting from the previous pressure value and the refrigerant selected :

```
 P305   CIRCUIT   1
EVAP.  TEMP.          xxx.x °
```

Circuit 1 suction temperature value :

```
 P306   CIRCUIT   1
SUCTION  TEMP.        xxx.x °
```

Circuit 1 superheat temperature :

```
 P307   CIRCUIT   1
SUPERHEAT             xxx.x °
```

Number of cut-offs caused by a High Pressure fault on circuit 1 in 24 hours :

```
 P308   NO.  HP1  CUTS
IN  24  HOURS               x
```

Number of cut-offs caused by a Low Pressure fault on circuit 1 in 24 hours :

```
 P309   NO.  LP1  CUTS
IN  24  HOURSS              x
```

Number of times stage 1 on circuit 1 turned on :

```
 P310   NO.  STARTS
STAGE1  CIRCUIT   1   xxxxx
```

Runtime of stage 1 on circuit 1 :

```
 P311  STAGE1  CIRCUIT1
RUNTIME              xxxxxH
```

Short-cycle protection on stage 1 of circuit 1 :

```
 P312  STAGE1  CIRCUIT1
SCP                  xxmnxxS
```

Number of times stage 2 on circuit 1 turned on :

```
 P313   NO.  STARTS
STAGE2  CIRCUIT   1   xxxxx
```

Runtime of stage 2 on circuit 1 :

```
 P314  STAGE2  CIRCUIT1
RUNTIME              xxxxxH
```

Short-cycle protection on stage 2 of circuit 1 :

```
 P315  STAGE2,  CIRCUIT1
SCP                  xxmnxxS
```

Number of cut-offs caused by frost protection on circuit 1 water line in 24 hours :

```
 P322   NO.  H2O  FROST  PROT
CUTS  CIRC  1              X
```

Number of cut-offs caused by frost protection on circuit 1 refrigerant line in 24 hours :

```
 P323   NO  FROST  PROT  CUTS
C1  REFRIG                X
```

# 8 - CONTENTS OF THE MENUS

Number of cut-offs caused by discharge temperature on stage 1 in 24 hours :

```
P 3 2 4 . 1   N O .   D I S C H A R G E   1
C U T S   I N   2 4 H                         X
```

Number of cut-offs caused by discharge temperature on stage 2 in 24 hours :

```
P 3 2 4 . 2   N O .   D I S C H A R G E   2
C U T S   I N   2 4 H                         X
```

Percentage of opening for the electronic expansion valve on circuit 1 :

```
P 3 2 5   C 1   E X V
O P E N I N G                           X X X %
```

Circuit 1 liquid temperature :

```
P 3 2 6   C I R C U I T   1
L I Q U I D   T E M P .              x x . x °
```

Circuit 1 subcooling value :

```
P 3 2 7   C I R C U I T   1
S U B C O O L I N G                 x x . x °
```

Number of cut-offs caused by circuit 1 expansion valve fault :

```
P 3 2 8   N O .   C U T O F F S   C A U S E
B Y   C 1   E X V   I N   2 4 H             x
```

■ **Circuit 2**

Circuit 2 High Pressure value :

```
P 3 3 0   H P 2   P R E S S U R E
                                    x x . x b
```

Value of calculated HP control setpoint :

```
P 3 3 1   H P 2   C O N T R O L
S E T P O I N T                     x x . x °
```

Circuit 2 condensing temperature value resulting from the previous pressure value and the refrigerant selected :

```
P 3 3 1   C I R C U I T   2
C O N D .   T E M P .               x x . x °
```

Stage 1, circuit 2 discharge temperature value :

```
P 3 3 2 . 1   D I S C H A R G E
R E F O U L E M E N T   2             x x x °
```

```
P 3 3 2 . 1   D I S C H A R G E
T E M P E R A T U R E   3             x x x °
```

Stage 2, circuit 2 discharge temperature value :

```
P 3 3 2 . 2   D I S C H A R G E
T E M P E R A T U R E   4             x x x °
```

Desuperheat temperature on circuit 2 stage 1 discharge
(= discharge temperature – condensation dew point temperature) :

```
P 3 3 3 . 1   D I S C H A R G E   2
D E S U P E R H E A T               x x . x °
```

```
P 3 3 3 . 1   D I S C H A R G E   3
D E S U P E R H E A T               x x . x °
```

Desuperheat temperature on circuit 2 stage 2 discharge
(= discharge temperature – condensation dew point temperature) :

```
P 3 3 3 . 2   D I S C H A R G E   4
D E S U P E R H E A T               x x . x °
```

Circuit 2 Low Pressure value :

```
P 3 3 4   L P 2   P R E S S U R E
                                    x x . x b
```

# 8 - CONTENTS OF THE MENUS

Circuit 2 evaporating temperature value resulting from the previous pressure value and the refrigerant selected :

```
 P 3 3 5   C I R C U I T     2
E V A P .   T E M P .             x x x . x °
```

Circuit 2 suction temperature value :

```
 P 3 3 6   C I R C U I T     2
S U C T I O N   T E M P .         x x x . x °
```

Circuit 2 superheat temperature :

```
 P 3 3 7   C I R C U I T     2
S U P E R H E A T                 x x x . x °
```

Number of cut-offs caused by a High Pressure fault on circuit 2 in 24 hours :

```
 P 3 3 8   N O .   H P 2   C U T S
I N   2 4   H O U R S                       x
```

Number of cut-offs caused by a Low Pressure fault on circuit 2 in 24 hours :

```
 P 3 3 9   N O .   L P 2   C U T S
I N   2 4   H O U R S                       x
```

Number of times stage 1 on circuit 2 turned on :

```
 P 3 4 0   N O .   S T A R T S
S T A G E 1   C I R C U I T   2   x x x x x
```

Runtime of stage 1 on circuit 2 :

```
 P 3 4 1   S T A G E 1   C I R C U I T 2
R U N T I M E                     x x x x x H
```

Short-cycle protection on stage 1 of circuit 2 :

```
 P 3 4 2   S T A G E 1 ,   C I R C U I T 2
S C P                         x x m n x x S
```

Number of times stage 2 on circuit 2 turned on :

```
 P 3 4 3   N O .   S T A R T S
S T A G E 2   C I R C U I T   2   x x x x x
```

Runtime of stage 2 on circuit 2 :

```
 P 3 4 4   S T A G E 2   C I R C U I T 2
R U N T I M E                     x x x x x H
```

Short-cycle protection on stage 2 of circuit 2 :

```
 P 3 4 5   S T A G E 2 ,   C I R C U I T 2
S C P                         x x m n x x S
```

Number of cut-offs caused by frost protection on circuit 2 water line in 24 hours :

```
 P 3 5 2   N O .   H 2 O   F R O S T   P R O T
C U T S   C I R C   2                       x
```

Number of cut-offs caused by frost protection on circuit 2 refrigerant line in 24 hours :

```
 P 3 5 3   N O   F R O S T   P R O T   C U T S
C 2   R E F R I G                           x
```

Number of cut-offs caused by discharge temperature on stage 1 of circuit 2 in 24 hours :

```
 P 3 5 4 . 1   N O .   D I S C H A R G E   2
C U T S   I N   2 4 H                       x
```

```
 P 3 5 4 . 1   N O .   D I S C H A R G E   3
C U T S   I N   2 4 H                       X
```

Number of cut-offs caused by discharge temperature on stage 2 of circuit 2 in 24 hours :

```
 P 3 5 4 . 2   N O .   D I S C H A R G E   4
C U T S   I N   2 4 H                       X
```

Percentage of opening for the electronic expansion valve on circuit 2 :

```
 P 3 5 5   C 2    E X V
O P E N I N G                           X X X %
```

Circuit 2 liquid temperature :

```
 P 3 5 6   C I R C U I T    2
L I Q U I D    T E M P .            x x . x °
```

Circuit 2 subcooling value :

```
 P 3 5 7   C I R C U I T    2
S U B C O O L I N G                 x x . x °
```

Number of cut-offs caused by circuit 2 expansion valve fault :

```
 P 3 5 8   N O .   C U T O F F S   C A U S E D
B Y   C 2   E X V   I N   2 4 H             X
```

■ **Inputs:**

State of unit automatic operation control input :

```
P 4 0 0    A U T O .   O P E R A T I O N
C T R L    I N P U T                  O P E N
```

State of setpoint selection input (1 or 2) :

```
P 4 0 2    S E T P O I N T    S E L E C T I O N
I N P U T                                    1
```

State of water flow fault input:

```
P 4 0 3    W A T E R    F L O W
F A U L T    I N P U T                O P E N
```

{ Same when 'CLOSED'

State of fan fault input:

```
P 4 0 4    F A N    F A U L T
I N P U T                             O P E N
```

State of operating mode selection input:

```
P 4 0 5    H E A T I N G / C O O L I N G
M O D E    I N P U T                  O P E N
```

State of phase controller fault input :

```
P 4 0 6    P H A S E    C O N T R O L L E R
F A U L T    I N P U T                O P E N
```

State of recovery operating mode selection input :

```
P 4 0 7    R E C O V E R Y    O P E R A T I O N
I N P U T                             O P E N
```

State of fault input 1 on Additional board 1 for units equipped with auxiliary electric heaters P22 = Yes :

```
P 4 0 8    F A U L T    I N P U T    1
E L E C T R I C    A D D 1      O P E N
```

State of fault input 2 on Additional board 1 for units equipped with auxiliary electric heaters P22 = Yes :

```
P 4 0 9    F A U L T    I N P U T    2
E L E C T R I C    A D D 1      O P E N
```

State of configurable input on additional board 1 for units equipped with auxiliary electric heaters P22 = Yes and P113 = load shedding or forced :

```
P 4 1 0    C O N F I G U R A B L E    I N P U T
E L E C T R I C    A D D 1      O P E N
```

State of stage 1 override input :

```
P 4 1 4    S T A G E    1    O V E R R I D E
I N P U T                             O P E N
```

State of stage 2 override input :

```
P 4 1 5   S T A G E   2   O V E R R I D E
I N P U T                             O P E N
```

State of stage 3 override input :

```
P 4 1 6   S T A G E   3   O V E R R I D E
I N P U T                             O P E N
```

State of stage 4 override input :

```
P 4 1 7   S T A G E   4   O V E R R I D E
I N P U T                             O P E N
```

State of manual High Pressure switch input on circuit 1 :

```
P 4 1 8   M A N U A L   H P 1
F A U L T   I N P U T                 O P E N
```

State of stage 1, circuit 1 fault input :

```
P 4 1 9   S T A G E 1   C I R C U I T 1
F A U L T   I N P U T                 O P E N
```

State of stage 2, circuit 1 fault input :

```
P 4 2 0   S T A G E 2   C I R C U I T 1
F A U L T   I N P U T                 O P E N
```

State of manual High Pressure switch input on circuit 2 :

```
P 4 2 2   M A N U A L   H P 2
F A U L T   I N P U T                 O P E N
```

State of stage 1, circuit 2 fault input :

```
P 4 2 3   S T A G E 1   C I R C U I T 2
F A U L T   I N P U T                 O P E N
```

State of stage 2, circuit 2 fault input :

```
P 4 2 4   S T A G E 2   C I R C U I T 2
F A U L T   I N P U T                 O P E N
```

State of fault input for electronic expansion valve on circuit 1 :

```
P 4 2 5   C I R C 1   E X V
F A U L T   I N P U T                 O P E N
```

State of fault input for electronic expansion valve on circuit 2 :

```
P 4 2 6   C I R C 2   E X V
F A U L T   I N P U T                 O P E N
```

■ **Outputs :**

Pump 1 contact :

```
P 4 3 0   P U M P   1   O U T P U T
                            O N
```

Pump 2 contact :

```
P 4 3 1   P U M P   2   O U T P U T
                               O N
```

Circuit 1 Y/C contact :

```
P 4 3 2   C I R C U I T   1
Y / C   O U T P U T                      O N
```

Circuit 2 Y/C contact :

```
P 4 3 3   C I R C U I T   2
Y / C   O U T P U T                      O N
```

Heat trace cable contact :

```
P 4 3 5   H E A T   T R A C E
                               O N
```

Heater contact :

```
P 4 3 6    H E A T E R
O U T P U T                                    O N
```

Contact for frost protection heat trace cable (recovery option) :

```
P 4 3 7    R E C O V E R Y    F R O S T
P R O T .   O U T P U T                        O N
```

Configurable output contact :

```
P 4 3 8    M A X I M U M
P O W E R   O U T P U T                        O N
```

```
P 4 3 9    B O I L E R   O U T P U T
                                               O F F
```

```
P 4 4 0    C L G / H T G   R E P O R T
O U T P U T                                    O F F
```

Control contact for fan stages if P180 = 1 :

```
P 4 4 1    F A N                         O F F
                                         O N
                                         H S        HS (High Speed)
                                         L S        =high temperature
                                                    LS = Low Speed
```

Control contact for fan stages P180 = 2 (2 stages) and P3 = 1 (1 circuit) :

```
P 4 4 1    H P   C O N T R O L
S T A G E   1   O U T P U T                    O N
```

```
P 4 4 2    H P   C O N T R O L
S T A G E   2   O U T P U T                    O N
```

Control contact for fan stages P180 = 2 (2 stages) and P3 = 2 (2 circuits) :

```
P 4 4 1    H P   C O N T R O L
S T A G E   1   C 1   O U T P U T              O N
```

```
P 4 4 2    H P   C O N T R O L
S T A G E   2   C 1   O U T P U T              O N
```

```
P 4 4 3    H P   C O N T R O L
S T A G E   1   C 2   O U T P U T              O N
```

```
P 4 4 4    H P   C O N T R O L
S T A G E   2   C 2   O U T P U T              O N
```

Control contact for fan stages P180 = 3 (3 stages) and P3 = 2 (2 circuits) and P11 = split
P441, P442, P443 and P444 same as P180 = 2 (2 stages) and P3 = 2 (2 circuits) :

```
P 4 4 5    H P   C O N T R O L
S T A G E   3   C 1   O U T P U T              O N
```

```
P 4 4 6    H P   C O N T R O L
S T A G E   3   C 2   O U T P U T              O N
```

Control contact for fan stages P180 = 3 (3 stages) and P3 = 2 (2 circuits) and P11 = mixed
P441, P442, P443 and P444 same as P180 = 2 (2 stages) and P3 = 2 (2 circuits) :

```
P 4 4 5    H P   C O N T R O L
C O M   S T A G E   1   O U T P U T            O N
```

```
P 4 4 6    H P   C O N T R O L
C O M   S T A G E   3   O U T P U T            O N
```

Speed control information (intertwined coil) :

```
P 4 4 7   H P   S T A G E   1
D R I V I N G   V O L T A G E       X X . X V
```

Speed control information (split or mixed coil), stage 1, circuit 1 :

```
P 4 4 8   H P   S T A G E   1   C 1
D R I V I N G   V O L T A G E       X X . X V
```

Speed control information (split or mixed coil), stage 1, circuit 2 :

```
P 4 4 9   H P   S T A G E   1   C 2
D R I V I N G   V O L T A G E       X X . X V
```

Speed control information (mixed coil), common stage 1 :

```
P 4 5 0   H P   C O M   S T A G E   1
D R I V I N G   V O L T A G E       X X . X V
```

Circuit 1 balance valve output contact :

```
P 4 5 1   C 1   B A L A N C E   V A L V E
O U T P U T                               O N
```

Circuit 2 balance valve output contact :

```
P 4 5 2   C 2   B A L A N C E   V A L V E
O U T P U T                               O N
```

Electric stage output :

```
P 5 3 x   E L E C T R I C   S T A G E   x
O U T P U T                               O N
```

Air blade information :

```
P 5 3 5   A I R   B L A D E
O P E N I N G   %                   x x x %
```
{ Stages 1 to 4

Version :

```
P 5 5 5   C P U   V E R S I O N   N O .
                              x x - x x
P 5 5 6   C O N S O L E   V E R S I O N
N O .                         x x - x x
```

```
P 5 5 7   C I R C U I T   2   B O A R D
V E R S I O N   N O .         x x - x x
```

```
P 5 5 8   R E V E R S A L   B O A R D
V E R S I O N   N O .         x x - x x
```

```
P 5 5 9   A U X .   B O A R D
V E R S I O N   N O .         x x - x x
```

Version number of circuit 1 electronic expansion valve :

```
P 5 6 0   C I R 1   E X V   V E R S I O N
N O .   X X . Y Y   V C M     X X . Y Y
```

Version number of circuit 2 electronic expansion valve :

```
P 5 6 1   C I R 2   E X V   V E R S I O N
N O .   X X . Y Y   V C M     X X . Y Y
```

"SO" order number :

```
P 5 7 0   S O   O R D E R
  N U M B E R           X X X X X X X X
```

MO number :

```
P 5 7 1   M O   N U M B E R
                      X X X X X X X X
```

Machine identification name :

```
P 5 7 2   M A C H I N E   L O C A T I O N
  X X X X X X X X X X X X X X X X X X X X X X X X
```

Machine identification number :

```
P 5 7 3   M A C H I N E   N U M B E R
                      X X X X X X X X
```

## 8.8 - FAULT MEMORY menu

This menu records the last 20 faults on the machine and the associated values measured at the time the faults occurred.

To enter the FAULT MEMORY menu, use the **+** or **–** buttons to position the cursor on 7 then press **OK**.

The list of faults appears on the display. Press the **+** or **–** buttons to scroll through the faults.

■ **Accessing the fault memory :**

To access measured values when a fault occurred, press **OK**.

⚠ **Measured values cannot be accessed in the event of a mains power failure.**

Press the **+** or **–** buttons to scroll through the faults line by line. To go back to the main menu, press the button **ESC** until the menu appears.

Below is the list of messages that appear in the fault memory regardless of the fault type (main circuit fault, main unit fault, temporary fault) :

```
x - M A I N S   P O W E R   F A I L U R E
x - P H A S E   C O N T R O L L E R
x - W A T E R   F L O W   R A T E
x - W A T E R   F R O S T   P R O T .   x
x - R E F R .   F R O S T   P R O T .   X
x - C P   D E L T A   P
x - C O M P   D R I V E R
x - C I R C U I T x   H P
x - M A N U A L   H P x
x - C I R C U I T x   L P
x - M O T O R   S T A G E x C I R x
x - M I N   S U P E R H E A T   C X
x - M A X   S U P E R H E A T   C X
x - R E F . T .   x
x - M I N .   T E M P . / A I R
x - M A X .   T E M P . / A I R
x - F A N
x - E X C H .   H 2 O   I N . S E N S O R
x - E X C H . x   H 2 O   O U T . S E N S .
x - O U T . T E M P .   S E N S O R
x - E X C H . x   F R O S   P R O T . S E N S O
x - C O N D E N S E R   I N   S E N S O R
x - C O N D E N S E R   O U T   S E N S O R
x - C I R   x   C O I L   A   S E N S O R
x - D I S C H .   S E N S O R x
x - M A N I F .   H 2 O   S E N S O R
x - E X C H .   A M B .   S E N S O R
x - S U C T I O N   S E N S O R
x - L P   S E N S O R   x
x - H P   S E N S O R   x
x - P U M P   X
x - P U M P S   1   A N D   2
x - S E L F - A D J   C T R L
x - C I R C U I T x   D E F R O S T
x - C X   E X P .   V A L V E
x - E X P .   V A L V E   X   L I N K
x - E X C H .   F R O S T   P R O T .   x
F A U L T   M E M O R Y   E M P T Y
```

} On refrigerant

Reading for saving faults to memory :

■ **Reading if a circuit fault occurs:** information on circuit that cut off

```
H P X :  x x x . x b     T C O N D : + x x . x °  ↑
L P x :  x x x . x b     T E V A P : + x x . x °
S U C T I O N  T .  x : + x x . x °    °
S U P E R H E A T  x : x x . x ° °          ↓

D I S . T 1 : x x x °   D I S . T 2 : x x x °  ↑
W A T E R  I N L E T :  - x x . x °
W A T E R  O U T L E T : - x x . x °
O U T D O O R  T . : - x x . x °          ↓

R E F R I G .  T .  x  + x x . x °          ↑
H O T  W A T E R  T .  - x x . x
```

■ **If a unit fault occurs :**

```
O U T D O O R  T . : - x x . x °          ↑
C T R L  S T P :  - x x . x °
W A T E R  I N L E T :  - x x . x °
M A N .  W A T E R  O U T : x x . x °      ↓

H O T  W A T E R  T .  - x x . x °         ↑
```

Manifold water outlets
(if two circuits)
or water outlet 1
(if one circuit)

## 8.9 - TEST MODE menu

TEST MODE is used to shorten time delays and eliminate limits (but keep the protections on).

The other menus (measured values, parameters, fault memory, etc.) can be accessed while in test mode.

**When test mode is on for a circuit, the Voltage LED flashes quickly (the same LED on the remote control console flashes).**

► **To turn on test mode :**
- Via menu 8.

```
T E S T  M O D E
                                    Y E S
T E S T  M O D E
                                    N O
```

Select YES or NO with the **+** and **–** buttons. Press **OK** to confirm your choice.

► **To turn off test mode :**
- Select NO in the submenu of menu 8 or wait 1 hour for test mode to turn off (NO) automatically.

Test mode remains on for 1 hour.

## 8.10 - HP test per circuit (from version V27)

The HP test is used to check the correct operation and threshold for activating the high pressure switch by applying very special operating conditions to the unit.

It is specifically used at the end of the machine's execution test to check compliance with the legal requirements relating to high-pressure safety.

It may also be used by the operator service when the unit is located at a customer's site.

This test consists of running the unit with high pressure until the high pressure switch opens (just before the a high-pressure safety valve releases refrigerant into the atmosphere). To successfully fulfil this condition, several safety functions must be overridden in this specific scenario.
- To prevent the discharge of the compressor, the HP fault threshold in the software (P54 in the configuration parameters) is increased to bring it above the pressure switch threshold (to reach this pressure switch threshold, the compressor must run outside of its comfort zone).
- The HP test systematically switches the unit to cooling mode.
- During the HP test, the time delay between stage values… will be the same as those used for test mode.

```
H P  T E S T  -  C I R C U I T  X
```

- Menu accessible from the "TEST MODE" menu
- Access level 3.

# 8 - CONTENTS OF THE MENUS

## a) Start-up procedure

- The test function will only be authorised to run if the unit is shut down.
- The circuit must be available (no forced shut-down of the 2 compressors; no fault)
- The normal HP test can only be performed from the local control console (not from the remote control console or from a CMS).
- The HP test is performed with just 1 compressor.
- The software shut-down threshold is 43 bar.
- To start the HP test, with level 3 access, go into the "HP TEST CIRCUIT x" menu and confirm with "YES".

The sequence then starts automatically:
- The evaporator pump starts followed by 1 compressor.
- The On/Off LED flashes 75/25.
- The condenser pump stops.
- When the flow switch is closed, the available compressors start up.
- The On/Off key is disabled for the duration of the HP test.
- The remote On/Off function is also disabled.

## b) End of the procedure

The HP test stops once one of the following conditions is met:
- It has been interrupted by setting the parameter "HP_TEST" to NO.
- The HP pressure switch is open, in which case, the HP test is confirmed.

# 9 - MANAGEMENT OF THE ON/OFF INPUTS

## 9.1 - Automatic machine operation control

This input is used by the customer. This control allows customers to remotely prevent the machine from operating.
- The On/Off LED flashes when this control is on.
- Message on display: SHUT OFF BY MACHINE AUTO CONTROL

Contact state: closed or connected by a jumper (automatic machine operation control = Yes)

## 9.2 - Load shedding control

The load shedding controls on the main board are used to turn off the stages on circuit 1.
The load shedding controls on the main board are used to turn off the stages on circuit 2.

■ **The stages to be shut off are selected by :**
- Balancing the runtimes (P175 = Automatic) and the number of closed inputs. Associated message: "NO. STAGES TO BE SHUT OFF".
  The controller turns off the stages that have been running the longest.
- Or they can be shut off selectively (P175 = Selective): Input 1 on circuit 1 turns off stage 1 on circuit 1. Input 2 on circuit 1 turns off stage 2 on circuit 1. Input 1 on circuit 2 turns off stage 1 on circuit 2. Input 2 on circuit 2 turns off stage 2 on circuit 2, and the following message appears: "STAGE x CIRCUIT x TURNED OFF".
  State of on/off contact: open at rest
  These stages can also be shut off via the Modbus protocol (bits 515 to 518). Refer to the communication protocol section at the end of these instructions.
- If P175 = Selective, OR is placed between the on/off inputs and the information from the bus.
- If P175 = Automatic, the compressors will be shut off by the greatest number of inputs between the on/off inputs and the bus.

**Load shedding is cancelled if no information is sent by the bus for more than 6 hours.**

## 9.3 - Water flow switch

The information is sent to an open on/off input on the water flow switch.
Changing the fault management mode resets the number of water flow faults.

### 9.3.1 - Management for water-to-water units in cooling mode, air-to-water units and reversible air-to-water units
- The water flow switch is read 10 second after pump 1 or 2 is authorised to turn on if P25 = 2 and while at one of the pumps is running. The contact must remain open for at least 3 seconds in order to detect a fault.
- If a water flow fault occurs during the 1-minute circulation delay (after the last control stage), it will not be managed as a fault but the pump will be shut off.

■ **If ≤ 3 shutdowns occur in 1 hour**

► **If a fault occurs :**
- Pump shut off, compressor and electric stages shut off
- 1-minute time delay (10 seconds in test mode).
- Saved in fault memory
- Machine fault output not active
- Water flow fault relay on optional board in Off position
- General fault LED on console flashes
- Number of faults over a 1-hour period managed.

► **Affichage :**

```
W A T E R     F L O W     F A U L T
X   C U T ( S )   I N   1 H
```

**Resetting :** The fault is automatically acknowledged after the 1-minute time delay.

■ **If > 3 shutdowns occur in 1 hour**

► **If a fault occurs :**
- Pumps shut off, compressor and electric stages shut off
- Saved in fault memory
- Unit fault output active
- Water flow fault relay on optional board in On position
- General fault LED on console lit steady
- Number of faults over a 1-hour period managed.

► **Display :**

```
      M A C H I N E     O F F
  W A T E R     F L O W     F A U L T
```

► **Resetting :** Press the **Reset** button**.**

■ **If reversible air-to-water + boiler (P111 = boiler)**

A) If P27 = Yes (pump controlled by boiler operation) :
- If a flow switch fault occurs on the heat pump, the boiler is authorised to turn on.

B) If P27 = No (pump controlled only by on/off) :
- If a flow switch fault occurs on the heat pump, the boiler is shut off.

### 9.3.2 - Management for water-to-water units in heating mode

A time delay is necessary to manage this fault.
This time delay is :
- Determined by P109 if P108 = depending on control mode
- 10 seconds if P108 = depending on On/Off.

The water flow switch is read after this time delay, after pump 2 is turned on and while pump 2 is running.
- If a water flow fault occurs during the 1-minute circulation delay (after the last control stage), it will not be managed as a fault but the pump will be shut off.

► **Display :**

```
W A T E R    F L O W    F A U L T
X    C U T ( S )    I N    1 H
```

► **Resetting :** The fault disappears automatically after 1 minute.

■ **If ≥ 3 stops in 1 hour**

► **If a fault occurs :**
- Pump 2 is shut off
- Thermodynamic stages shut off; auxiliary heaters may remain on
- Saved in fault memory
- Fault output on

► **Display :**

```
        M A C H I N E    O F F
    W A T E R    F L O W    F A U L T    U
```

► **Resetting :** Press **Reset.**

■ **If ≤ 3 stops in 1 hour**

► **If a fault occurs :**
- Pump 2 is shut off
- Thermodynamic stages shut off; auxiliary heaters may remain on
- Saved in fault memory
- Fault output off
- General fault LED on console lit steady
- Time delay increased by 10 seconds before water flow fault read
- The time delay value obtained is stored in memory so that it can be applied the next time the pump is turned on.
- The increased time delay is reset if P109 is changed.

- General fault LED on console flashes
- The time delay value obtained is stored in memory so that it can be applied the next time the pump is turned on.
- The increased time delay is reset if P109 is changed.

## 9.4 - Fan fault (circuits 1 and 2)

Fan faults are managed in series. As a result, there is only one fan fault input. Faults are read on terminals 5-6 of terminal block J6.

■ **If P10 ≠ centrifugal :**

► **If a fault occurs :**
- Machine and fans shut off by HP safety.
- Fault saved to fault memory
- Fan fault relay on relay board in On position

■ **If P10 = centrifugal**

► **If a fault occurs :**
- Machine shut off because fan shut off
- Fault saved to fault memory
- General fault relay on relay board in On position

► **Display :**

When P21 = Yes or P10 = Pressure, this input should not be read until 10 seconds after the unit is turned on and IS NOT TAKEN INTO ACCOUNT WHEN THE UNIT IS SHUT OFF.

- General fault LED on console flashes
- Fault acknowledged automatically when input closed

- General fault LED on console lit steady
- Fault acknowledged manually.

```
        M A C H I N E    S T A T U S
    F A N    F A U L T
```

Saved in fault memory

```
X - F A N
```

► **Resetting :**

When the input is closed the fault is acknowledged automatically

Special case: a fan fault will turn off units in the LP range (air-to-water and centrifugal fan).

## 9.5 - Expansion valve fault

■ **If P42 = ALCO**

This configuration corresponds to using the electronic expansion valve with the Alco driver module and display.

Only fault feedback signals from the valve are managed in this case.

The fault signal contact on the electronic expansion valve on circuit 1 must be wired to terminals 5-6 on terminal block J5 on the motherboard. The contact on the valve on circuit 2 must be wired to terminals 5-6 on terminal block J2 on additional board 2 for circuit 2

► **Operation :**

Corresponding circuit shut off when its input opens.

■ **If < 3 shutdowns occur in 24 hours**

► **If a fault occurs :**
- Corresponding circuit shut off
- Fault output on
- Saved in fault memory
- Circuit fault LED on console flashes
- Number of faults over a 24-hour period managed.

► **Display :**

```
F A U L T    O N    E X V    X
     X    C U T S    I N    2 4 H
```

■ **If ≥ 3 shutdowns occur in 24 hours**

► **If a fault occurs :**
- Corresponding circuit shut off
- Fault output on
- Saved in fault memory
- Circuit fault LED on console lit steady
- Number of faults over a 24-hour period managed.

► **Display :**

```
     C I R C U I T    X    O F F
E X P .    V A L V E    F A U L T
```

► **Resetting :**

If the number of faults in 24 hours < 3: The fault is automatically acknowledged after 120 seconds and the fault input is closed.

If the number of faults in 24 hours ≥ 3: Acknowledge by pressing Reset on the console and by closing the fault input.

► **Fault memory :**

```
    F A U L T    O N    E X V    c x
```

■ **If P42 = VCM (bus link)**

**Expansion valve actuator and expansion valve board protection :**

If any of these four faults is detected on the corresponding refrigerating circuit, the circuit is shut off and the fault is reported.
 The circuit may restart when the fault disappears :

```
B O A R D    L I N K    F A U L T
C I R C U I T    1    E X V
```

Link fault in fault memory :

```
 - E X P A N S I O N    V A L V E    1    L I N K
```

EXV actuator fault in machine status :

```
M O T O R    F A U L T
C I R C U I T    1    E X V
```

EXV actuator fault in fault memory :

```
 - E X V    1    A C T U A T O R
```

# 9 - MANAGEMENT OF THE ON/OFF INPUTS

Expansion valve VCM board fault :

```
          C I R C U I T    X    O F F
  E X P .    V A L V E    F A U L T
```

```
  F A U L T    O N    E X V    X
     X   C U T S    I N    2 4 H
```

## 9.6 - Phase controller fault

The phase controller protects the entire machine. It must be wired to terminals 7-8 on terminal block J5 on the motherboard.

The machine is shut off when a fault occurs on the phase controller (contact opens).

► **Fault message :**

```
          M A C H I N E      O F F
  P H A S E    C O N T R O L L E R    F A U L T
```

► **If a fault occurs :**
- Fault saved in fault memory
- Relay in On position
- Phase control fault relay on relay board in On position
- General fault LED on console lit steady

► **Resetting :**

The opening of the input starts a 2-minute time delay. The fault is acknowledged at the end of this period provided the contact is closed.

The input is not read during this time delay.

► **Message in fault memory :**

```
X - P H A S E    C O N T R O L L E R
```

## 9.7 - Pump fault

Pump faults are automatically reset. They disappear when acknowledged on the circuit breakers.

■ **If P25 = 0 :**

No pumps supplied, only pump fault 1 is managed in the same way if P25 = 1

If a pump fault occurs after the last control stage is shut off but before the pump is shut off (1 minute after), the water flow fault is not managed. Instead, the pump is shut off.

■ **If P25 = 1 :**

Only one pump supplied.

If the pump fault is detected, the unit is shut off and the following message appears :

```
          M A C H I N E      O F F
  P U M P    1    F A U L T
```

- Compressor and electric stages shut off
- Saved in fault memory
- Unit fault output active
- Pump 1 fault relay on optional board in On position
- General fault LED on console lit steady.

■ **If P25 = 2 then P2 = air-to-water or reversible air-to-water:** two pumps supplied

A) If a fault occurs on the pump that is on, the unit is shut off then turned back on with the other pump operating. A pump fault is reported

```
  P U M P    X    F A U L T
B A C K U P    P U M P    O N
```

- Saved in fault memory
- Unit fault output active
- Pump 1 fault relay on optional board in On position
- General fault LED on console flashes

# 9 - MANAGEMENT OF THE ON/OFF INPUTS

B) If a fault occurs on the second pump as well, the unit is shut off and the following message appears

```
          M A C H I N E     O F F
P U M P   1   A N D   2   F A U L T
```

- Saved in fault memory
- Unit fault output active
- Pump 1 fault relay on optional board in On position
- Pump 2 fault relay on optional board in On position
- General fault LED on console lit steady.

C) If the machine is turned on :
- The available pump (i.e. without a fault) is turned on and the faulty pump is reported.

## 9.8 - Compressor protection

► **Operation :**

Information is received by the following open inputs :
- Terminals 1-2 on terminal block J5 on motherboard: Stage 1, circuit 1
- Terminals 2-3 on terminal block J5 on motherboard: Stage 2, circuit 1
- Terminals 1-2 on terminal block J2 on circuit 2 ADD2 board: Stage 1, circuit 2
- Terminals 2-3 on terminal block J2 on circuit 2 ADD2 board: Stage 2, circuit 2

These inputs are read 10 seconds after a mains power failure (slowness of switch INT69 causing a fault). They must be open for more than 5 seconds for the fault to be taken into account.

► **Main circuit fault :**
- Corresponding circuit shut off; fault displayed on LCD
- Circuit fault LED lit steady
- Fault stored in memory in case of a mains power failure
- Fault saved in fault memory
- Relay in On position
- Stage x fault relay on relay board in On position.

This fault must be acknowledged manually and the motor fault must disappear (closed)

► **Display :**

```
        M O T O R    F A U L T
      S T A G E x   C I R C U I T   x
```

Saved in fault memory

```
X - M O T O R    S T A G E x    C I R x
```

► **Resetting :**
Press **Reset**

## 9.9 - Manual HP pressure switch fault on circuit 1 or 2

► **Operation :**

These two inputs monitor the status of the HP pressure switches on each refrigerating circuit.

They are associated with the operation of their respective circuits.

They are read 3 seconds after a stage on the circuit turns on.

► **If a fault occurs :**
- Corresponding circuit shut off.
- General fault output on
- Circuit x HP fault relay on optional board in On position
- Circuit LED on console lit steady

► **Display :**

```
        C I R C U I T   B R E A K   x
      M A N U A L   H P   F A U L T
```

Saved in fault memory :

```
X - M A N U A L   H P x
```

► **Resetting :**
Reset the HP switch manually then reset the fault by pressing **Reset**.

## 9.10 - Setpoint selection via on/off input

If the number of setpoints = 2 with selection via on/off input (the on/off input corresponds to terminals 4-6 on terminal block J6 on the motherboard).

■ **In cooling mode :**
- If the setpoint is not adjusted based on the outdoor temperature or there is a fault on the outdoor temperature sensor, the control setpoint = P121 if the on/off input is open or P122 if the on/off input is closed.
- If the setpoint is adjusted based on the outdoor temperature and there are no faults on the outdoor sensor:
  The setpoint is calculated using P121 if the on/off input is open. If the input is closed, the setpoint is calculated using P122.

■ **In heating mode :**
- If the setpoint is not adjusted based on the outdoor temperature or there is a fault on the outdoor temperature sensor, the control setpoint = P123 if the on/off input is open or P124 if the on/off input is closed.
- If the setpoint is adjusted based on the outdoor temperature and there are no faults on the outdoor sensor:
  The setpoint is calculated using P123 if the on/off input is open. If the input is closed, the setpoint is calculated using P124.

## 9.11 - Variable setpoint via 4 20 mA input

■ **In heating mode :**
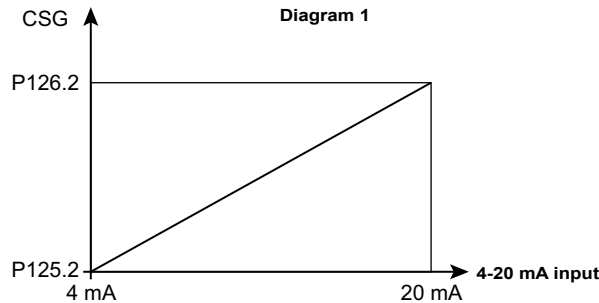


Diagram 1

STP = Setpoint

Displayed if P120 = 3 and in HEATING mode :

```
P 1 2 5 . 2   S T P   F O R   4 m A
H E A T I N G           - x x , x °
```

```
P 1 2 6 . 2   S T P   F O R   2 0 m A
H E A T I N G           - x x , x °
```

If setpoint adjustment based on outdoor temperature = No or there is an outdoor sensor fault → Control setpoint = result of diagram 1

If the setpoint is adjusted based on the outdoor temperature = Yes and there are no faults on the outdoor sensor:

The derived setpoint is calculated using the outdoor temperature. The result of diagram 1 is taken as the setpoint (P123 or P124).

If P120 is set to '3', P131 automatically switches to 'No'.
- To reverse the direction of the slope, simply set P125.2 to > P126.2 with a minimum difference of 5 K.

■ **In cooling mode :**



Diagram 2
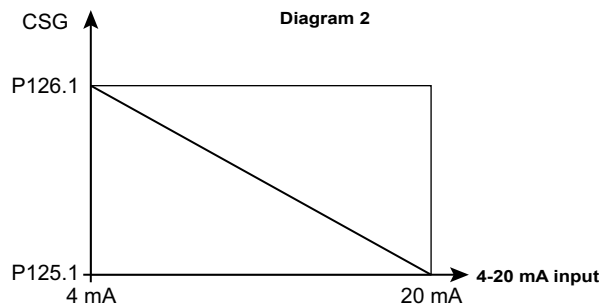
STP = Setpoint

Displayed if P120 = 3 and in cooling mode :

```
P 1 2 5 . 1   S T P   F O R   4 m A
C O O L I N G             - x x , x °
```

```
P 1 2 6 . 1   S T P   F O R   2 0 m A
C O O L I N G             - x x , x °
```

If setpoint adjustment based on outdoor temperature = No or there is an outdoor sensor fault → Control setpoint = result of diagram 2

If setpoint adjustment based on outdoor temperature = Yes and there are no faults on the outdoor sensor → The derived setpoint is calculated using the outdoor temperature. The result of diagram 2 is taken as the setpoint (P121 or P122).

If P120 is set to '3', P127 automatically switches to 'No
- To reverse the direction of the slope, simply set P125.1 to > P126.1 with a minimum difference of 5 K

> **IMPORTANT NOTE ABOUT THIS FUNCTION :** operating problems may occur if parameters P127 and P131 are set to 'Yes' and the controller delivering the 4 20 mA signal has its own function for shifting the setpoint based on the outdoor temperature.
>
> If the minimum value of the signal becomes less than 4 mA, the value of the setpoint will not drop below the minimum setpoint.

## 9.12 - Operating mode selection

■ **If P119 = 4 (cooling/heating via on/off input) :**

The unit is controlled, during water heating or water chilling, based on the mode selected via the input located:
- Between terminals 5-6 on terminal block J6 on the motherboard if P2 = water-to-water
- Between terminals 1-2 on terminal block J4 on additional board 1 if P2 = reversible air-to-water, 1 circuit
- Between terminals 1-2 on terminal block J2 of additional board 2 (cycle reversal) if P2 = reversible air-to-water, 2 circuits

The contact must be closed in order to be able to select heating mode, and it must be open in order to be able to select cooling mode.
- If P2 = water-to-water, the machine must be shut off via the On/Off button or the automatic operation control and winter protection must be shut off before the operating mode may be changed

► **A fault will occur if the operating mode is changed while the machine is running :**
- Unit shut off,
- General fault LED on
- LED of initial mode flashes; fault control contact closed (not stored in fault memory)

```
M A C H I N E   O F F
O P E R A T I N G   M O D E   C H A N G E
```

► **Automatic acknowledgment :**
- The operating mode changes if the change is confirmed via the On/Off button or the automatic operation control.
- If the input returns to its original state, the unit resumes its initial operating.

If P2 = reversible air-to-water, the operating mode may be switched with the unit running. After the operating mode is changed, the unit will stop and restart in its new operating mode and take into account the short-cycle protection.

## 10.1 - Temperature sensor

Diagram of sensors: All sensor faults are taken into account in the fault memory
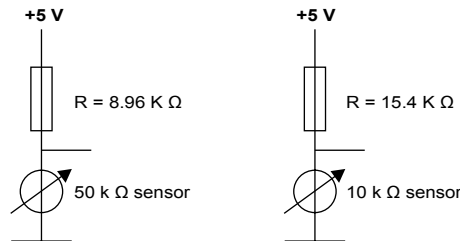


■ **Water inlet sensor :** CTN 10 K at 25°C (if P2 = 1, 2 or 3)

This sensor monitors the water temperature on the exchanger inlet in order to :
- Adjust the unit (water return control).
- Monitor the operation of the unit if the water return temperature is too high (load limiting).
- Display the chilled water or hot water inlet temperature (display range: 40 to 99°C, resolution: 0.1 K).
- Automatic acknowledgement.

```
E X C H . 1   W A T E R   I N L E T
S E N S O R   F A U L T   J 7 / 2 - 3
```

- Sensor wire cut and short circuit :

► **In cooling mode :**
- Unit shut off, message on LCD, unit fault LED lit steady, fault saved in fault memory, fault relay in On position.

► **In heating mode :**
- Water-to-water unit → No effect on control, message on LCD, unit fault LED flashes, fault saved in fault memory.
- Reversible air-to-water unit and water return control→ Unit shut off, message on LCD, unit fault LED lit steady, fault saved in fault memory, fault relay in On position.
- Reversible air-to-water unit and water return control → No effect on control, message on LCD, unit fault LED flashes, fault saved in fault memory.

■ **Water outlet sensor on heat exchanger 1 :** CTN 10 K at 25°C (if P2 = 1, 2 or 3)

This sensor monitors the water temperature on the exchanger outlet in order to :
- Adjust the unit (to water supply) → (P6 = 1) and (P141 = 3 or 4) and cooling mode or (P02 = 3), (P6 = 1) and (P141 = 3 or 4) and heating mode
- Enable the frost protection
- Display the water outlet temperature (display range: 40 to 99.9°C, resolution: 0.1 K).
- Automatic acknowledgement

```
E X C H . 1   W A T E R   O U T L E T
S E N S O R   F A U L T   J 7 / 4 - 5
```

- Sensor wire cut and sensor short circuit → Fault relay in On position

If this sensor is used for control, the unit is shut off (message from table 1 in machine status menu shown on LCD, unit fault LED lit steady, fault saved in fault memory). If heating mode is on: the electric auxiliary heaters are turned on if possible and the boiler relay is in the On position if P111 = boiler).

If the sensor is not used for control (i.e. it is used only for the frost limit), the fault is a circuit fault (message from circuit 1 table in machine status menu shown on LCD, circuit fault LED lit steady, fault saved in fault memory).

■ **Water outlet sensor on heat exchanger 2 :** CTN 10 K at 25°C (if P2 = 1, 2 or 3)(if P6 = 2 → two sensors + manifold sensors).

This sensor monitors the water temperature on the exchanger outlet in order to :
- Enable the frost protection
- Display the water outlet temperature (display range: 40 to 99.9°C, resolution: 0.1 K).
- Automatic acknowledgement

```
E X C H . 2   W A T E R   O U T L E T
S E N S O R   F A U L T   A D D 2   J 4 / 1 - 2
```

- Sensor wire cut and sensor short circuit → Fault relay in On position

This sensor is not used for control (i.e. it is used only for frost protection; control is provided by the manifold sensor). The fault is a circuit fault (message on LCD, circuit fault LED lit steady, fault saved in fault memory).

# 10 - MANAGEMENT OF THE ANALOGUE INPUTS

■ **Outdoor air sensor:** CTN 10 K at 25°C

This sensor monitors the temperature of the outdoor air in order to :
- Adjust the system based on the outdoor temperature (cooling and heating). If the sensor wire is cut (open circuit) or the sensor short-circuits, the unit is adjusted to the setpoint value (heating and cooling) and a fault is displayed.
- Limit the operation of the unit based on the minimum temperature in heating mode.
- Display the outdoor air temperature (display range: 40 to 99.9°C, resolution: 0.1 K).
- Automatic acknowledgement

```
OUT.    TEMP.    SENSOR    FAULT
                 J 7 / 1 - 2
```

- Sensor wire cut and short circuit :
  • Control based on outdoor temperature inhibited; control using setpoint.
  • If the unit is running in heating mode and can run with the electric stages, the compressors are shut off, control is on the electric stages, a message appears on the LCD, the unit fault LED flashes, and the fault is saved in fault memory.
  • If P2 = water-to-water, the unit continues to operate and the fault is reported (message from table 2 in machine status menu shown on LCD, unit fault LED flashes, fault saved in fault memory)
  • In all other cases: unit shut off, message on LCD (table 1 in machine status menu), unit fault LED lit steady, fault saved in fault memory, heat trace cabled turned on, fault relay in On position, boiler relay in On position if heating mode on and P111 = boiler.

■ **Frost protection sensor for refrigerant in heat exchanger (1 or 2) :** CTN 10 K at 25°C (if P2 =1, 2 or 3 unless P1 = R407C, P2 = 3 and P3 = 2).

This sensor monitors the temperature of the refrigerant at the heat exchanger inlet in order to :
- Protect the heat exchanger from frost :
  • Power reduced if several control stages are used
  • Slope of fans changed
  • Unit shut off
- Refrigerant frost protection temperature displayed (display range:  40 to 99.9°C, resolution: 0.1 K)
- Automatic acknowledgement

```
EXCH.x    REFR.    FROST
PROT.    SENS.    FAULT    Jx / x - x
```

- If the sensor wire is cut or the sensor short-circuits, the corresponding circuit is shut off, a message appears on the LCD, the circuit x fault LED is lit steady, the fault is saved in the fault memory, the general fault relay is in the On position, and the auxiliary heaters are turned on if heating mode is on)

■ **Coil sensor (A to D) :** CTN 10 K at 25°C

If P2 = reversible air-to-water, this sensor manages the freon temperature at the coil outlet in order to:Gérer (lancer et arrêter) un dégivrage :
- Manage (turn on and off) a defrosting cycle
- Display the coil temperature (display range:  40 to 99.9°C, resolution: 0.1 K)
- Automatic acknowledgement

```
COIL.    x    CIRCUIT    x
SENSOR    FAULT            Jx / x - x
```

If the sensor wire is cut or the sensor short-circuits :

► **In cooling mode :**

Fonctionnement normal, message LCD, led défaut circuit x clignotante, sauvegarde mémoire défaut.

► **In heating mode :**
- If outdoor temperature ≥ 10°C → normal operation, message on LCD, circuit x fault LED flashes, fault saved in fault memory.
- If outdoor temperature < 10°C → circuit x shut off, message on LCD, circuit fault LED flashes, fault saved in fault memory

■ **Condenser hot water sensor :** CTN 10 K at 25°C (if P2 = 1 and P141 = 3 or 4) = P258 (if P2 = 1 and P141 = 1) = P257

This sensor monitors the water temperature at the condenser exchanger's inlet (or outlet) in order to :
- Adjust in heating mode
- Display the condenser's water temperature (display range:  40 to 99.9°C, resolution: 0.1 K)
- Automatic acknowledgement

```
CONDENSER    INLET    SENSOR
FAULT        J7 / 5 - 6
```

Sensor wire cut and short circuit :

► **In cooling mode :**

Normal control, message on LCD, unit fault LED flashes, fault saved in fault memory, general fault relay in On position.

► **In heating mode :**

Unit shut off, message on LCD, unit fault LED flashes, fault saved in fault memory, general fault relay in On position, boiler relay in On position if P111 = boiler.

■ **Heat exchanger ambient sensor :** CTN 10 K at 25°C (if P2 = 2)

This sensor monitors the temperature inside the hydraulic enclosure housing the heat exchanger(s) in order to:
- Turn on the heaters
- Display the temperature inside the enclosure (display range: 40 to 99.9°C, resolution: 0.1 K)
- Automatic acknowledgement

```
E X C H A N G E R    A M B I E N T    T E M P .
S E N S O R    F A U L T    J 7 / 5 - 6
```

- Sensor wire cut and short circuit: heaters turned on (relay in On position), message on LCD, unit fault LED flashes, fault saved in fault memory + general fault relay in On position.

■ **Control stage discharge sensor (1, 2, 3 or 4) :** CTN 50 K at 25°C (all configurations)
- Monitors the discharge temperature on the compressors
- Displays the discharge temperature (display range: 5 to 150°C, resolution 1 K).

```
D . T E M P .    S E N S O R    X    F A U L T
                 J x / x - x
```

- If the sensor wire is cut (check 5 minutes after compressor turned on) and the sensor short-circuits (continuous monitoring), the corresponding control stage is turned off and the auxiliary heaters are turned on if need be. If there are no auxiliary heaters, the boiler relay moves to the On position if P111 = boiler. A message appears on the LCD, the circuit fault LED is lit steady, and the fault is saved in the fault memory.
- This fault must be acknowledged manually if the temperature < 145°C. The discharge fault must also be acknowledged.

■ **Water manifold outlet sensor :** CTN 10 K at 25°C (if P2 = 1, 2 or 3 and P6 = 2)

This sensor monitors the water temperature on the exchanger outlet in order to :
- Adjust the unit (to water return)
- Display the common water outlet temperature (display range: 40 to 99.9°C, resolution: 0.1 K).
- Automatic acknowledgement

```
M A N I F .    W A T E R    O U T L E T
S E N S O R    F A U L T    A D D 2    J 4 / 2 - 3
```

- Sensor wire cut and short circuit :
    • If water return control or if P2 = water-to-water and heating mode on (i.e. sensor not used for control):
      Normal control, message from table 2 in machine status menu shown on LCD, unit fault LED flashes, fault saved in fault memory, general fault relay.
    • If water outlet control and (cooling mode on or P2 = 3):
      Unit shut off, message from table 1 in machine status menu shown on LCD, unit fault LED lit steady, fault saved in fault memory, general fault relay

■ **Circuit suction sensor :** CTN 10 K at 25°C (all configurations)

If P42 = 2 (electronic expansion valve on VCM board)

The sensor is connected to the expansion valve board and the temperature information is transmitted over the bus link.

The sensor monitors the suction temperature in order to:
- Display the superheat temperature (display range: 40 to 99.9°C, resolution: 0.1 K)
- Automatic acknowledgement
- If the sensor wire is cut or the sensor short-circuits:
    • If P43 = No: a secondary fault is displayed, the fault LED flashes; the circuit fault relay is in the On position and the fault is automatically acknowledged
    • If P43 = Yes: The corresponding circuit is turned off and the auxiliary heaters are turned on if need be. If there are no auxiliary heaters, the boiler relay moves to the On position.
      If P111 = Boiler. A message appears on the LCD, the circuit fault LED is lit steady, and the fault is saved in the fault memory and automatically acknowledged

► **Fault message :**

```
S U C T I O N    T E M P .    S E N S O R
F A U L T    C I R C U I    . x    J x / x x - x x
```

■ **Circuit liquid sensor :** CTN 10 K at 25°C (all configurations)

This sensor measures the liquid temperature in order to:
- Display the subcooling temperature (display range: 40 to 99.9°C, resolution: 0.1 K)
- Automatic acknowledgement
- If the sensor wire is cut or the sensor short-circuits, a secondary fault is displayed, the fault LED flashes, the circuit fault relay is in the On position, and the fault is automatically acknowledged

► **Fault message :**

```
L I Q U I D    T E M P .    S E N S O R    . x
F A U L T    C I R C    . x    J x / x x - x x
```

■ **Fault detection values :**
- For the 50 K sensors: Cut-off fault (or sensor absent) if < 5°C and the unit has been operating for 5 minutes, and sensor short-circuit if > 148 °C.
- For the 10 K sensors: Cut-off fault (or sensor absent) if < 40°C and sensor short-circuit if > 99°C.

# 10 - MANAGEMENT OF THE ANALOGUE INPUTS

■ **Correspondence table :**

| Temperature (°C) | SENSOR RESISTANCE Ω | |
| --- | --- | --- |
| | DISCHARGE SENSOR 50 KΩ | CONTROL AND OUTDOOR SENSOR 10 KΩ |
| 10 | - | 55340 |
| -5 | - | 42340 |
| 0 | 162250 | 32660 |
| 5 | 126977 | 25400 |
| 10 | 99517 | 19900 |
| 15 | 78570 | 15710 |
| 20 | 62468 | 12490 |
| 25 | 50000 | 10000 |
| 30 | 40280 | 8058 |
| 35 | 32650 | 6532 |
| 40 | 26624 | 5326 |
| 45 | 21834 | 4368 |
| 50 | 18005 | 3602 |

## 10.2 - Pressure sensor

The high and low values for the HP/LP pressure sensors are given below:

The sensors are adjusted using parameters P30 to P39.

Measurement range :

| Low value from | High value to | |
| --- | --- | --- |
| P31 | P30 | HP1 |
| P33 | P32 | HP2 |
| P37 | P36 | BP1 |
| P39 | P38 | BP2 |

- Power supply: 5 V DC
- Signal: 0.5 - 4.5 V
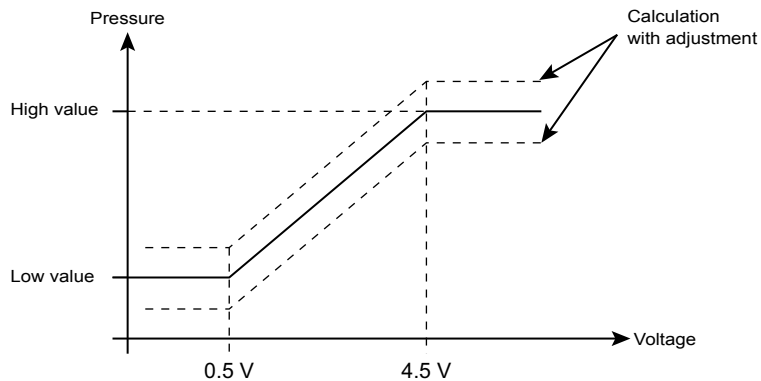


Short-circuit faults will be detected by a voltage ≥ 4.75 V.

This is not taken into account for the low-pressure sensors of each circuit when the unit has stopped or is in the defrosting phase.

For LP sensors, this fault is taken into account following a time delay of 120 s from start-up.

Open-circuit faults will be detected by a voltage ≤ 0.25 V.

The pressure values given are for *relative pressure*

■ **The HP sensor will :**
- Monitor the HP pressure in the circuit and relay this information
- Control the unit using the HP
- Control the condensing pressure

■ **The LP sensor will :**
- Monitor the LP pressure in the circuit and relay this information
- Monitor for refrigerant leaks before turning on stages.

# 10 - MANAGEMENT OF THE ANALOGUE INPUTS

When reading the operation parameters for the pressure levels while the machine is on, the sensors can be adjusted with the **OK** button if there is a difference between a value that is read and the corresponding value measured by a pressure gauge.

Exemple :

```
P 3 x x H P x    P R E S S U R E    ↑
                 x x . x b ↓
```

Press **OK** to access and change the adjustment value.

```
S E N S O R    A D J U S T M E N T      H P x
               x x . x b          0 . 0 b
```
{ [- 1 + 2.5] 0 by default

Press **OK** to confirm the new adjustment value and go back to the operation parameter.

Press **ESC** to cancel any changes made and go back to the operation parameter.

This readjustment will be used to correct the difference between the value measured by a pressure sensor and the value read on a pressure gauge.

The resulting new slope will then be used for control.

# 11 - MANAGEMENT OF THE WATER PUMPS

## 11.1 - Pump 1

Pump 1 is assigned to the main hydraulic network. Therefore, it is used in all configurations:
- If P2 = air-to-water or reversible air-to-water and P25 = 2, it will be managed alternately with Pump 2.
  The pump that has run for the shortest amount of time starts up first.
- Otherwise, the pumps may be turned on using the On/Off button (and automatic operation control input closed).
  The pump is shut off 1 minute after the last control stage turns off.

## 11.2 - Pump 2

Pump 2 is used only in certain configurations :

A) If P2 = water-to-water, pump 2 is assigned to the customer's secondary network and its control mode is determined by P108.
- If P108 = depending on control mode, the pump control is linked to the unit control :

Pump x is turned on before the first control stage (where x is the value entered in P109).

The pump is shut off 1 minute after the last control stage turns off.

```
P U M P   x     O N
                            x  x  s
```

Automatic time delay countdown.

This time delay is maintained during test mode.
- If P108 = depending on On/Off, the pump control is linked to the operation of the unit.:
  • The pump is turned on (via On/Off and with the automatic operation control input closed; or via On/Off, with the automatic operation control input closed and winter protection activated by outdoor temperature; or remotely via a PC, modem or other).
- The pump is immediately turned off when P108 is changed and switches from On/Off control to Depending on control mode (unless control mode called for).
- The pump is shut off 1 minute after the last control stage turns off.

B) If P2 = air-to-water or reversible air-to-water, it depends on P25
- If P25 = 0 or 1 (only one pump supplied.) there is no pump 2.
- If P25 = 2, the unit is supplied with a backup pump. This pump is managed by On/Off control and runs alternately with pump 1. The pump that has run for the shortest amount of time starts up first.

  The next time the machine is turned off by the control after 7 days of operation with the same pump, the pumps are switched (by turning off the one that was running) in order to balance the runtimes.

  The pump is shut off 1 minute after the last control stage turns off.

## 11.3 - Pump management if P2 = 3 (reversible air-to-water) + heating mode + P111 = boiler

Parameter P27 is used to have the pump controlled by the operation of the boiler.

A) If P27 = Yes: When the boiler is turned on, the pump is shut off unless there is a risk of the unit freezing (outdoor temperature ≤ P52 and P261 ≤ 30°C)

A tank with four nozzles must be installed on the system and the boiler must have its own pump and its own control with its own protections

```
P 2 7   P U M P   C O N T R O L L E D
B Y   B O I L E R               Y E S
```

The boiler will continue to operate if the heat pump malfunctions.

B) If P27 = No: The pump is controlled by the On/Off button. It continues to run even when the boiler is authorised to operate.

```
P 2 7   P U M P   C O N T R O L L E D
B Y   B O I L E R   N O
```

## 11.4 - Unseizing and switching the pumps

If any of the pumps remains off (for a reason other than a fault) for over 7 days, it must be turned on between 9.00 am and 9.00 pm and be allowed to run for 2 minutes.
- If P25 = 2, the pump with the longest runtime is turned off after being unseized.
- If the unit is turned off via the On/Off button or the automatic operation control and a water flow fault occurs during unseizing, both pumps are turned off.

## 11.5 - Actuation of variable-speed pump 1 on water-to-water machines via the 0/10V output:

Addition of functions necessary for actuation of pump 1 (indoor network), not supplied, in variable speed mode using a 0/10V output with a PID algorithm.

The aim of this function is to maintain a constant temperature difference between the water outlet and inlet in COOLING mode on the evaporator when this is possible as the machine output varies.

In heating modes, a fixed speed is imposed on the pump.
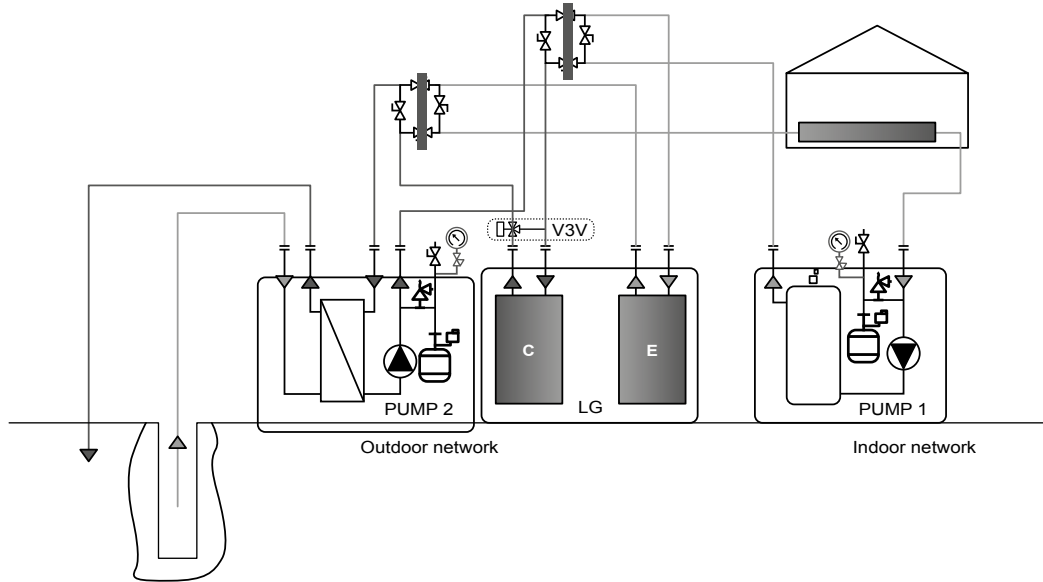


### 11.5.1 - Outputs used: :

- Terminal strip J2 on the motherboard (analogue outputs)
- Terminals 3-4 (0V): 0-10 V output no.2 Pump 1 actuation indoor network customer application evaporator side in COOLING control mode and condenser in HEATING mode

### 11.5.2 - Parameters :

These parameters will only be visible if the machine type P2=water-to-water.

**P240.1:** Evaporator delta T setpoint, pump 1 in COOLING mode and pump 2 in HEATING mode

```
P 2 4 0 . 1    E V A P O R T O R
D E L T A    T    S E T    P O I N T      x . x
```

**P240.9:** Pump 1 speed in HEATING mode

```
P 2 4 0 . 9    H O T    M O D E    P U M P    1
S P E E D                                    0 %
```

### 11.5.3 - PUMP 1 setting :

**P240:** Pump 1 variable speed control

```
P 2 4 0    V A R I A B L E    S P E E D
P U M P    1                                N O
```

**P240.2:** Pump 1 proportional gain

```
P 2 4 0 . 2    P    G A I N    P U M P    1
                                    x x . x
```

**P240.3:** Pump 1 integral gain

```
P 2 4 0 . 3    G A I N    P U M P    1
                                    x . x
```

**P240.4:** Pump 1 derivative gain

```
P 2 4 0 . 4    D    G A I N    P U M P    1
                                    x . x
```

**P240.5:** Pump 1, boost mode

```
P 2 4 0 . 5    B O O S T    M O D E
P U M P    1                                N O N
```

**P240.6:** Pump 1, boost mode max. speed

```
P 2 4 0 . 6    M A X    S P E E D
B O O S T    M O D E    P U M P    1      1 0 0 %
```

**P240.7:** Pump 1, STANDARD mode min. speed

```
P 2 4 0 . 7    M I N I    S P E E D    P 1
S E R    P T : X X X %      M O T O R : x x x %
```

**Note: The minimum speed setpoint must be set based on the specifications for the pump and the minimum acceptable flow rate for the evaporator (water flow safety device cut-off)..**

**P240.8:** Pump 1, STANDARD mode max. speed

```
P 2 4 0 . 8    M A X I    S P E E D
P U M P    1                                    0 %
```

## 11.5.4  -  PUMP 1 reading :

**P580:** Pump 1 speed variation mode

```
P 5 8 0    S P E E D    V A R I A B L E
M O D E    P U M P    1                B O O S T
```

**P581:** Pump 1 speed

```
P 5 8 1    P U M P    1    S P E E D
                                    x x x %
```

## 11.5.5  -  Operating principle :

- The controller provides one 0-10 V signal so that it can actuate the pump installed by the customer on the indoor circuit (one pump).
- The pump is actuated based on the temperature difference between the evaporator water outlet in COOLING control mode; in heating mode, a fixed speed set by the parameter P240.9 is imposed on the pump.
- The control will return the pump speed value (in %) using a PID controller, based on the control mode selected.
- The speed value calculated in % by the controller is converted into an analogue signal (0/10V) to control the pump.
- A PID loop is applied to control the analogue outputs.
- The default sampling frequency of the PID is 1 second.
- The PID can be configured and must be adapted for each site.

## 11.5.6  -  Water pump control :

► **In COOLING mode :**
- Pump 1 is actuated by the evaporator $\Delta T$.

► **In HEATING mode :**

The speed of pump 1 is set at the value configured using the parameter P240.9.
- The actuation of the 0/10V signal for pump 1 is identical to that for the pump 1 binary outputs for water-towater machines.
- Conditions, pump OFF, 0V signal; conditions pump ON, control of the $\Delta T$ in PID.
- The pump is started with an actuation voltage of 10V.
- The PID algorithm for managing the $\Delta T$ only produces an action 10 s after being triggered and 60 s after a thermodynamic control stage is stopped.
- In the event of a cut-out on the water flow rate safety, the min. voltage which can be imposed on pump 1 in COOLING mode is that stored before the cut-out +10%; a message is sent on the console.

To enable this, the actuation voltage for the pump is stored before a control stage is stopped.

```
  F O R C E D    M I N I    S P E E D
P U M P    X                        x x x %
```

- To ensure the minimum flow rate value accessible by the pump is that set by the parameters P240.7 once more, go into the parameter, modify the value if necessary, and confirm with the OK key.

A change in the operating mode (HEATING/COOLING) also cancels the override function.

The values CONS (setpoint) and MOTOR will then be the same.

## 11.5.7  -  Boost mode :

- The control for the indoor pump (pump 1) is forced to boost mode max speed in HEATING mode if there is a HP cut-off and in COOLING mode if there is a frost protection cut-off.
- The pump output speed will always be between the values set in the parameters P240.7 and P240.8 in both Normal and Boost mode.

# 12 - WINTER PROTECTION

## 12.1 - Frost protection of pumps and heat exchangers while unit is off

This function protects the pump(s) and the heat exchanger(s) from freezing.

The heater and heat trace cable outputs are enabled only when P2 = air-to-water and reversible air-to-water.

P265 becomes visible if P2 = air-to-water and reversible air-to-water

### 12.1.1 - Use with pure water: If P52 ≥ its standard adjustment value based on the refrigerant type :

1) Heater control :
- If exchanger ambient temperature ≤ P220 or ambient temp. sensor fault and water inlet temperature≤ (P52 + 2) + all compressors off + pump off if P25 ≠ 0 → Heaters on.
- If ambient temperature sensor fault and water inlet temperature ≤ (P52 + 2) + all compressors off + pump off if P25 ≠ 0 → Heaters on.
- If exchanger ambient temperature > P220 + P222 or water inlet temperature ≥ (P52 + 2) + P222 or if a compressor or a pump is on if P25 ≠ 0 → Heaters off

2) Heat trace cable control :
- If outdoor temperature sensor ≤ P220 and water inlet temperature ≤ 20°C + all compressors off + pump off if P25 ≠ 0 → Heat trace cables on
- If outdoor temperature sensor fault and water inlet temperature ≤ 20°C + all compressors off + pump off if P25 ≠ 0 → Heat trace cables on
- If outdoor temperature > P220 + P222 or water inlet temperature ≥ 20°C + P222 or if a compressor or a pump is on → Heat trace cables off.

### 12.1.2 - Use with glycol/water mix: If P52 < its standard adjustment value based on the refrigerant type :

1) Heater control :
- If exchanger ambient temperature and water inlet temperature ≤ P52 + 2 K + all compressors off + pump off if P25 ≠ 0 → Heaters on.
- If exchanger ambient temp. sensor fault and water inlet temperature ≤ P52 + 2 K + all compressors off + pump off if P25 ≠ 0 → Heaters on.
- If exchanger ambient temperature P265 or water inlet temperature > P52 + 2 + P222 or if a compressor or a pump is on if P25 ≠ 0 → Heaters off.

2) Heat trace cable control :
- If outdoor temperature ≤ 0 and water inlet temperature ≤ 0°C + all compressors off + pump off if P25 ≠ 0 → Heaters on.
- If outdoor temperature sensor fault and water inlet temperature ≤ 0°C + all compressors off + pump off if P25 ≠ 0 → Heaters on.
- If outdoor temperature > 0 + P222 or water inlet temperature ≥ 0°C + P222 or if one compressor or a pump is on if P25 ≠ 0 → Heat trace cables off.

► **Output state displays :**

```
P 4 3 5    H E A T    T R A C E
                        O N
```

```
P 4 3 6    H E A T E R    R T I E
O U T P U T                      O N
```

### 12.1.3 - Controlling frost protection for partial recovery (desuperheater) or total recovery option :

```
P 2 9 . 1    H E A T    R E C O V .    E X C H .
F R O S T    P R O T E C T I O N      Y E S
```

Parameter visible only if P2 (unit type) = air-to-water or reversible air-to-water :

► **Default value :**
- No if P29 (total recovery) = No
- Yes if P29 = Yes
- If P29.1 = Yes and outdoor temperature ≤ P220: heat trace cables on
- If P29.1 = Yes and outdoor temperature sensor fault: heat trace cables on
- If P29.1 = Yes and outdoor temperature > P220 + P222: heat trace cables off.

The heat trace cables will be controlled by output 4 on terminal block J5 on additional board 1 (1-circuit cycle reversal). If P29.1 is set to 'Yes' and the link with additional board 1 is missing, a link fault should appear.

► **Output state displays :**

```
P 4 3 7    R E C O V E R Y    F R O S T
P R O T .    O U T P U T                 O N
```

## 12.2 - Water loop winter protection

► **In heating mode :**

This function is possible only if P142 = Yes, the automatic operation control input is open and the On/Off button on the console is set to 'On'.

In this case the function must maintain water inlet temperature on the heat exchanger at 30°C as soon as the outdoor temperature falls below 3°C (2 K differential).

The return temperature will be maintained at 30°C if the outdoor temperature sensor ever malfunctions.

► **In cooling mode :**

This function is possible only if P142 = Yes, the automatic operation control input is open and the On/Off button on the console is set to 'On'. In this case the pump is turned on if the outdoor temperature falls below P220 and shut off at P220 + P222.

The pump will be forced on if the outdoor temperature sensor ever malfunctions.

## 13.1 - Management of the compressor protections

### 13.1.1 - Short-cycle protection :

Information from compressor manufacturer:

Compressors are not allowed to start more than 12 times an hour (on/off time of 5 minutes and minimum of 3 minutes between starts).

The on time + off time will be adjustable via parameter P50.

The auxiliary heaters do not operate during short-cycle protection.

On power-up, the SCP = 0 minutes and the minimum off time = 3 minutes.

In test mode, the short-cycle protection is shunted. The compressor can start up immediately at the end of the pump start-up time delay

```
        S H O R T - C Y C L E   P R O T E C T I O N
S T A G E x   C I R x   x x m n x x s
```

```
S T A G E x   C I R C U I T x   A T
M I N .   S T O P       x x m n x x s
```

The information is displayed only if a call is made to turn on the stage while the time delay is counting down.

### 13.1.2 - Forced stop of compressors

This function prevents the compressor stages from operating individually.
It is enabled and disabled via the following parameters:
P230: On authorisation, stage 1 circuit 1
P231: On authorisation, stage 2 circuit 1
P232: On authorisation, stage 1 circuit 2
P233: On authorisation, stage 2 circuit 2

## 13.2 - Management of the time counters

The number of hours of operation in each mode (cooling and heating) can be viewed for each pump and each compressor stage.
The parameters are as follows :
P285: Heating mode runtime (in hours)
P286: Cooling mode runtime (in hours)
P287: Pump 1 runtime
P288: Pump 2 runtime
P311: Stage 1, circuit 1 runtime
P314: Stage 2, circuit 1 runtime
P341: Stage 1, circuit 2 runtime
P344: Stage 2, circuit 2 runtime
There are also monitoring counters: P289, P290, P308, P309, P310, P313, P322, P323, P324, P338, P339, P340, P343, P352, P353, and P354.

#### ► In heating mode (P285) :
The time delay increments if heating mode is on via the On/Off button and the automatic operation control input is closed or the winter protection is on with a control stage on.

#### ► In defrost mode (P285) :
These counters are visible if P285 is opened, Enter is pressed on the console and P159 = optimised.

The top line corresponds to the total runtime in heating mode (excluding defrosting). The second line corresponds to the total defrosting time.

These counters have been added in order to know the gain compared to frosting during a fixed period of time.

#### ► In cooling mode (P286) :
The time delay increments if cooling mode is on via the On/Off button and the automatic operation control input is closed or the winter protection is on with a control stage on.

## 13.3 - Management of compressor start-up

Applies only for units with several compressors and if the number of stages on circuit 1 ≠ 1 and the number of stages on circuit 2 ≠ 1.
Parameter P13 is visible only :
- If P3 (No. of circuits) = 1 and P4 (No. of stages on circuit 1) = 2
- If P3 (No. of circuits) = 2 and P4 (No. of stages on circuit 1) = 2 and P5 (No. of stages on circuit 2) = 2

### 13.3.1 - With balanced tandem compressors :

Before stages are turned on, the runtime of each stage is always checked so that the stage that has run the least is started first.

When only one of the two compressors on each circuit is running, it is turned off after 4 hours and the other compressor is turned on.

► **With 1 circuit and 1 stage :** No runtime balancing.

► **With 1 circuit and 2 stages :** The two stages on the circuit are balanced (during operation and at start-up).

► **With 2 circuits and 3 stages :** On circuit X, the first of the three stages to be turned on is the one that has run the least amount of time.

On circuit Y, the second stage to be turned on (circuit change) is the one that has run for the second-shortest time.

Then the third and last stage is started.

Then the fourth and last stage is turned on.

► **With 2 circuits and 4 stages :** On circuit X, the first of the four stages to be turned on is the one that has run the least amount of time.

On circuit Y, the second stage to be turned on (circuit change) is the one that has run for the second-shortest time.

The third stage to be turned on is the stage that has run for the third-shortest time.

Then the fourth and last stage is turned on.

This function must take into account:
- The stage restriction
- The short-cycle protection
- The authorisation for the stages to turn on
- Compressor faults

The compressors are turned off in sequence,

starting with the compressor that has run the longest.

### 13.3.2 - With unbalanced tandem compressors and partial-load control :

Partial-load control is enabled on water chillers equipped with scroll compressors with one or two refrigerating circuits with two or four control stages.

It makes it possible to manage up to six control stages using four compressor outputs.

On machines equipped with unbalanced tandem compressors, this type of control is particularly useful in obtaining the following breakdown:

If P3 (number of circuits) = 1 → 33%, 66%, 100%

If P3 = 2 → 16%, 33%, 50%, 66%, 83%, 100%

The stages must therefore be assigned on the compressor outputs

Motherboard
- Terminal 2 on terminal block J3, output of stage 1 on circuit 1 = most powerful stage on circuit 1
- Terminal 3 on terminal block J3, output of stage 2 on circuit 1 = most powerful stage on circuit 1

Additional board 2, circuit 2 function
- Terminal 2 on terminal block J3, output of stage 1 on circuit 2 = most powerful stage on circuit 2
- Terminal 3 on terminal block J3, output of stage 2 on circuit 2 = most powerful stage on circuit 2

► **With 1 circuit and 1 stage :** No partial-load operation

► **With 2 circuits and 3 stages :** No partial-load operation as the compressors are of the same size (LGN and LJA range). The compressor that has run the least is turned on first.

This function must take into account :
- The stage restriction,
- The short-cycle protection,
- The authorisation for the stages to turn on
- Compressor faults

■ **Compressor switching management :**

When only one of the two compressors on each circuit is running, it is turned off after 4 hours and the other compressor is turned on.

■ **Short-cycle protection management (SCP) :**
- Call for power :

If the only available stage is in SCP mode, the machine remains in its current state and SCP is indicated by the flashing LED on the console.

Before stages are turned on, the runtime of each stage is always checked so that the stage that has run the least is started first.

## 13.4 - Compressor stopping sequence :

This stopping sequence allows you to delay the end of the second stage (the smallest compressor in the case of unbalanced tandem compressors) in relation to the end of the first stage in a dual staged start under the following three circumstances :
- On automatic operation control
- Following a defrosting request.
- After the defrosting "output" status

The end of the second stage will be delayed by P09 seconds in the three cases listed above.

**CLARIFICATION :** For machines with two circuits and two stages on each circuit operating at 100%.

If a stopping sequence is requested (on automatic operation control or before and after the defrosting phase with an intertwined coil): compressors 1 & 3 stop --> P09 seconds time delay --> compressors 2 & 4 stop.

## 13.5 - Management of the reversing valves

The reversing valves are fitted on reversible units only.

They are managed by the following convention:
- In cooling mode: the reversing valves are supplied.
- In heating mode: the reversing valve are not supplied.

The supply to the reversing valves is cut off 30 minutes after the last stage on the corresponding circuit is turned off. This time delay becomes 30 seconds in test mode.

## 13.6 - Management of configurable output P111 :

The output between terminals 9-10 on terminal block J3 on the motherboard is configurable so that the customer can define its function.

**Max. power :** The NC contact informs the customer that the unit is running at full power (all compressors and all electric stages).

**Boiler :** The NC contact allows the customer to activate an auxiliary heater. This type of operating mode is described in section 21 "Management of the back-up boiler".

**Cooling/Heating :** The NC contact informs the customer of the heating operation of the unit. The NO contact informs the customer of the cooling operation of the unit.

Backup on all faults (on air-to-water machines only). The NC contact informs the customer that the machine is either not operating at full capacity (a compressor is off) or has been shut off following the detection of a fault. The machine will remain off until the fault is acknowledged with the **Reset** button.

► **Display :**

```
              M A C H I N E      O F F
F A U L T S    O R    L I M I T E R U R
```

- Unit fault output active
- General fault LED on console lit steady

To see which type fault caused the machine to be shut off, go to the fault memory.

List of faults and impairments that shut off the machine if P111 is set to 'backup on all faults':

- Pump fault
- Intermediate and final water flow fault
- Limiter on water outlet
- Intermediate and final water frost fault
- Limiter on refrigerant
- Intermediate and final frost fault on refrigerant
- Exchanger frosting fault
- Limiter on high pressure
- Intermediate and final high pressure control fault
- Manual high pressure fault
- Motor fault
- Limiter on discharge
- Intermediate and final discharge fault
- Intermediate and final low pressure fault
- Water inlet sensor fault
- Exchanger 1 or 2 water sensor fault
- Refrigerant sensor fault
- Discharge sensor fault
- Manifold water outlet sensor fault if control on outlet
- Sensor fault
- Excessively low outdoor temperature fault
- Electronic expansion valve fault
- Fan fault if P3 and P180 = 1
- Maximum superheat fault
- Minimum superheat fault
- Limiter on max. air during cooling
- Phase controller fault
- Suction sensor fault if P43 = Yes
- Excessively high outdoor temperature fault

These functions allow the machine to adjust itself to certain occasionally extreme operating conditions and thus avoid stops caused by faults.

## 14.1 - Self-adjusting function: water frost limit

► **Operation :**
- Before shutting down after a fault occurs, the unit reduces its power by turning off a stage (if there are two on the circuit), or by reducing the compressor to half speed. In the case of INVERTER units, they shut off if they are already running at half speed.
- The threshold is detected by the water outlet sensor at P52 + 0.8 K.
- The unit returns to normal operation at P52 + 2 K for 5 minutes and then the HP gradually rises to its set threshold (P181).
- This function operates on each circuit.

► **Display :**

```
C I R C . x   W A T E R   F R O S T   L I M
P O W E R   R E D U C .
```

Special case for machines with two circuits and a single evaporator :
- Before shutting down after a fault occurs, the unit reduces its power for minutes by turning off stages
- The threshold is detected by the water outlet sensor at P52 + 0.8
- Normal operation resumes when the water outlet temperature rises to a sufficient level by monitoring the temperature difference between the inlet and the outlet and the number of stages turned on.

## 14.2 - Self-adjusting function: refrigerant frost limit

► **Operation :**
Before shutting down after a fault occurs, the unit reduces its power by turning off a stage (if there are two on the circuit), or by reducing the compressor to half speed. The threshold is detected by the sensor placed on the freon pipe at the evaporator inlet at P52 - P53 + 2 K for 10 seconds. The unit returns to normal operation at P52 - P53 + 3.5 K and then the HP gradually rises to its set threshold (P181).

► **Display :**

```
C I R C . x   R E F R I G   F R O S T
P O W E R   R E D U C .
```

**Exception: P08 = "SWEP DOUBLE":**
The limit is detected by the saturation temperature (LP side), at P52 – P53 for 60 seconds if at least one control stage is in operation. Normal operation resumes when the saturation temperature (LP side) rises to a sufficient level.

► **Display :**

```
C X   E V A P   T . / F R E E Z E   L I M . X
P O W E R   R E D U C .
```

## 14.3 - Self-adjusting function: HP pressure limit

► **Operation :**
- Before shutting down after a fault occurs, the unit reduces its power by turning off a stage, or by slowing the compressor to 50 Hz, or by shutting off Inverter units for 30 minutes.
- The threshold is detected by the HP sensor at P54-P195 and returned to normal operation after 30 minutes.
- This time period becomes 30 seconds in test mode.

This function is turned on on both circuits at the same time.

► **Display :**

```
C I R C U I T   x   H P   L I M I T
P W R   R E D U C T I O N   x x m n
```

**Special case of Inverter machines in water heating mode :**

If the HP pressure ≥ P54 - P195, the controller *adjusts the control setpoint* so as not to push the compressors near their limits too often. If necessary, a coil defrosting cycle will be forced on.

**Cas particulier sur les machines eau/eau en production d'eau chaude :**

Normal operation of the machine turning on the compressor stages resumes if the high pressure and the water inlet temperature have dropped sufficiently in relation to the point at which load shedding was activated.

**Cas particulier sur les machines eau/eau en maitre esclave :**

The machine is in Fault mode for the first HP cut-off when a single compressor stage is in operation so that the slave machine can start up from the first HP cut-off in the master machine.

## 14.4  -  Self-adjusting function: discharge protection, circuit 1 or 2

► **Operation :**
- Before shutting down after a circuit fault occurs, the unit reduces its power for 30 minutes by turning off a stage.
- The threshold is detected by the discharge sensor at value P51 and the stage that was turned off is returned to normal operation after 30 minutes.
- This time period becomes 30 seconds in test mode.

► **Display :**

```
C I R C . X   D . T E M P   L I M I T
P W R   R E D U C T I O N   x x m n
```

**Special case for reversible machines in water heating mode :**

If the discharge circuit temperature ≥ P151, the controller adjusts the control setpoint so as not to push the compressors near their limits too often.

If necessary, a coil defrosting cycle will be forced on.

## 14.5  -  Self-adjusting function: minimum HP, circuit 1 or 2

► **Operation :**
- f the pressure measured by the HP sensor is ≤ P63 for water-to-water units, the controller lowers the circuit's power to avoid an excessive drop in LP. Normal operation is restored at P63 + 1b.

► **Display :**

```
C I R C . x   M I N .   H P   L I M .
P O W E R   R E D U C .
```

## 14.6  -  Self-adjusting function for high water return temperatures

► **Operation :**
- The water return temperature may be high as the installation warms up in cooling mode. This causes all the compressor stages to turn on one after the other and can result in HP cuts and unwanted voltage spikes.
- To prevent this, the controller limits the turning-on of the stages if the water inlet temperature on the heat exchanger is higher than P171 as long as the temperature does not drop below P171-5K.

► **Display :**

```
W A T E R   R E T U R N   T .   L I M I T
U N I T   P W R   R E D U C T I O N
```

# 15 - FAULT FUNCTIONS

## 15.1 - Water frost limit fault on circuits 1 and 2

► **Operation :**
- Should the self-adjusting function be insufficient, a fault will occur on the unit when the temperature measured on the heat exchanger water outlet is at P52 (measured for 15 seconds, or P52 – 1 K).

■ **Si moins de 3 arrêts en 24 heures sur ce défaut :**
- Corresponding circuit shut off.
- Circuit fault output off
- Frost protection fault relay on optional board in Off position
- Circuit fault LED on console **flashes**

► **Display :**

```
C I R C   X   H 2 O   F R O S T   F A U L T
X   C U T ( S )   I N   2 4 H   2 4 H
```

■ **If this fault causes more than 3 shutdowns in 24 hours :**
- Corresponding circuit shut off
- Fault output on
- Frost protection fault relay on optional board in On position
- Circuit fault LED on console lit **steady**
- Boiler on if P111 = Boiler and heating mode.
- Auxiliary heaters on if P22 = Yes and heating mode

► **Display :**

```
        C I R C U I T   X   O F F
        W A T E R   F R O S T   F A U L T
```

► **Saved in fault memory :**

```
    X . W A T E R   x   F R O S T   P R O T .
```

► **Resetting :**
- If the number of faults in 24 hours ≤ 3 → the fault is automatically acknowledged if the temperature rises back above P52 + 6 K.
- If the number of faults in 24 hours > 3 → the fault is acknowledged if the temperature rises back above P52 + 6 K and **Reset** is pressed on the console

## 15.2 - Refrigerant frost limit fault on circuits 1 and 2

Frost on the heat exchangers is detected in two ways on most machines.
- Detection method 1: sensors monitor for deviations in low pressure and in the water outlet temperature. Such deviations indicate that ice has started to form on the heat exchanger. There is no self-adjusting function; the risk of freezing is immediately handled as a fault.

Parameters P58 and P59 are used in this mode of detection. Therefore, the lower their values, the more the frost protection is sensitive.

► **Display :**

```
        C I R C U I T   X   O F F
        E X C H .   A N T I F R E Z E
```

This function can be turned off via parameter P115 in order to perform maintenance.
- Detection method 2: frost is detected by a freon sensor on the heat exchanger inlet :

```
C I R C   X   R E F   F R O S T   F A U L T
  X   C U T ( S )   I N   2 4 H
```

► **Operation :**
- Should the self-adjusting function be insufficient, a fault will occur on the unit when the temperature measured on the freon pipe at the heat exchanger inlet or the saturation temperature is at P52 - P53 (measured for 60 seconds).

■ **If this fault causes fewer than 3 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- Circuit fault output off
- Frost protection fault relay on optional board in Off position
- Circuit fault LED on console **flashes**

► **Display :**

```
        C I R C   X   R E F   F R O S T   F A U L T
        X   C U T ( S )   I N   2 4 H
```

■ **If this fault causes more than 3 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- Fault output on
- Frost protection fault relay on optional board in On position
- Circuit fault LED on console lit **steady**
- Boiler on if P111 = Boiler and heating mode.
- Auxiliary heaters if P22 = Yes + heating mode

► **Display :**

```
        C I R C U I T    X    O F F
R E F R I G .    F R O S T    F A U L T
```

► **Saved in fault memory :**

```
X . R E F R I G .   x   F R O S T    P R O T
```

■ **Resetting :**
- If the number of faults in 24 hours ≤ 3 → the fault is automatically acknowledged if the temperature rises back above P52 - P53 +10 K.
- If the number of faults in 24 hours > 3 → the fault is acknowledged if the temperature rises back above P52 - P53 +10 K and **Reset** is pressed on the console.

## 15.3 - HP pressure fault, circuits 1 and 2

► **Operation :**
- Information is sent by the pressure sensors on each circuit. This function prevents manual HP cuts during brief increases in HP during momentary blockages in the condenser.
- Should the self-adjusting function be insufficient, a fault will occur on the circuit when the pressure measured is at P54.

■ **If this fault causes fewer than 5 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- 30 min. time delay (in seconds in test mode).
- Fault output off
- Circuit x HP fault relay on optional board in Off position
- Circuit fault LED on console **flashes**.
- The number of faults over a 24 hour period is managed (P308 for circuit 1 and P338 for circuit 2).

► **Display :**

```
C I R x   H P   F A U L T   x x m n
  X   C U T ( S )   I N   2 4 H
```

■ **If this fault causes more than 5 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- Fault output off.
- Circuit x HP fault relay on optional board in On position.
- Circuit LED on console lit **steady**.

► **Display :**

```
        C I R C U I T    X    O F F
            H P    F A U L T
```

► **Saved in fault memory :**

```
X . C I R C U I T x   H P
```

► **Resetting :**
- If the number of faults in 24 hours ≤ 5 → the fault is acknowledged after 30 minutes.
- If the number of faults in 24 hours > 5 → the fault is acknowledged if **Reset** is pressed on the console

## 15.4 - Discharge temperature fault, circuit 1 or 2

► **Operation :**
- Information is sent by the sensors placed on the discharge pipes (one per control stage).
- The maximum discharge temperature limit is set by parameter P51 + 1 K in air conditioning and P51 for 1 minute in heat pump

■ **If this fault causes fewer than 5 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- 30 min. time delay (in seconds in test mode)
- Fault output off
- Circuit x discharge temperature fault relay on optional board in Off position
- Circuit fault LED on console **flashes**.

► **Display :**

```
D . T E M P     F A U L T     C x     x x m n
  X   C U T ( S )     I N     2 4 H
```

■ **If this fault causes more than 5 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- Fault output on
- Circuit x discharge temperature fault relay on optional board in On position
- Circuit fault LED on console lit **steady**

► **Display :**

```
      C I R C U I T     X     O F F
  D I S C H A R G E     F A U L T
```

► **Saved in fault memory :**

```
X - D I S C H . T .     C I R C U I T x
```

► **Resetting :**
- If the number of faults in 24 hours ≤ 5 → the fault is acknowledged after 30 minutes.
- If the number of faults in 24 hours > 5 → the fault is acknowledged if DISCH.T. ≤ P51 – 15°C and **Reset** is pressed on the console.

## 15.5  -  LP fault on circuit 1 or 2

► **Operation :**
- If the pressure measured by the LP pressure sensor is ≤ P55, the controller records an LP fault.
- This input is checked 2 minutes after the first stage on the circuit is turned on. It is also checked when power is shut off but ignored both during and 2 minutes after defrosting.
- Both of these time delays are maintained in test mode.

■ **If this fault causes fewer than 3 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- Fault output off
- Circuit x LP fault relay on optional board in Off position
- Circuit fault LED on console **flashes**

► **Display :**

```
  C I R C U I T     x     L P     F A U L T
  X   C U T ( S )     I N     2 4 H
```

■ **If this fault causes more than 3 shutdowns in 24 hours :**
- Corresponding circuit shut off.
- Fault output on
- Circuit x LP fault relay on optional board in On position
- Circuit fault LED on console lit **steady**

► **Display :**

```
      C I R C U I T     X     O F F
          L P     F A U L T P
```

► **Saved in fault memory :**

```
      X . C I R C U I T x     L P
```

► **Resetting :**
- If the number of faults in 24 hours ≤ 3 → the fault is automatically acknowledged if BP > P55 + 2b.
- If the number of faults in 24 hours > 3 → the fault is acknowledged if BP > P55 + 2b and **Reset** is pressed on the console.

If a fault occurs on the sensor on the open circuit, the fault is preceded in the fault memory by an LP fault.

**Special case for reversible machines and water chilling:**

 the fault threshold switches to P55+1 b and normal operation is restored if BP > P55 + 3 b.

**Special case for reversible machines and water heating:**

Defrosting is forced on when the LP is < P55 for 1 minute.

If defrosting is forced on 3 times in 1 hour, the circuit with a LP fault is turned off the fourth time the LP drops below P55.

### 15.6 - Management of superheat faults

The superheat temperature on the suction end of each circuit can be monitored by comparing the LP saturation temperature to the suction temperature.

This protection is enabled by setting P43 to 'Yes' (No by default). It protects the compressor(s) from excessively low or high superheat values.

If superheat protection = Yes → This function is turned on when at least the first control stage (per circuit) is on and 5 minutes after the first stage is turned on.

■ **Minimum superheat fault :**
- If the superheat value (P307 or P337) drops below the minimum superheat limit value (P44) for 1 minute, the circuit is shut off and the minimum superheat error message is displayed.
- The unit automatically restarts after 5 minutes (5 seconds in test mode).
- This function remains on in test mode.

► **Display :**

```
M I N    S U P E R H E A T    F A U L T    C X
X   C U T ( S )    I N    1 H
```

■ **If there are more than 3 cuts in 1 hour :**

The unit is turned off by the superheat protection. The **Reset** button must be pressed in order to restart the circuit.

► **Display :**

```
      C I R C U I T    X    O F F
M I N .    S U P E R H E A T    F A U L T
```

■ **Maximum superheat fault :**
- If the superheat value (P307 or P337) rises above the maximum superheat limit value (P45) for 1 minute and the evaporating temperature < 15°C, the circuit is shut off and the maximum superheat error message is displayed.
- This function is turned off during defrosting.
- The unit automatically restarts after 5 minutes (5 seconds in test mode).
- This function remains on in test mode.

► **Display :**

```
M A X    S U P E R H E A T    F A U L T    C X
X    C U T ( S )    I N    1 H
```

■ **If there are more than 3 cuts in 1 hour :**

The unit is turned off by the maximum superheat protection and the **Reset** button must be pressed in order to restart the circuit.

► **Display :**

```
      C I R C U I T    X    O F F
M A X .    S U P E R H E A T    F A U L T
```

► **If a permanent fault occurs :**
- Fault stored in memory in case of a mains power failure
- Fault saved in fault memory
- Relay in On position.

► **If a temporary fault occurs :**
- Fault not stored in memory if a mains power failure occurs
- Fault saved in fault memory
- The minimum or maximum superheat fault relay on the relay board is in the Off position
  During test mode, the time delays are counted down in seconds, not minutes.

► **Messages in the fault memory :**

```
C X    M I N .    O V E R H E A T

```

```
C X    M A X .    O V E R H E A T

```

## 16.1 - Main control in cooling and heating modes

■ **Definition and principle :**

The chilled water and hot water temperatures are measured and compared with the setpoint value. Depending on the result, the compressor stages are turned on or off. This check is performed on the heat exchanger's water outlet (water supply = PIDτ) or water inlet (water return).

### 16.1.1 - Operating mode selection (P119) :

- If P119 = 1 (Cooling)

Cooling only.
- If P119 = 2 (Heating)

Heating only
- If P119 = 3 (Cooling/Heating via console)

The operating mode can be changed only with the machine stopped automatic operation control input set to on, On/Off button).

The Heating/Cooling button will be disabled if it is pressed while the machine is running.
- If P119 = 4 (Cooling/Heating via on/off input)

The operating mode can be changed only with the machine stopped (automatic operation control input set to on, On/Off button).

Attempting to change the operating mode while the machine is running will result in a fault :
- Machine stopped.
- Machine fault relay in On position.
- General fault LED on.
- Initial operating mode LED flashes

```
MACHINE     OFF
OPERATING    MODE    CHANGE
```

■ **Automatic reset :**
- Either the machine changes its operating mode if the change is confirmed by pressing On/Off or if the automatic operation control input is open;
- Or it resumes its initial operating mode if the input is restored to its initial value.

■ **If P119 = 5, the machine switches between heating and cooling depending on the outdoor temperature :**
- This function is visible only if P2 = reversible air-to-water
- When this function is turned on, the minimum heating limit and the maximum cooling limit (depending on the outdoor temperature) are re-enabled and are set to the following values:
  • For a minimum air temperature of      -10°C if P7 ≠ INVERTER
                             -20°C if P7 = INVERTER
  • For a maximum air temperature of 46°C.

However, they can be disabled.

```
P136    MAX    AIR    TEMP.
AUTO    HEATING    MODE    - xx
```

```
P137    MIN    AIR    TEMP.
AUTO    COOLING    MODE    - xx
```
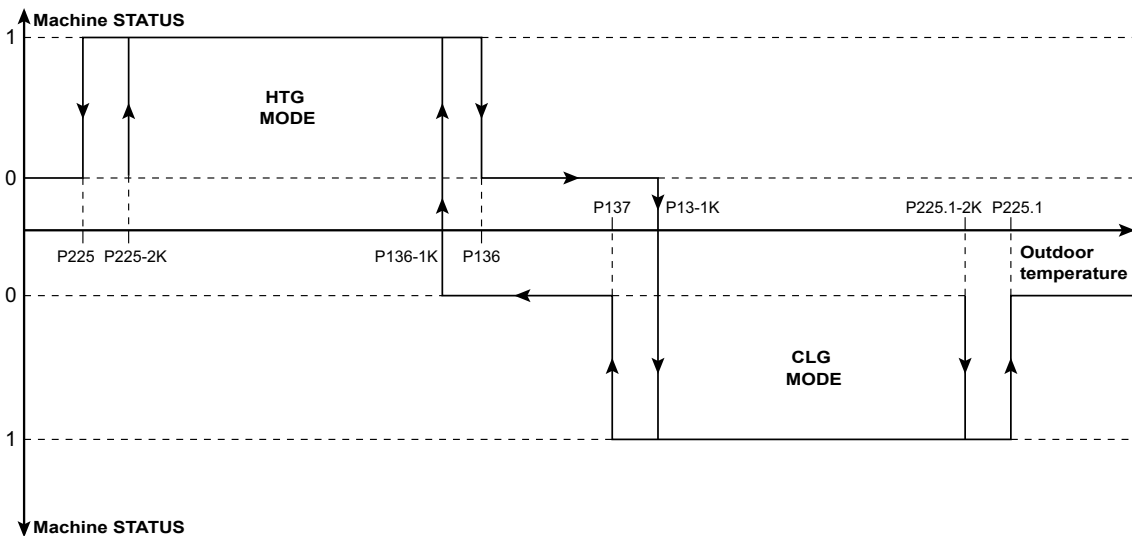
- When an operating mode reaches its end temperature setpoint in automatic mode, the following message is displayed until a mode is turned on :

```
D E A D    B A N D    A U T O
    H E A T I N G / C O O L I N G
```

The two heating and cooling LEDs flash while this message is displayed.

The pump is shut off in the deadband.

## 16.2 - Water temperature setpoint adjustment

The control mode is set using parameter P141.

Value 1: set to water return.

Value 2: set to water supply.

Value 3: set to water supply with compensation by water return.

Setpoint 2 allows a similar shift if control adjusted based on the outdoor air (If P127 = Yes or P131 = Yes) or allows the control mode to be changed if P54 (storage) = Yes.

## 16.3 - Adjustment of water temperature setpoint if P7 ≠ INVERTER

### 16.3.1 - Water return control (P141 = 1) :

The temperature used to adjust the setpoint is measured by:
- the inlet sensor on heat exchanger 1 if P2 = air-to-water or reversible air-to-water, if P2 = water-to-water and cooling mode,
- the hot water sensor if P2 = water-to-water and heating mode.

The difference between the control temperature the setpoint is compared to the stage differential and the interstage differential. Depending on the result, it will be necessary to either turn on an additional stage or to turn one off.

Each stage is turned on at 60-second intervals and the shut off at 1-second intervals.

■ **The related parameters are as follows:**
P143: Stage differential
P144: Interstage differential
P251: Control setpoint

► **In cooling mode :**
- A call is made for an additional stage if T > Setpoint + SD + (ISD × NSO)
- A call is made to stop a stage if T < Setpoint + (ISD × NSO-1)

Where :
T: Control temperature (measured).                    ISD: Interstage Differential (P144)
STP: Setpoint                                          NSO: Number of Stages On
SD: Stage Differential (P143)

Exemple : Two-stage water chiller

Parameter settings: STP = 10°C, SD = 2 K, ISD = 1.5 K

| Stage 1 | | Stage 2 | |
|---|---|---|---|
| On | Off | On | Off |
| 12 | 10 | 13,5 | 11,5 |
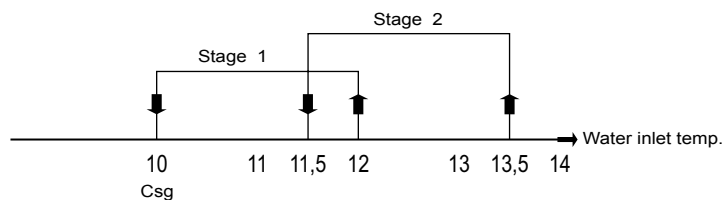


► **In heating mode :**
- A call is made for an additional stage if T < STP - SD - (ISD × NSO)
- A call is made to stop a stage if T > STP - (ISD × NSO-1)

Where :
T: Control temperature (measured).                    ISD: Interstage Differential (P144)
STP: Setpoint                                          NSO: Number of Stages On
SD: Stage Differential (P143)

Exemple : Two-stage water heater for a water temperature range of 35 40°C.

Parameter settings: STP = 40°C, SD = 2 K, ISD = 1.5 K.

| Stage 1 | | Stage 2 | |
|---|---|---|---|
| On | Off | On | Off |
| 38 | 40 | 36,5 | 38,5 |
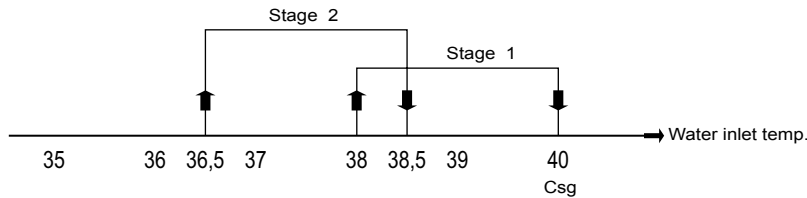


```
R E T U R N     T E M P . : − x x . x °
S E T P O I N T       : − x x . x °
```

## 16.3.2 - Water supply control (P141 = 2)

If heating mode is selected with a water-to-water unit, the setpoint is adjusted based on the temperature measured by the hot water supply sensor. If cooling mode is selected and P6 = 1, the setpoint is adjusted based on the temperature measured by the heat exchanger outlet sensor. If P6 = 2 in the same mode, it is adjusted based on the temperature measured by the manifold sensor.

The type of control used is PIDτ.

The temperature is measured periodically (τ) then compared to the setpoint and multiplied by a proportional coefficient (P) -- taking into account the difference between the measurement and the setpoint (D) and the change in the difference between the measurement and the setpoint (I) -- in order to approach the setpoint quickly.

Formula: $EC = P (M-C) t1 + \int (M-C)*I + [(M-C) t0 - (M-C) t1]*D$

M = Measurement, S = Setpoint.

When P146 = 0 and P147 = 0 (standard setting), the PIDτ function becomes PT (the Integral and Derivative functions are disabled).

■ **The related parameters are as follows :**
P251: Calculated setpoint
P121: Setpoint 1 in cooling mode
P123: Setpoint 1 in heating mode
P145: P coefficient
P146: I coefficient
P147: D coefficient
P148: T coefficient

► **In cooling mode :**

A call is made for an additional stage if:

DV > +1.0 K for the first stage and +0.5 K for the additional stages.

A call is made to turn off a stage if:

DV < −0.5 K for a stage and −1.0 K for the last stage.

Example: Two-stage unit with a 5°C setpoint, where D = 0 and I = 0.

| P | Stage 1 | Stage 2 | | Stage 1 |
|---|---|---|---|---|
| | Off | | On | |
| 0,5 | 3 | 4 | 6 | 7 |
| 1 | 4 | 4,5 | 5,5 | 6 |
| 1,5 | 4,33 | 4,66 | 5,33 | 5,66 |
| 2 | 4,5 | 4,75 | 5,25 | 5,5 |

► **In heating mode :**

A call is made for an additional stage if:

DV < −1.0 K for the first stage and -0.5 K for the additional stages.

A call is made to turn off a stage if:

DV > +0.5 K for a stage and +1.0 K for the last stage.

Example: Two-stage unit with a 45°C setpoint. I = 0 and D = 0.

| P | Stage 1 | Stage 2 | | Stage 1 |
|---|---|---|---|---|
| | Off | On | | |
| 0,5 | 43 | 44 | 46 | 47 |
| 1 | 44 | 44,5 | 45,5 | 46 |
| 1,5 | 44,34 | 44,66 | 45,33 | 45,66 |
| 2 | 44,5 | 44,75 | 45,25 | 45,9 |

```
S U P P L Y   T E M P . : - x x . x °
S E T P O I N T       : - x x . x °
```

### 16.3.3 - Adjusting the setpoint to the water supply with compensation on the water return (P141 = 3) :

► **Aim :**

Allow the control system to anticipate changes in load on the loop by monitoring for variations in the water inlet temperature.

► **Action :**

Adjusts the controller time delay.

► **Principle :**

The water return temperature is measured: $\theta t0$; evaporator in cooling mode, condenser in heating mode at time t0 then t0 + P151.

The calculated temperature variation [$\theta t1 - \theta t0$] is used to define the compensator coefficient.

The PID control polling time then becomes: remaining time × compensator coefficient.

Configuring the compensator coefficient: The compensator coefficient can be set to between 0.1 and 1. (Parameter P150)
- If the compensator coefficient = 1 → the function is disabled.
- If the water return temperature variation < 0.5°C → no compensation.

The compensator coefficient is maximum when the temperature variation = 10°C between each time $\propto$.

**Compensator coefficient diagram :**
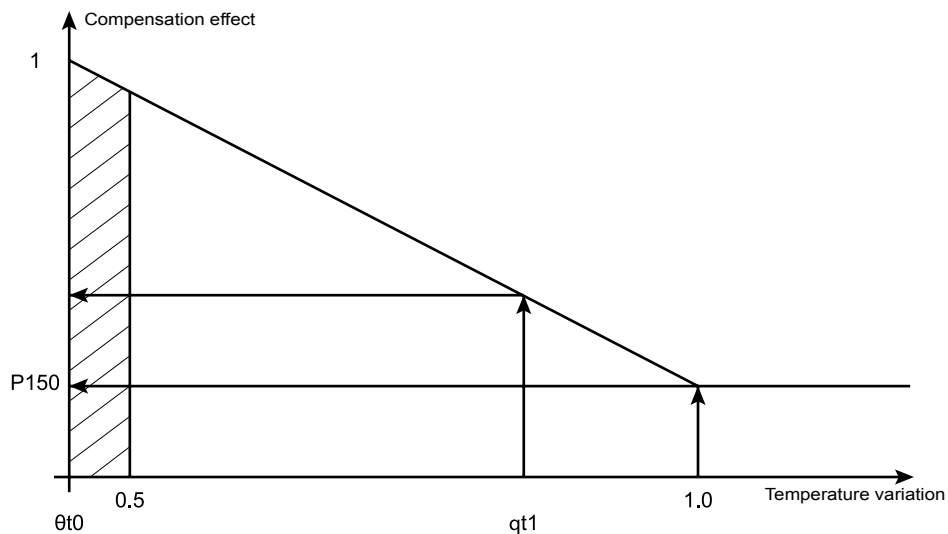


Example with a compensation factor of 0.5

Controller time delay P148 = 100 seconds

Compensation time P151 = 10 seconds
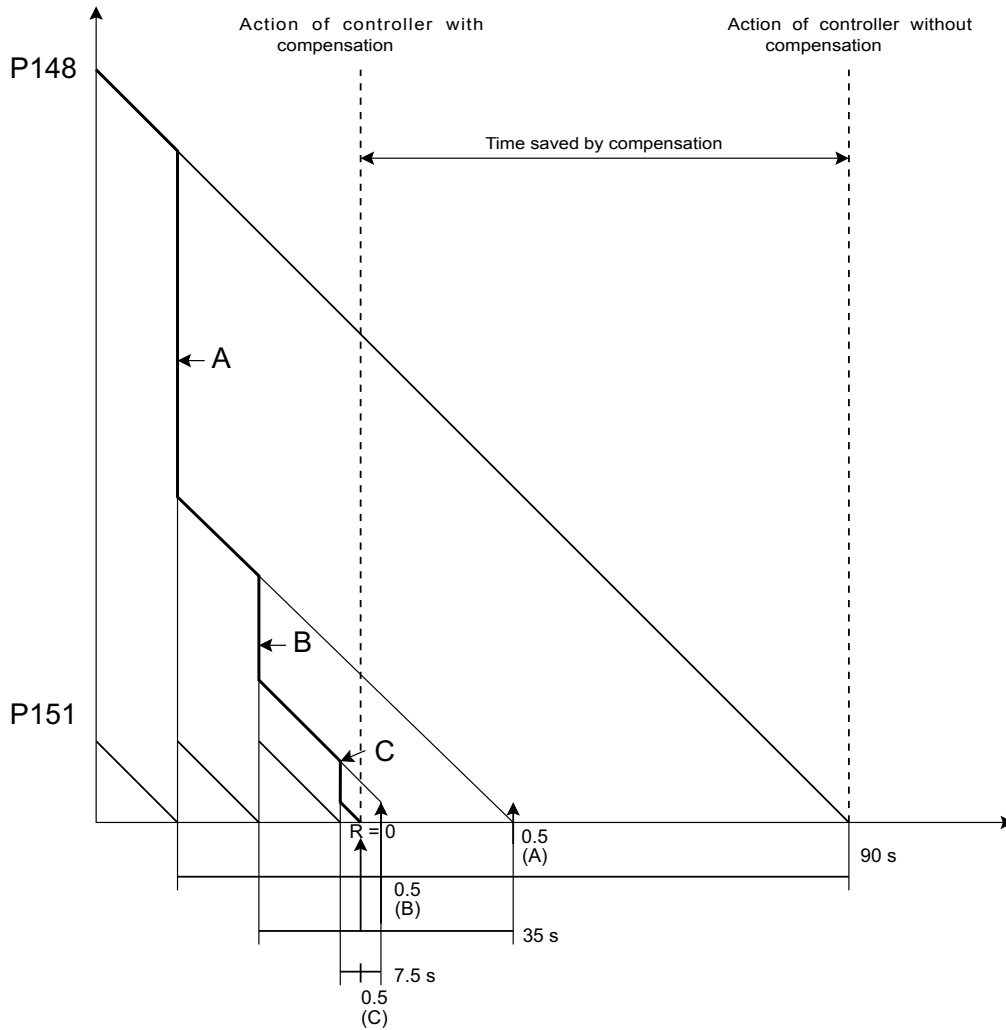
**A:** 1st compensation result. The controller's remaining time is (100 - 10 = 90 seconds) × 0.5 = 45 seconds.

**B:** 2nd compensation result. The controller's remaining time is (45 - 10 = 35 seconds) × 0.5 = 17.5 seconds

**C:** 3rd compensation result. The controller's remaining time is (17.5 – 10 = 7.5 seconds) × 0.5 = 3.75 seconds.

R = 0: Moment when the controller's time delay = 0.

The two time delays are resynchronised at this moment.

### 16.3.4 - The related parameters are as follows :

P145: P coefficient
P146: I coefficient
P147: D coefficient
P148: T coefficient (polling time)
P150: Minimum compensation setpoint
P151: Compensation time

```
S U P P L Y    T E M P . : - x x . x °
S E T P O I N T       : - x x . x °
```

### 16.4 - Adjustment of setpoint for the water supply and return temperatures (P141 = 1 or 2) if P7 = INVERTER

The difference between the control temperature the setpoint is compared to the stage differential and the interstage differential. Depending on the result, it will be necessary to either turn on the compressor and increase its speed or to decrease its speed and turn it off.

► **EIn cooling mode :**
- A call will be made to turn on the compressor if: T > STP + Stage differential
- The compressor rotation speed will be progressively increased if (STP + Stage differential) < T < (STP + Stage differential + Interstage differential)

Conversely, the compressor speed will be progressively decreased as the water return temperature approaches the setpoint value.
- The compressor will be shut off when T < STP

► **In heating mode :**
- A call will be made to turn on the compressor if T < STP + Stage differential
- The compressor rotation speed will be progressively increased if (STP - Stage differential - Interstage differential) < T < (STP - Stage differential)
- The compressor will be shut off as soon as T > STP

Conversely, the compressor speed will be progressively decreased as the water return temperature approaches the setpoint value

The temperature used to adjust the setpoint is measured by the sensor on the water outlet or inlet of the heat exchanger based on the value of P141.

► **In cooling mode :**
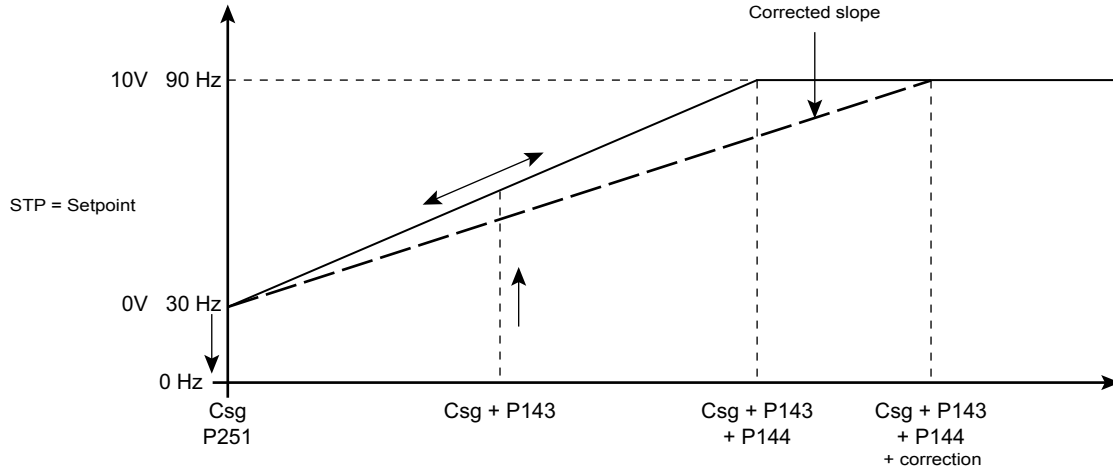


► **In heating mode :**
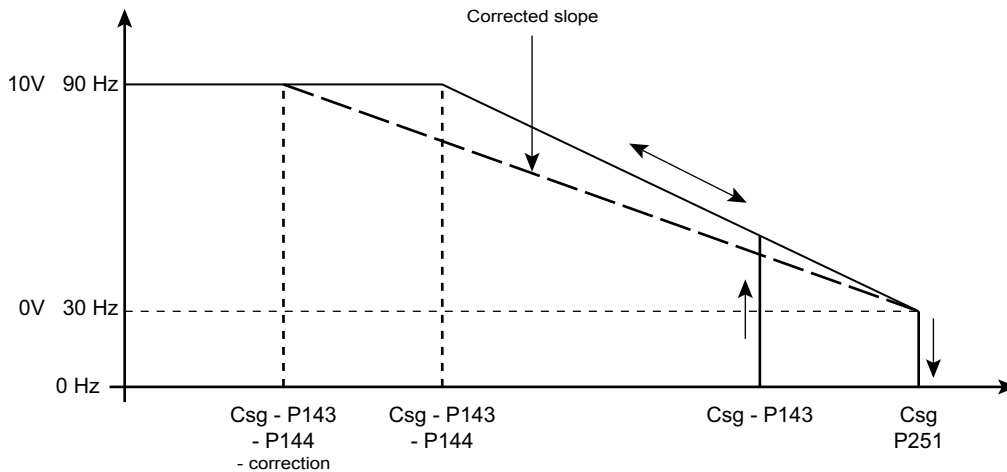


■ **Csg = STP**

► **Correction management:**

Correction is enabled if P7 = Inverter and if P141 = supply and return.

The correction factor is used to prevent the compressor from running during short-cycle protection and too-short runtimes caused by a lack of inertia in the system.

The correction factor On/Off button is set to '0' at power-up.

## 16.5 - Storage control

If P154 = No → The control mode remains standard and may be adjusted to the return or supply line depending on the value of P141 (control mode).

If P154 = Yes → Storage control is enabled. The control mode is managed based on the setpoint selected:
- If setpoint 1 is selected, the control remains standard and the mode (supply or return) is selected by P141 (control mode).
- If setpoint 2 is selected, the control automatically switches to 'return with storage' mode.

This type of control makes it possible to generate maximum capacity at a given time, often when electricity is cheapest.
- One after the other, the compressor stages turn on in 10-second intervals at value P122 + P155. When P122 is reached, the stages are shut off at the rate of one per second.
- The setpoint 2 LED lights up.
- All limits are maintained.



P122          P122 + P125          Heat exchanger water inlet temperature
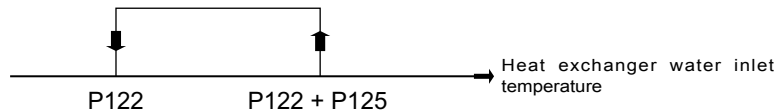
**NOTE : Control based on the outdoor temperature is not available if setpoint 2 is selected. It is, however, available with setpoint 1.**

This operating mode is available in cooling mode only

```
R E T U R N     T E M P . : - x x . x °
S E T P O I N T         : - x x . x °
```

## 16.6 - Control setpoint (P251) management

### 16.6.1 - If P142 (water loop winter protection) = No :

■ **If P120 (setpoint No.) = 1**

► **In cooling mode :**

If P127 cooling setpoint adjustment = f (outdoor temperature) = 0 or outdoor sensor fault; Control setpoint = P121

If P127 = 1 and no fault on outdoor sensor, setpoint f (outdoor temperature) is calculated using P121.

► **In heating mode :**

If P131 heating setpoint adjustment = f (outdoor temperature) = 0 or outdoor sensor fault; Control setpoint = P123

If P131 = 1 and no fault on outdoor sensor, setpoint f (outdoor temperature) is calculated using P123.

■ **Si P120 (Nbre de consigne) = 2 avec la sélection depuis le pupitre**

► **In cooling mode :**

If P127 cooling setpoint adjustment = f (outdoor temperature) = 0 or outdoor sensor fault; Control setpoint = P121 or P122 depending on selection on console

If P127 = 1 and no fault on outdoor sensor; Setpoint f (outdoor temperature) is calculated using P121 or P122 based on the selection made via the console.

► **In heating mode :**

If P131 heating setpoint adjustment = f (outdoor temperature) = 0 or outdoor sensor fault; Control setpoint = P123 or P124 depending on selection on console

If P131 = 1 and no fault on outdoor sensor; Setpoint f (outdoor temperature) is calculated using P123 or P124 based on the selection made via the console.

■ **If P120 (setpoint No.) = 2 selected via on/off input**

The on/off input corresponds to terminals 4-5 on terminal block J6 on the motherboard.

► **In cooling mode :**

If P127 cooling setpoint adjustment = f (outdoor temperature) = 0 or outdoor sensor fault; Control setpoint = P121 if on/off input open; P122 if on/off input closed.

If P127 = 1 and no fault on outdoor sensor:
- Setpoint f (outdoor temperature) is calculated using P121 if the on/off input is open.
- Setpoint f (outdoor temperature) is calculated using P122 if the on/off input is closed.

► **In heating mode :**

If P131 = 0 or outdoor sensor fault; control setpoint = P123 if on/off input open; P124 if on/off input closed.

If P131 heating setpoint adjustment = f (outdoor temperature) = 1 and no fault on outdoor sensor:
- Setpoint f (outdoor temperature) is calculated using P123 if the on/off input is open.
- Setpoint f (outdoor temperature) is calculated using P124 if the on/off input is closed.

### 16.6.2 - If P142 (water loop winter protection) = Yes and automatic operation control input open :

The control setpoint = 30°C.

### 16.6.3 - Management of the setpoint based on the outdoor temperature :

The water controls in COOLING and heating mode are activated by default (P127 and P131 are set to "Yes" by default).

Gradients are managed during operation with two setpoints in the following manner:

Depending on the outdoor temperature, the water control with setpoint 2 is parallel to the control set using setpoint 1. The shift is equal to the difference between the two setpoints (setpoint 1 – setpoint 2), see the graphs below.

**NOTE: Minimum setting of 5 K between start and end of setpoint drift.**

► **Slope adjustment in cooling mode :**
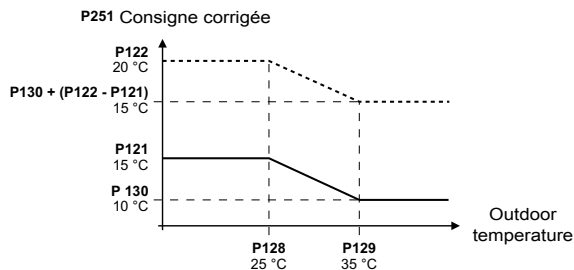The related parameters are as follows:
P121: Cooling setpoint 1
P122: Cooling setpoint 2
P128: Outdoor temperature at start of drift in cooling mode
P129: Outdoor temperature at end of drift in cooling mode
P130: Maximum setpoint at end of drift in cooling mode
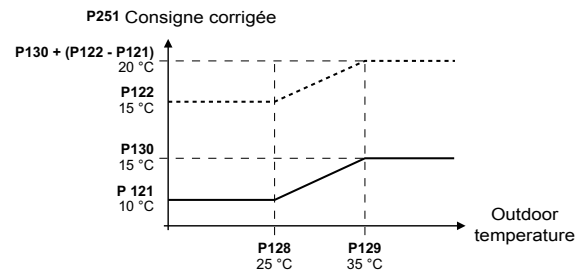


► **Slope adjustment in heating mode**
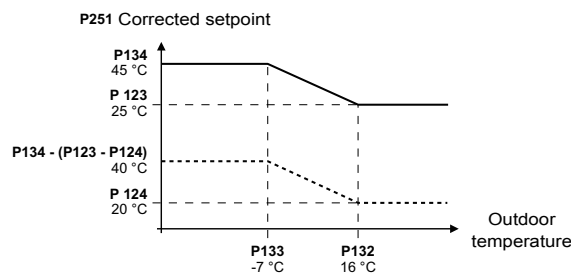The related parameters are as follows:
P123: heating setpoint 1
P124: heating setpoint 2
P132: Outdoor temperature at start of drift in heating mode
P133: Outdoor temperature at end of drift in heating mode
P134: Maximum setpoint at end of drift in heating mode



- The maximum setpoint calculated cannot be above 60 °C, regardless of the gradient setting.

## 16.7 - Automated self-regulating control

If the compressor runtime drops below 3 minutes, the stage differential is increased by 1.0 K for control on the return line (maximum value of 7.0 K). For control on the supply line, the calculated difference is changed by 1.0 K in order to delay the starting of the compressor. The maximum shift value is 7.0 K for the first stage and 6.5 K for the following stages.

The following message appears :

```
S E L F - R E G U L A T I N G
C O N T R O L     M O D E
```

If the compressor runtime rises above 5 minutes and the automated self-regulating control is on, the stage differential for the control on the return line is lowered by 1.0 K until the initial values are reached.

For control on the supply line, the calculated difference by 1.0 K is changed in order to hasten the starting of the compressor until the initial values are reached.

The function is disabled if the initial values are reached, if the unit is turned off (via On/Off button on console or automatic operation control on with winter water loop protection off), if a unit fault occurs, if parameter P141 (control mode) is changed and if a power failure occurs.

## 16.8 - Control for bus connection to the Drycooler controller in FREECOOLING mode

**The thermodynamic unit can control only the cooling return line** because the FREE COOLING module adjusts the cooling capacity using its own return line sensor and by retrieving the setpoint set by the cooling unit controller.

## 17.1 - Control during normal operation or on/off control

► **In heating mode :**

All the fan stages are turned on at maximum speed:
- Once a compressor stage is running on the unit when P11 = intertwined
- Once a compressor stage is running on the circuit when P11 = split.

► **In cooling mode :**
- Control mode is turned on as soon as a compressor stage is running on the circuit.

**A) On/Off, where P21 (variable speed control) = No, P10 = Propeller and P11 = Split**

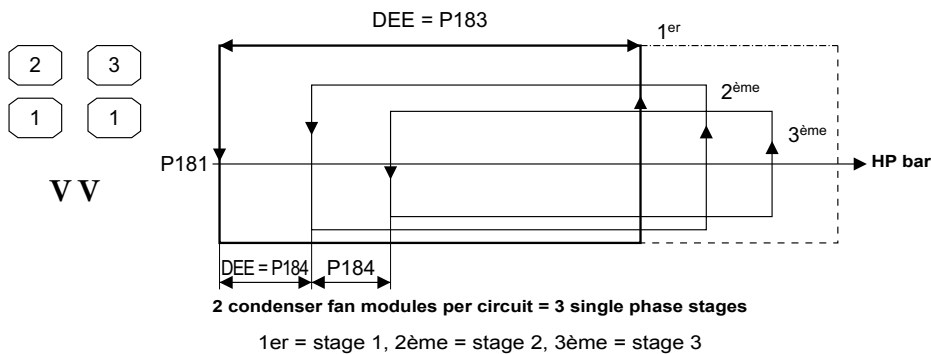The fans turn on once the compressor on the corresponding circuit starts up.

P180 = 2 or 3 corresponds to 2 or 3 fan stages per circuit.
- Fan 1 on circuit 1 will be controlled by stage 1, motherboard terminal block J3 (terminal 5)
- Fan 2 on circuit 1 will be controlled by stage 2, motherboard terminal block J3 (terminal 6)
- Fan 1 on circuit 2 will be controlled by stage 1 on circuit 2, ADD 2 board terminal block J3 (terminal 5)
- Fan 2 on circuit 2 will be controlled by stage 2 on circuit 2, ADD 2 board terminal block J3 (terminal 6)

1er = stage  1, 2ème = stage  2, DEE = Interstage differential



**1 condenser fan module per circuit = 2 single phase stages**
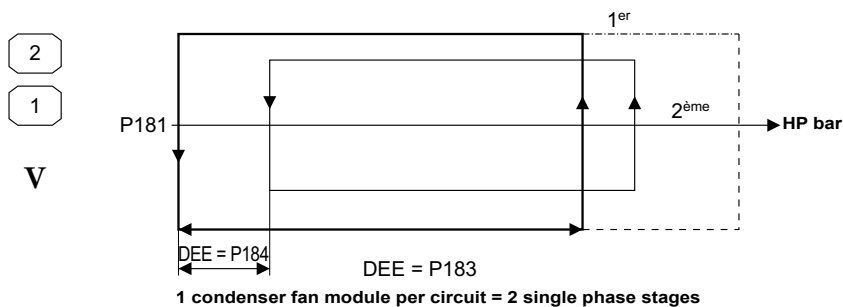
- The two fans 1 on circuit 1 will be controlled by stage 1 on circuit 1, motherboard terminal block J3 (terminal 5)
- Fan 2 on circuit 1 will be controlled by stage 2 on circuit 1, motherboard terminal block J3 (terminal 6)
- Fan 3 on circuit 1 will be controlled by stage 3 on circuit 1, ADD 2 board terminal block J3 (terminal 7)
- The two fans 1 on circuit 2 will be controlled by stage 1 on circuit 2, ADD 2 board terminal block J3 (terminal 5)
- Fan 2 on circuit 2 will be controlled by stage 2 on circuit 2, ADD 2 board terminal block J3 (terminal 6)
- Fan 3 on circuit 2 will be controlled by stage 3 on circuit 2 of the ADD 2 board terminal block J3 (terminal 8)



**2 condenser fan modules per circuit = 3 single phase stages**

1er = stage 1, 2ème = stage 2, 3ème = stage 3

**B) On/Off, where (P21 = No), P10 = propeller and P11 = intertwined**

- Control mode is turned on as soon as a compressor stage is running on the unit.
- If one of the two circuits is shut off (by a temporary or permanent fault, or control fault or other fault), the fan continues to operate using the pressure from the circuit this is still on.

When both refrigerating circuits are on, the fans are turned on and off by the circuit with the highest pressure.
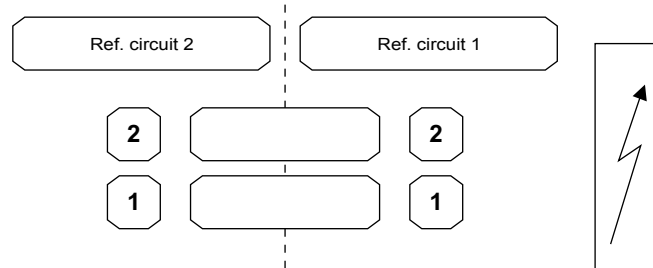- Fan 1 will be controlled by stage 1, motherboard terminal block J3 (terminal 5)
- Fan 2 will be controlled by stage 2, motherboard terminal block J3 (terminal 6)



1er = Stage 1, 2ème = Stage 2, 3ème = Stage 3, 4ème = Stage 4
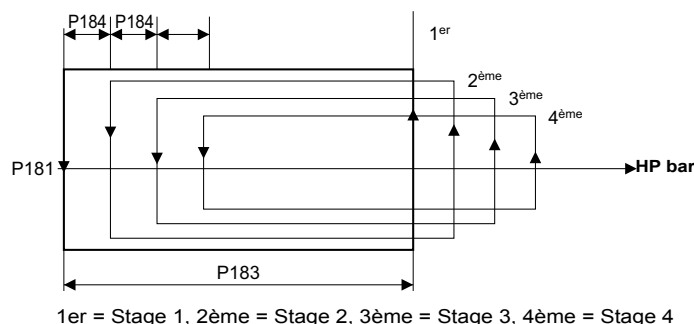
**C) On/Off, where (P21 = No), P10 = propeller and P11 = intertwined**

- Control mode is turned on as soon as a compressor stage is running on the unit.
- Stages 1 and 2 are controlled by each circuit.
- Common stage 1 is turned on as soon as the first control stage for circuits 1 and 2 is turned on.
- Common stage 3 is turned on as soon as the third control stage for circuits 1 and 2 is turned on.



- Fan 1 on circuit 1 will be controlled by stage 1, motherboard terminal block J3 (terminal 5)
- Fan 2 on circuit 1 will be controlled by stage 2, motherboard terminal block J3 (terminal 6)
- Fan 1 on circuit 2 will be controlled by stage 1 on circuit 2, ADD 2 board terminal block J3 (terminal 5)
- Fan 2 on circuit 2 will be controlled by stage 2 on circuit 2, ADD 2 board terminal block J3 (terminal 6)
- "Common" fan 1 will be controlled by common stage 1, ADD 2 board terminal block J3 (terminal 7)
- "Common" fan 3 will be controlled by common stage 3, ADD 2 board terminal block J3 (terminal 8)



1er = Stage 1, 2ème = Stage 2, 3ème = Stage 3
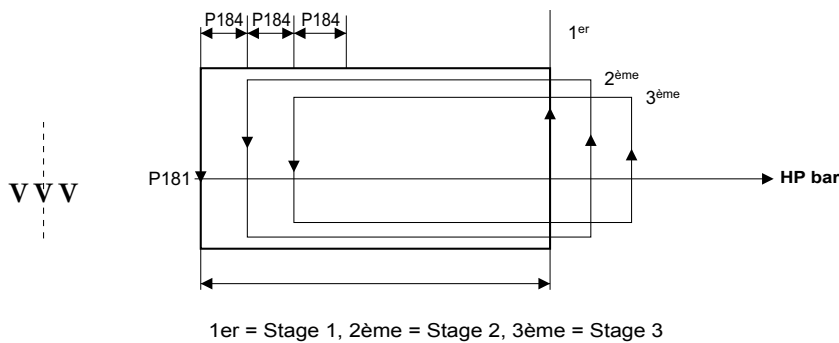
## 17.2 - Forced and self-adjusting control

**Case 1:** If HP > P54 – P195 – 0.5, the fans run at maximum speed for 30 minutes and the stages turn on at 1-second intervals. This 30-minute runtime applies in case 2 as well.
- If intertwined coils are used, the first fan is turned on by the sensor that reads the highest value.
- If split coils are used, the function is managed by each circuit.
- If mixed coils are used, fans 1 and 2 are managed by each circuit. In the case of common fans 1 and 3, they are turned on by the sensor that reads the highest value.

**Case 2:** Management of control stage 1 (case of propeller fans with on/off control).

If fan stage 1 turns on more than 5 times in 10 minutes while the other stages are off, increase the stage differential by 4.5 b to shut off the other stages. Normal control mode resumes (extra 4.5 b pressure eliminated and other stages allowed to turn on) if HP > P54 - P195 - P196 or if HP > P181 + P183 for 10 minutes.

If the common fan 1 stage (common to both circuits) turns on more than 5 times in 10 minutes and the other higher stages on both circuits are off, increase the stage differential by 4.5 b on both circuits.

The following message appears when P11 = split and mixed if stage 1 or 4 turns on more than 5 times in 10 minutes :

```
H P   P R E S S U R E   C O N T R O L
S T A G E   1   O N L Y
```

The following message appears when P11 = intertwined and mixed if stage 3 turns on more than 5 times in 10 minutes :

```
H P   P R E S S U R E   C O N T R O L
S T A G E   1   O N L Y
```

## 17.3 - Fan speed control

The speed of the fans is controlled by the HP pressure sensor and the 0-10 V outputs on the motherboard and additional board 2. This control functions in cooling mode only in order to reduce the sound level of the units. In heating mode, the fans run at maximum speed once a compressor stage turns on.

If P21 = 2 or 3 (speed control with energy or acoustic optimisation) the speed of fan 1 on each circuit will be controlled; the other fans will be adjusted to P180 by the on/off inputs.

The moment the fan starts in speed control mode and the moment the other stages are turned on must be separated by an interval of 3 seconds.

### 17.3.1 - Variable speed drive (VSD) :

In order for it to adjust the speed based on the 0-10 V signal, the variable speed drive selected must first be supplied electrically and informed of the direction of rotation.

#### ► VSD power supply :

Power will be supplied, via the power contactors, by the control for fan 1 on circuit 1 (terminal 5 on terminal block J3), the control for fan 1 on circuit 2 (terminal 6 on terminal block J3 on additional card 2) and the control for fan 1 common to both circuits (terminal 5 on terminal block J3 on additional board 2).

In both **heating** and **cooling** mode, these three outputs must be powered as soon as the unit is turned on by pressing the On/Off button on the console or by turning off the Automatic Operation control. They will shut off after the Automatic Operation control is turned on or if the On/Off button on the console is pressed.

#### ► Authorisation of VSD operation :

External VSDs (ALTIVAR) will not be controlled by the software. Instead, they will be controlled electromechanically via two auxiliary relays on the KGs of the compressors (as soon as a compressor turns on, the associated relay sends the information to the VSD). As a result, running the VSDs without the compressors will not be possible.

In the case of electronically commutated fans (built-in variable speed drive), authorisation for the VSDs to turn on is given by the board when the fan contactor outputs are in the On position (no relay needed).

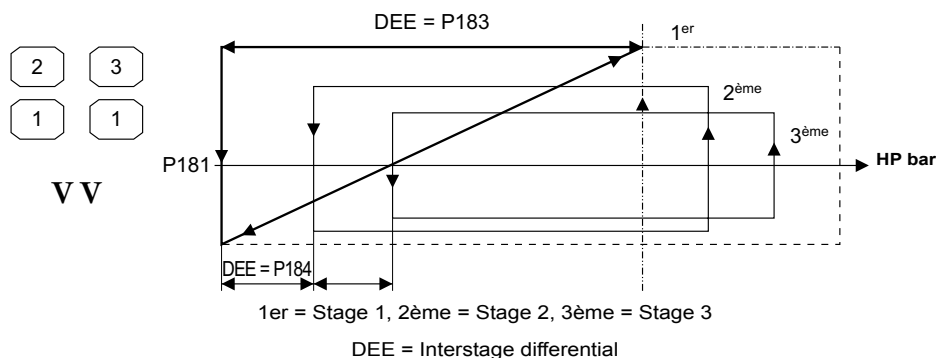### 17.3.2 - Fan speed control with split coils (P11 = split) :

This configuration requires a variable speed drive for each circuit.
- 0-10 V output, stage 1, circuit 1, terminals 1-2 on motherboard terminal block J2
- 0-10 V output, stage 1, circuit 2, terminals 2-1 on terminal block J6 of additional board 2
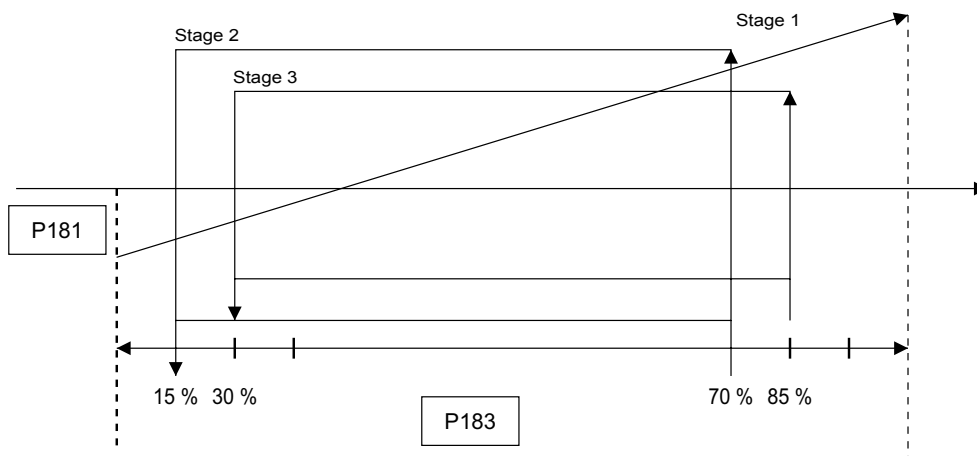
Speed control mode is turned on as soon as the circuit is on.

#### a) P21 = 2 with acoustic optimisation

1 condenser fan module per circuit = 1 stage (1 fan) with speed control + 1 single-speed stage (same as standard)

2 condenser fan modules per circuit = 1 stage (2 fans) with speed control + 2 single-speed stages (same as standard)



1er = Stage 1, 2ème = Stage 2, 3ème = Stage 3

DEE = Interstage differential

#### b) P21 = 3 with energy optimisation (Available only if P42 = ALCO or VCM)



If P180 = 3 stages: 15-30% and 70-85% for stages 2-3
If P180 = 2 stages: 20 and 80% for stage 2
The values of P181 and P183 must be set.
P181 = 17.8 b for R410A, 12 b for R407C, 11.0 b for R22 and 6.8 b for R134a
P183 = 7.8 b for R410A or 5.5 b for R407C, 5.0 b for R22 and 3.8 b for R134a
In this case parameters P181 and P183 can be adjusted (resolution of 0.1) and parameter P184 becomes needless and therefore inaccessible.
The minimum value of P181 becomes 16 bar for R410A.
The minimum value of P183 becomes 8 bar for R410A.

---

### 17.3.3 - Fan speed control with intertwined coils (P11 = intertwined):

Speed control mode is turned on as soon as the unit is on.
With 1 circuit running: speed is controlled by the circuit's HP sensor.
With 2 circuits running: the speed is controlled by the sensor with the highest pressure.

**a) P21 = 2 with acoustic optimisation**



**b) P21 = 3 with energy optimisation (Available only if P42 = ALCO or VCM)**



If P180 = 4 stages: 10-25 40% and 60-75-90% for stages 2-3-4
If P180 = 3 stages: 15-30% and 70-85% for stages 2-3
If P180 = 2 stages: 20 and 80% for stage 2
The values of P181 and P183 must be set.
P181 = 17.8 b for R410A, 12 b for R407C, 11 b for R22 and 6.8 for R134a
P183 = 7.8b for R410A or 5.5b for R407C, 5.0b for R22 and 3.8 b for R134a

In this case parameters P181 and P183 can be adjusted (resolution of 0.1) and parameter P184 becomes needless and therefore inaccessible.
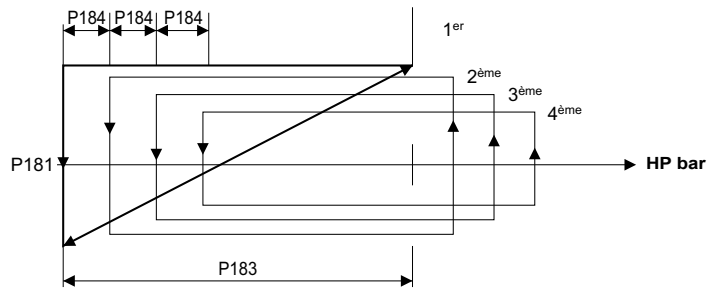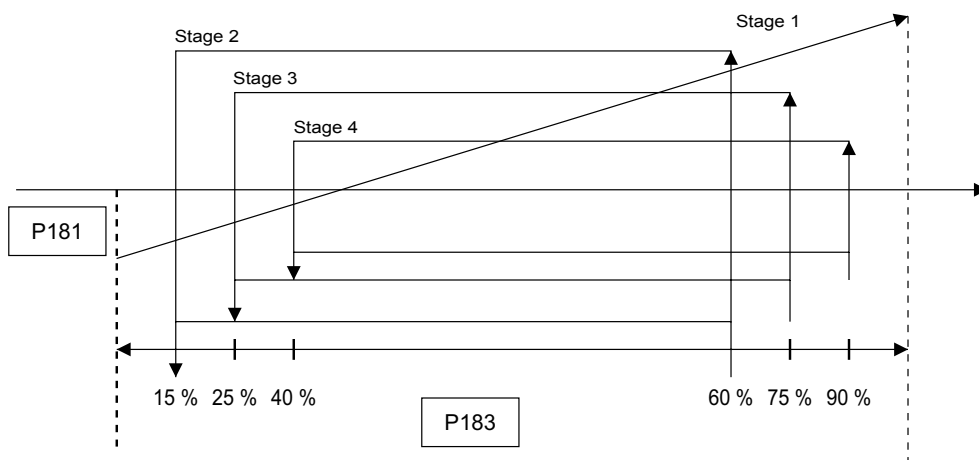- The minimum value of P181 becomes 16 bar for R410A.
- The minimum value of P183 becomes 8 bar for R410A.

### 17.3.4 - Fan speed control with mixed coils (P11 = mixed) :

- 0-10 V output, stage 1, circuit 1, terminals 1-2 on motherboard terminal block J2
- 0-10 V output, stage 1, circuit 2, terminals 2-1 on terminal block J6 of additional board 2
- 0-10 V output, stage 1 common to circuits 1 and 2, terminals 2-3 of terminal block J6 of additional boards 2
- Common stage 1 is controlled by the highest value of the two signals on circuits 1 and 2
- Common stage 3 is turned on as soon as the third control stage for circuits 1 and 2 is turned on.

**a) P21 = 2 with acoustic optimisation**

**b) P21 = 3 with energy optimisation (Available only if P42 = ALCO or VCM)**

If P180 = 3 stages: 15-30% and 70-85% for stages 2-3
If P180 = 2 stages: 20 and 80% for stage 2
The values of P181 and P183 must be set.
P181 = 17.8 b for R410A, 12 b for R407C, 11.0 b for R22 and 6.8 b for R134a
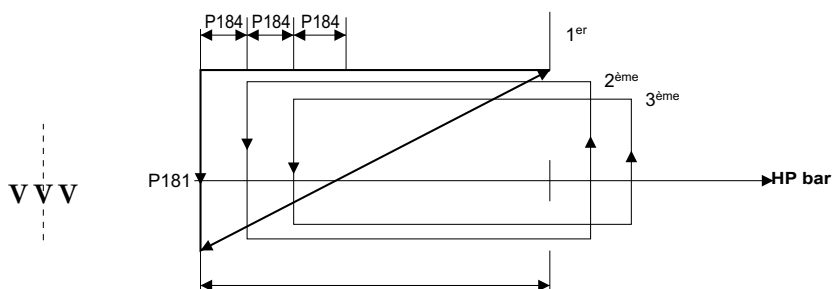P183 =7.8 b if R410A or 5.5 b if R407C, 5.0 b if R22 and 3.8 b if R134a
In this case parameters P181 and P183 can be adjusted (resolution of 0.1) and parameter P184 becomes needless and therefore inaccessible.
- The minimum value of P181 becomes 16 bar for R410A.
- The minimum value of P183 becomes 8 bar for R410A.
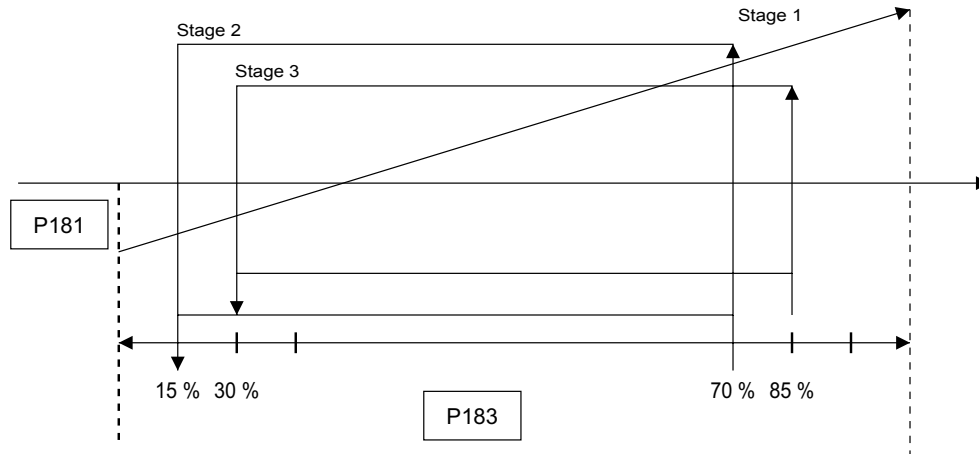


## 17.3.5 - Fan speed control if P7 = INVERTER :

- The rotation speed is limited by parameter P192 (default value of 7.8 V). It can be set at between 5 and 10 V (resolution of 0.1 V).
- If P7 = INVERTER, the standard setting value of P181 becomes 13.4 bar as long as LP < 8.3 bar.
- If the LP rises above this value, the HP control setpoint is becomes equal to P181 + 4.4 bar.
- The HP control setpoint returns to P181 when the LP drops to < 7.8 bar.
- The maximum shift in the HP STP is 33.9 bar (recovery function included).

## 17.3.6 - Forced control of variable-speed fans :

The condensing pressure control can be forced in cooling mode in two cases:
- If HP > P54 – P195 – 0.5, the fans run at maximum speed for 30 minutes and the stages turn on at 3-second intervals.
- During defrosting in order to defrost the coils as quickly as possible. The HP will have to be as high as possible without turning on the protections.
- Parameter P166 (3 by default) is used to adjust the fan control.
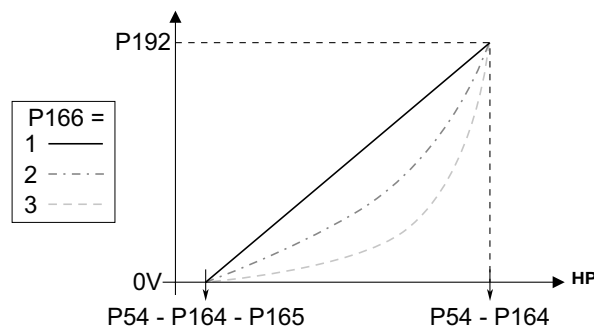


Adjustment adopted during defrosting (once the cycle has been reversed by the reversing valve). The other fans are off during this time.

## 17.3.7 - Speed control of centrifugal fans (P10 = Centrifugal) :

P21 is hidden. This configuration is not available. The HP is controlled via the air blades. Refer to the section on controlling the air blades.

### 17.3.8 - Speed control of electronically commutated pressure fans (P10 = Pressure) :

This function provides the same functionalities as the variable speed drive described above with the added possibility of allowing the customer to limit the speed of the fans in order to lower the sound level or best adjust the available pressure.

This function is enabled when:

P10 = pressure P2 = Air-to-Water or Reversible Air-to-Water,

P180 (No. of HP control stages) = 1 = hidden,

P21 (speed control) = 2 hidden,

P181 and P183 = visible and P11 (coil type) visible.

In cooling mode, the speed is controlled by the HP pressure sensor and the 0-10 V outputs on the main board. This applies in cooling mode only. In heating mode, the fans run at maximum speed once a compressor stage turns on.

If several electronically controlled fans are on the same circuit, the 0-10 V supplies must be wired in series (two maximum).

The speed of the fans is limited by parameter P192 which is set by default to 8 V but may be adjusted to between 5 and 10 V in increments of 0.5 V.

Control:

Regardless of the value of P11, the control system is on as soon as a compressor stage is on.
- One circuit used: The fans are controlled in response to the high pressure on the circuit.
- Two circuits used: The fans are controlled in response to the highest pressure read by either sensor on the two circuits.

The fans are controlled simultaneously
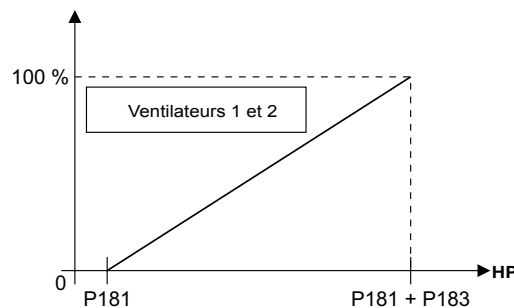


The cases for forced control and control during defrosting are the same as those described in section **17.3.5.**

## 17.4 - Low Noise control (single-fan units only)

This function is available only on single-fan units, i.e. if P180 = 1. To see if the function is enabled, go to parameter P191 (Low Noise operation), which is set to 'Yes' by default. Visible only if P180 = 1.
This function disappears if a variable speed drive is used (P21 = Yes).
The fan must be shut off when switching from LS to HS and back. To do so, open contact J3, terminal 2 before actuating J3, terminal 3.
LS is obtained by energising fan relay 1 (terminal 2 on terminal block J3) and fan relay 2 remains open.
HS is obtained by energising fan relay 2 (terminal 3 on terminal block J3) and fan relay 1 remains open.

► **In cooling mode :**

■ **If P191 (LOW NOISE) = Yes :**

As long as HP < P54 - P195 – 3 b, low speed must remain on. When the HP rises above this value, shift to high speed (cut off terminal 2, terminal block J3; cut off terminal 3 on terminal block J3; restore terminal 2 on terminal block J3). LS is resumed when HP < P54 - P195 – 7 b.

■ **If P191 (LOW NOISE) = No :**

The system must be switched to high speed very quickly in order to deliver a maximum amount of power to the customer.
- If HP > P181 + P183, turn on LS
- If HP > P181 + P183 + P184, turn on HS

**Forced and self-adjusting control :**

**Case1:** On if P64 (optimised frost protection) = No
- If HP > P54 - P195 - 0.5, the fans are already running at HS unless the frost limiter on the water or refrigerant line is on. In this case, remain at LS and let the HP protection do its job.

**Case2:** Regardless of the value of P191
- If the fan turns on more than 5 times in 10 minutes, increase the stage differential by 4.5 b. Normal control mode resumes (extra 4.5 b pressure eliminated) if HP > P54 - P195 - P196 or if HP > P181 + P183 for 10 minutes.

The following message appears when P180 = 1 and stage 1 turns on more than 5 times in 10 minutes :

```
H P    P R E S S U R E    C O N T R O L
H P    S H I F T E D
```

► **In heating mode :**

The fan runs at HS.

# 17 - CONTROL OF CONDENSING PRESSURE FOR AIR-COOLED UNITS

## 17.5 - Total recovery control

The total recovery function and its associated parameters (P29 and P193) are accessible only if P2 = air-to-water:

| P 2 9 | T O T A L | | |
|---|---|---|---|
| R E C O V E R Y | | | N O |

- P193 visible If P29 = Yes

| P 1 9 3 | H P | S T P | S H I F T |
|---|---|---|---|
| I N | R E C O V E R Y | | |

Recovery input (10/11 on J6) will be used by the customer to define the operating mode: STANDARD or RECOVERY

**Two operating modes are possible if parameter P29 = Yes :**

A) Contact J6 - 10/11 on motherboard open without recovery :
- Standard fans controlled based on the values of P10, P20 and P21

B) Contact J6 - 10/11 motherboard closed with recovery:
- The turning-on of the fans is shifted using parameter P193 → The HP control setpoint then becomes equal to P181 + P193
- The control logic will then be identical to standard control using the values of P10, P20 and P21.

## 17.6 - Management of the air blades if P10 = Centrifugal

This "all season" option will be offered for air-to-water units with centrifugal fans.

■ **If P20 = Yes :**

► **Ø Heating mode :**

The centrifugal fan starts up 3 seconds after the compressor, regardless of the HP1 and HP2 values.

The fan is turned off during defrosting. The air blades are always open.

► **Ø Cooling mode :**

The air blades are controlled by the 0-10 V output (terminals 1-2 on terminal block J2 on motherboard) as shown below :
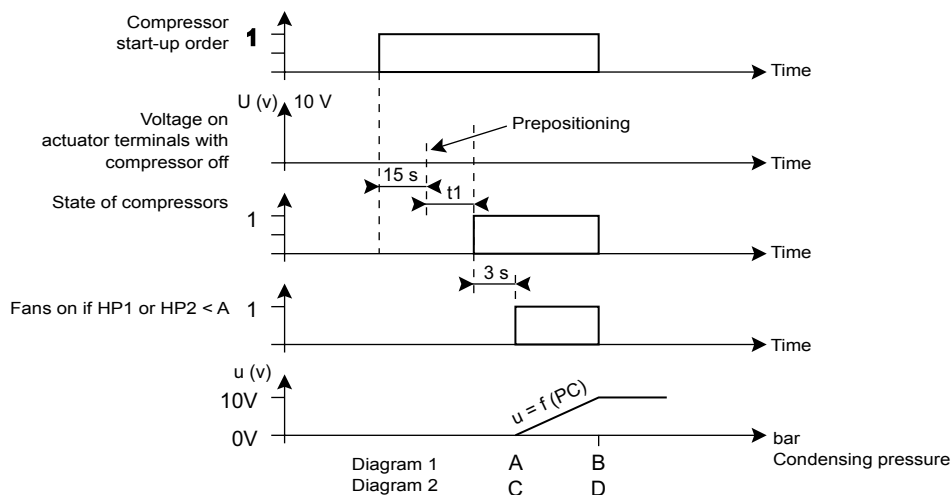




| | Diagram 1 | | Diagram 2 | |
|---|---|---|---|---|
| | Value A | Value B | Value C | Value D |
| R22/R407C | 12b | 16b | 19b | 23b |
| R134a | 7,5b | 10,5b | 12,5b | 15,5b |
| R404a | 14b | 18b | 20b | 23b |
| R410a | 20b | 25b | 30b | 37b |

# 17 - CONTROL OF CONDENSING PRESSURE FOR AIR-COOLED UNITS

⇨ **One-circuit unit** (or fault on one circuit of a two-circuit unit) :

Adjust as shown in diagram 1.

⇨ **Two-circuit unit** and if the compressor on circuit 2 running for at least 5 seconds :
- If HP1 or HP2 < A → Control shown in diagram 1 and taking into account the sensor with the lowest pressure.
- If A < (HP1 and HP2) < C → Control shown in diagram 1 and taking into account the sensor with the lowest pressure.
- If HP1 or HP2 > C → Control shown in diagram 2 and comparison of:
  • Voltage U1 = Diagram 1 (lowest HP)
  • Voltage U2= Diagram 2 (highest HP)

And voltage U adjusted to highest value of U1 and U2.
- If HP1 and HP2 > C → Control shown in diagram 1 and taking into account the sensor with the highest pressure.

■ **P20 = No :**

Output = 0 V

## 18.1 - Operation with a two-way valve

If municipal wastewater is used to cool the condenser, we recommend installing the two-way valve so as to be able to set the condensing pressure to a value that will ensure correct operation of the unit and save on cooling water.

Set P26 to 'two-way valve'. The valve will open linearly from P197 to P198 based on the high pressure.

For more details, refer to the instruction manual supplied with the kit. To obtain high cooling capacity, set P197 and P198 to their lowest values. To save on water, set P197 and P198 to their highest values.

These adjustments depend solely on your installation. It is essential that you ensure the correct operation of your unit.

## 18.2 - Operation with a three-way valve

We recommend installing our three-way valve kit if our units are used with cooling towers. This valve will allow you to adjust the condensing pressure better and thus optimise your unit's performance. Set P26 to 'three-way valve'. The valve will open linearly from P197 to P198 based on the water return temperature. For more details, refer to the instruction manual supplied with the kit.

# 19 - RESTRICTION OF OPERATION OF THE MACHINES BASED ON THE OUTDOOR TEMPERATURE

## 19.1 - Restriction to the minimum air temperature in heating mode

```
P 2 2 5   M I N .   A I R     T E M P .     I N
I N   H E A T I N G   M O D E   – x x °
```

- This parameter can be set to between -25°C and 5°C in 1°C increments.
- Default setting: -10°C if P119 ≠ Cooling where P2 = 3 reversible air-to-water and P7 ≠ INVERTER  20°C if P119 ≠ Cooling where P2 = 3 reversible air-to-water and P7 = INVERTER

This function is disabled if at least one circuit is being defrosted.

The thermodynamic unit shuts off once the outdoor temperature ≤ P225. The auxiliary heaters or the boiler are substituted for the thermodynamic control stages. The (thermodynamic) unit restarts once the temperature rises to above P225 + 2K.

■ **Display in heating mode and if auxiliary electric heater P22 = No and P111 ≠ Boiler :**

```
M A C H I N E   O F F   I N   H T G   M O D E
    O U T   T E M P .   T O O   L O W
```

► **If a fault occurs :**
- Fault stored in memory in case of a mains power failure
- Fault saved in fault memory
- Relay in On position
- Unit fault LED lit steady.

■ **Display in heating mode and if auxiliary electric heater P22 = Yes :**

```
E L E C   A U X   C T R L       E C
    O U T   T E M P .   T O O   L O W
```

► **If a fault occurs :**
- Fault not stored in memory if a mains power failure occurs
- Fault not saved in memory if a mains power failure occurs
- Fault relay in Off position
- Unit fault LED off.

■ **Display in heating mode and if P111 = Boiler :**

```
B O I L E R   C O N T R O L
    O U T   T E M P .   T O O   L O W
```

► **If a fault occurs :**
- Fault not stored in memory if a mains power failure occurs
- Fault not saved in memory if a mains power failure occurs
- Fault relay in Off position
- Unit fault LED off.

■ **To disable this function :**
- Simply press the - button until the maximum value of the parameter appears. Below this value, the following message appears :

```
P 2 2 5   M I N .   A I R   T E M P .
I N   H T G   M O D E   D I S A B L E D
```

- To turn off the function, simply press **Enter**.
- To re-enable it, simply enter a value of between -25°C and +5°C and press **Enter**.

## 19.2 - Restriction to the maximum air temperature in cooling mode

Visible only if P2 = air-to-water or reversible air-to-water and cooling mode

```
P 2 2 5 . 1   M A X .   A I R   T E M P .
I N   C L G   M O D E       + x x °
```

- This parameter can be set to between 35°C and 50°C in 1°C increments.
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≥ P225.1.

The unit restarts once the temperature rises back to above P225.1- 2K.

► **Fault message :**

```
M A C H I N E   O F F   I N   C L G   M O D E
    O U T   T E M P .   T O O   H I G H
```

# 19 - RESTRICTION OF OPERATION OF THE MACHINES BASED ON THE OUTDOOR TEMPERATURE

► **If a fault occurs :**
- Fault stored in memory in case of a mains power failure
- Fault saved in fault memory
- Relay in On position
- Unit fault LED lit steady.

■ **To disable this function :**
- Simply press the + button until the maximum value of the parameter appears. Above this value, the following message appears :

```
P 2 2 5 . 1    M A X .    A I R    T E M P .
I N    C L G    M O D E    D I S A B L E D
```

- To turn off the function, simply press **Enter**.
- To re-enable it, simply enter a value of between 35°C and 50°C and press **Enter**.

## 19.3 - Restriction to the maximum air temperature in heating mode :

This function is used to prohibit the machine operating in heating mode when the outdoor temperature rises above a configurable value.

This function is disabled if at least one circuit is being defrosted

Visible if P2 = water-to-water and reversible air-to-water when P119 ≠ 1 (Cooling only)

```
P 2 2 5 . 2    M A X .    A I R    T E M P .
I N    H E A T I N G    M O D E    – x x ° x °
```

- This parameter can be set to between -5°C and 20°C in 1°C increments.
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≥ P225.2

The unit restarts once the temperature rises back to above P225.2 - 2K.

► **Display :**

```
M A C H I N E    O F F    I N    H T G    M O D E
  O U T    T E M P .    T O O    H I G H
```

This limit is not managed as a fault if the machine is shut off because of it:
- Not stored in memory if a mains power failure occurs
- Fault not saved in memory
- Fault relay in Off position
- The unit fault LED is off

 To disable this function:

- Simply press the **+** button until the maximum value of the parameter appears. Below this value, the following message appears :

```
P 2 2 5 . 2    M A X .    A I R    T E M P .
I N    H T G    M O D E    D I S A B L E D
```

- To turn off the function, simply press **Enter**.
- To re-enable it, simply enter a value of between -5°C and +20°C and press **Enter**.

## 19.4 - Restriction to the minimum air temperature in cooling mode :

This function is used to prohibit the machine operating in cooling mode when the outdoor temperature rises above a configurable value.

Visible if P2 = Reversible Water-to-Water and Air-to-Water when P119 ≠ 2 (Heating only)

```
P 2 2 5 . 3    M I N .    A I R    T E M P .
I N    C L G    M O D E    + x x °
```

- This parameter can be set to between 20°C and 12°C in 1°C increments.
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≤ P225.3.

The unit restarts once the temperature rises back to above P225.3 + 2K.

► **Display :**

```
A R R E T    M A C H I N E    E N    F R O I D
  T . E X T . T R O P    B A S S E
```

This limit is not managed as a fault if the machine is shut off because of it:
- Not stored in memory if a mains power failure occurs
- Fault not saved in memory
- Fault relay in Off position
- The unit fault LED is off.

# 20 - MANAGEMENT OF THE AUXILIARY HEATER BOARD AND THE ELECTRIC AUXILIARY HEATERS

The auxiliary electric heater board is the additional board 1 with the rotary switch in position 2.

It is used to obtain up to four additional control stages in heating mode.

**Example :**

When used on a unit with two control stages, the board brings the total number of control stages to six (two thermodynamic stages + four electric stages).

Although the electric stages are managed as control stages, the last control stages will turn on last.

► **The electric stages are turned on if :**
- the thermodynamic power is insufficient
- faults occur on the compressor stages
- the outdoor temperature is less than P225
- the water return temperature is too low to allow defrosting

► **The electric stages are shut off if a water flow fault occurs**

► **The auxiliary electric heater board has three separate on/off inputs :**
- Input 1 → additional board 1, use in auxiliary heater terminal block J4 between terminals 2-3 (if the input is open, the electric auxiliary heaters are shut off by fault 1 and the corresponding message appears).
- Input 2 → additional board 1, use in auxiliary heater terminal block J4 between terminals 4-5 (if the input is open, the electric auxiliary heaters are shut off by fault 2 and the corresponding message appears).
- Input 3 → additional board 1, use in auxiliary electric heater terminal block J4 between terminals 1-2

Value of P113 :
- If P113 = DISABLED, the input is disabled regardless of its state.
- If P113 = LOAD SHEDDING, two cases apply

1) The input is open: the electric auxiliary heaters operate normally

2) The input is closed: the electric auxiliary heaters are turned off
- If P113 = OVERRIDE :

1) The input is open: the thermodynamic stages and the electric auxiliary heaters operate normally

2) The input is closed: the thermodynamic stages are turned off

The outputs always close in the same order (1, 2, 3, 4) and always open in the reverse order (4, 3, 2, 1).
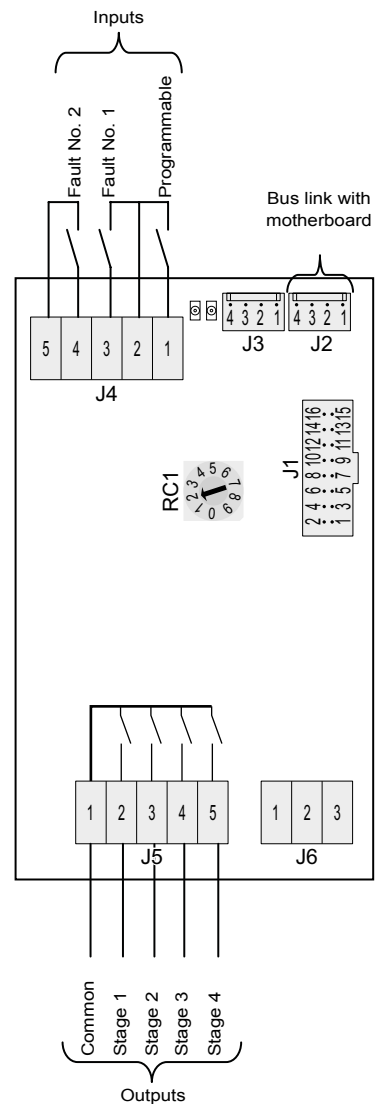


**Management of the electrical auxiliary heaters under normal operation :**
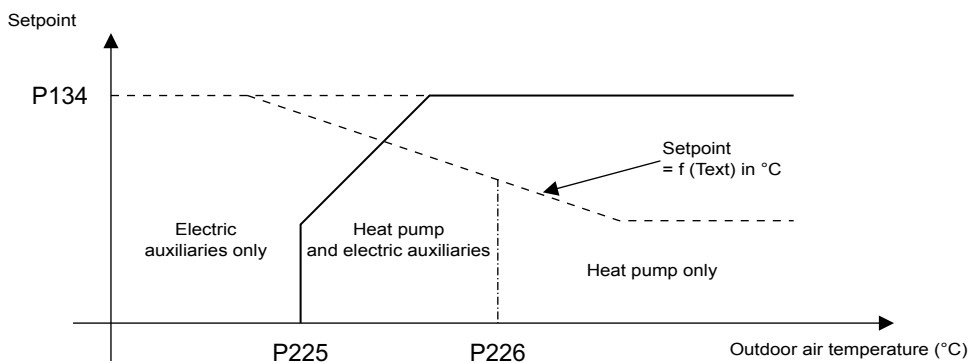


- If the air temperature ≥ P226: heat pump alone
- If the air temperature < P226: heat pump and electric auxiliary heaters. If a call is made for control, the thermodynamic control stages are the first stages.
- If the air temperature < P225: the heat pump is shut off and only the electric stages operate.

# 20 - MANAGEMENT OF THE AUXILIARY HEATER BOARD AND THE ELECTRIC AUXILIARY HEATERS

**Management of the electric auxiliary heaters when the thermodynamic control stage is shut off by a setpoint corrected by the discharge protection :**

- The electric stages take the place of the thermodynamic stages and become the first control stages, and the outdoor air temperature at that exact moment is stored in memory.
- The auxiliary heaters are set to the initial setpoint if P131 (setpoint adjustment based on outdoor temperature) = No. They are set to the calculated setpoint if P131 = Yes.
- The thermodynamic stages adjust to the setpoint corrected by the discharge temperature protection.
- Whether the machine is on or off, the corrected setpoint will increase by 1°C for an equivalent rise in the air temperature until:
  - Initial setpoint if P131 = No
  - Calculated setpoint if P131 = Yes
- When the air temperature is >  than the air temperature stored in memory + 2, the thermodynamic stages revert to being the first control stages and the electric stages are the last and adjust to the original setpoint:
  - Initial setpoint if P131 = No
  - Calculated setpoint if P131 = Yes

**Management of the electric auxiliary heaters when the machine is shut off by a general fault :**

The electric stages take the place of the thermodynamic stages.

■ **If P111 = Boiler**

► **Management under normal operation :**
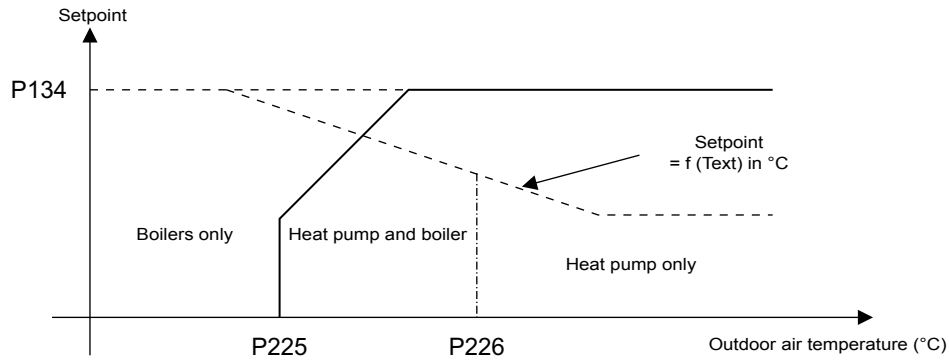


- If the air temperature ≥ P226: heat pump alone
- If the air temperature < P226: heat pump and boiler. If a call is made for control. The thermodynamic control stages are the first stages.
- If the air temperature < P225: heat pump shut off and boiler turned on

► **Management of the electric auxiliary heaters when the thermodynamic control stage is shut off by a setpoint corrected by the discharge protection :**
- The boiler contact (terminals 9-10 on terminal block J3 on the main board) is closed, the outdoor air temperature at the time of closing is stored in memory. P226 takes on the value of the outdoor temperature if it is lower.
- The boiler is set to the initial setpoint if P131 (setpoint adjustment based on outdoor temperature) = No. It is to the calculated setpoint if P131 = Yes
- The thermodynamic stages adjust to the setpoint corrected by the discharge temperature protection
- Whether the machine is on or off, the corrected setpoint will increase by 1°C for an equivalent rise in the air temperature until :
  • Point de consigne initial si P131 = NON
  • Point de consigne calculée si P131 = OUI
- The boiler relay is open when the air temperature > P226 + 2.

► **Management of the boiler when the machine has been shut off by a general fault :**
- Boiler contact closed
- Control with P135 = 50°C as minimum setpoint
- by default, this minimum setpoint must be adjusted based on the technology of the boiler.

► **Management of the boiler when the machine has been shut off by a water flow fault :**

(Depending on state of P27: pump controlled by boiler operation)
- If P27 = Yes, boiler operation authorised.
- If P27 = No, the boiler is shut off.
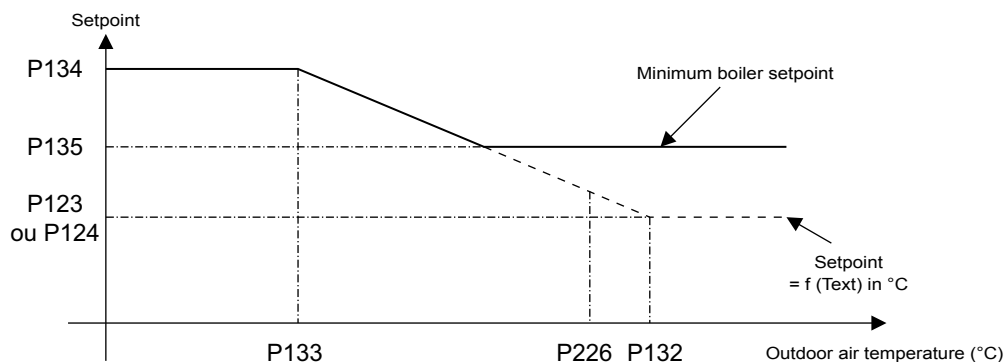
## 22.1 - Case of two parallel-connected machines

For a master/slave setup involving two parallel-connected machines, the machines must be connected by a bus link and one must be designated as the master machine in control of the slave machine.

Menu 12 (Master/Slave) appears when parameter P28 is set to 'Yes'.

```
1 2  -    M A S T E R / S L A V E
```

► **Designation of master machine :**

```
P 8 0 0    M A S T E R    M A C H I N E
O N   L O O P    Y E S       O U I
```

> **Only one machine may be configured as the master on each loop. If the master machine has already been configured and you try to configure the slave machine as the master, the slave machine's parameter will be locked and not be accessible.**
>
> **Parameter P808 sets the minimum time delay between the turning-on of machines 1 and 2.**

### 22.1.1 - Operating principle :

The master machine sends the following information to the slave machine :
- ON-OFF.
- Heating/cooling mode.

The master machine will not have access to detailed information about the slave machine (fault details, operating readings, machine parameters, operating parameters, etc.) and vice versa.

If a BMS is used, each machine will have access to all the information on the other machine.

**The control temperature is measured on the machine that operates first, which may be a the master or the slave, depending on availability**

> **The master machine's BMS link manages information from the loop and the master machine. To obtain information on the slave machine, its BMS link must be connected.**

► **Loop description :**
- The loop is limited to two units. Both may be assigned to the loop's operation or one may be assigned as a backup.
- The loop may be controlled in either heating or cooling mode. Switching between modes is managed in the same way as when a single machine is running (no master/slave control).
- Each machine will be adjusted by its own software and the adjustments made to the master machine will control the units on the loop in cascade mode.

### 22.1.2 - General :

In all cases, the slave machine's On/Off button can be used to cut the master machine's control over the slave machine.

Once a machine is configured as the master, it has control over the slave machine.

The machine with the most control stages must always be designated as the master machine.

The slave machine's control parameters become locked when P28 = Yes.

The time on the master machine's console is sent to the slave machine so that both have the same time.

If communication between the master and slave machine is lost for more than two minutes, the slave machine switches to independent operation with its own information and displays the following message :

```
     L I N K    F A U L T
L I N K    F A U L T
```

► **Automatic acknowledgment :**
- The automatic operation controls are managed by each machine as if the machines were not linked.
- Load shedding via the on/off inputs is managed by each machine as if the machines were not linked.
- The pumps are also managed by each machine as if the machines were not linked.

Parameters P801 to P810 are hidden if P800 = No (i.e. on the slave machine).

### 22.1.3 - Management of the functions :

**A) Machine operation priority and balancing of runtimes :**
- The order in which machines are started is determined based on faults and the number of hours of operation.
- **A machine is available** when it is off, has no faults, and is authorised to operated.
- The first machine to start is one that is available and has the fewest hours of operation.

► **Balancing of runtimes :**
- After every 50 hours of machine operation, the system switches to the machine which has operated the least in order to balance the runtimes.
- While the system is on (and before it is shut off), compare the time counters of the machines that are running and change the order number so that the machine with the longest runtime is shut off first.
- If a fault occurs on an active stage (or the stage is forced off), stage "n" becomes "n-1".
- Stages are shut off in the reverse order that they were turned on regardless of their number of hours of operation.

The total runtime of each machine calculated by adding P285 and P286 on each machine.

**B) Backup or auxiliary machine (P801 = Yes):**

► **Without changeover :**

The backup machine is designated by the customer (P803 = x).

> **WARNING : In this configuration, the customer will have to run this machine twice a year to prevent the pump from seizing.**

► **With changeover :**
- The machine with the longest runtime and which is off is automatically set as the backup.
- If a partial fault occurs on a machine on the loop, that machine is automatically made the backup.
- If parameter P807 ≠ 0, the backup machine also serves as the auxiliary machine. It is started up if the temperature >setpoint + P807, and stopped at 1 K below this value.

► **The backup machine may operate if :**
- A machine has a link fault
- A machine has a total fault
- Operation of backup authorised if P807 ≠ 0 and temperature > setpoint + P807

On the backup machine the pumps are off, the LED flashes on and off at 1-second intervals and the following message is displaye :

```
    M U L T I U N I T   M A N A G E M E N T
      B A C K U P   M A C H I N E
```

**C) Forced stop of machines :**

This function can be configured to prevent a machine from operating. This selection is enabled by configuration.

**D) Water loop winter protection :**

If parameter P142 on the master machine = Yes

► **In heating mode :**
- This function is possible if P142 on the master machine = Yes, if the automatic operation control inputs on both machines are open, and both machines are set to On. The function must maintain the water inlet temperature on the heat exchanger at 30°C as soon as the outdoor temperature ≤ 3°C (2 K differential = pump and compressors shut off immediately)(Cascade control on the return line).
- Adjust water-to-water units to the hot water sensor.
- The heating LED is lit; the On/Off LED flashes.
- If a fault occurs on the outdoor sensor, maintain the water loop at 30°C.

Corresponding message on each machine :

```
M A I N T A I N   W A T E R   L O O P
    T E M P E R A T U R E   A T   3 0 °
```

► **In cooling mode :**
- This function is possible if P142 on the master machine = Yes, the units are set to On, and the automatic operation control inputs on both machines are open. In this mode, the pump is turned on when the outdoor temperature ≤ P220 and shut off at P220 + P222.

Corresponding message on both machines :

```
W A T E R   C I R C U L A T I O N
P U M P   F O R C E D   O N
```

If a fault occurs on the outdoor temperature sensor, the pump is forced on.

**Note regarding the circulation of water during freezing weather : the customer must install a bypass so as to avoid creating a temperature problem during use.**

### 22.1.4 - Controls :

► **Operating mode :**

**Note : The slave machine's operation is determined by the master unit (P119). If P28 = Yes, its operation cannot be changed via the corresponding on/off input, via the console or because of the outdoor temperature.**
- If the slave machine has a different P119 value than the master machine (e.g. master set to cooling/heating while slave set to cooling only) and a call is made for the slave to operate in a different mode than the master, the slave machine is shut off and the following message is displayed:

```
S L A V E     F A U L T
P 1 1 9    O P E R A T I N G    M O D E
```

The machine is then shut off

► **Control setpoint calculation :**

The control setpoint is set by the master machine. If a fault occurs on the master machine, the slave machine operates using its own setpoint and its own sensors :

Return control (P141 = 1 on master machine) :
- The control sensor used is on the master machine. If it is shut off (On/Off by automatic operation controls) or a fault has occurred on it, the slave machine will operate using its own setpoint and its own sensors.

Supply control (P141 = 3 on master machine) :
- A sensor must be added to the water outlet manifold connecting both machines. To do so, the sensor must be connected to the slave machine in place of the water inlet sensor on this machine (terminals 2-3 on terminal block 7 of the motherboard).
- The control temperature is sent by the slave machine connected to the water inlet on the slave's heat exchanger.
- The manifold water outlet temperature is the water outlet temperature on the master machine's manifold.
- The water inlet temperature on the slave's heat exchanger is the temperature from the master machine, including in parameter P255.
- The water outlet temperature on the slave's manifold is the temperature of the water outlet on the slave's manifold.

**A) Cascade control :**
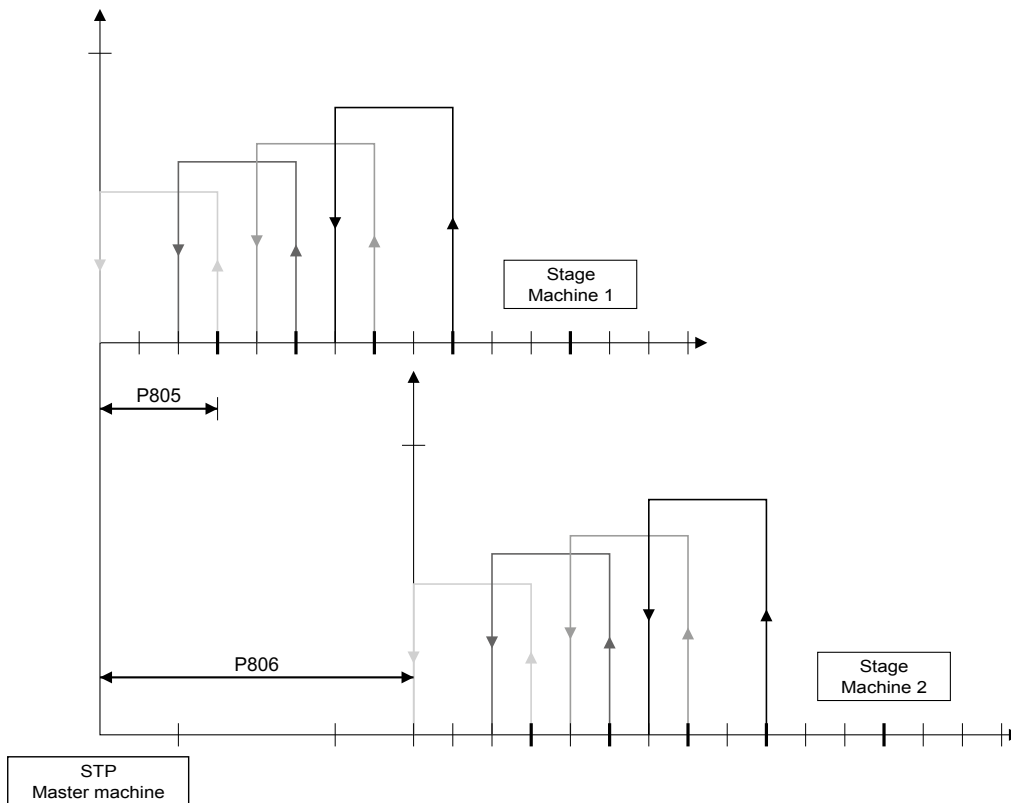


**Note : P804 = Cascade → parameter P143 on each machine becomes equal to 1°C. This is because the interstage differential on each machine will be adjusted by the value of P143 on each machine.**

Machine 2's setpoint is shifted by P806 relative to machine 1's setpoint. The value of P806 will have to be selected based on machine 1 in order to achieve an operating order similar to the start-up of the last stage (see figure above)

**B) Control in parallel with "shifted setpoint":**
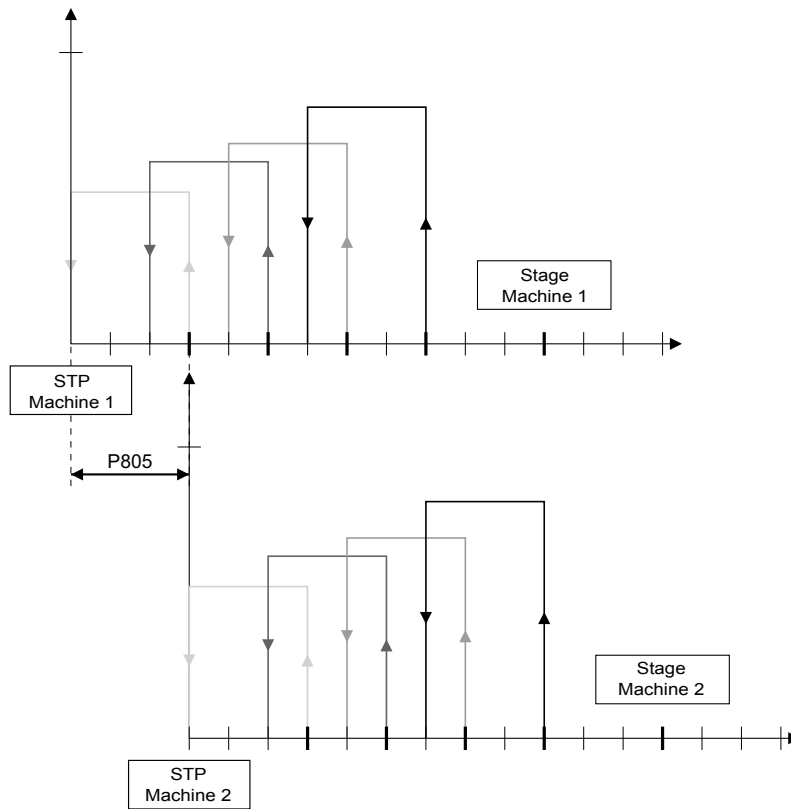


Machine 1 adjusts itself to the master machine's setpoint. Machine 2's setpoint is shifted by the value of P805. Thus, the machine 2's setpoint 2 is machine 1's setpoint + P805.

**C) Water return control for storage (P154 on master machine = Yes) :**

This type of control makes it possible to generate maximum capacity at a given time, often when electricity is cheapest. Both machines are turned on at an interstage time delay of 10 seconds when P122 + P155 is achieved. The machines are shut off at P122 at an interstage time delay of 1 second.
- If P154 = Yes, storage control is enabled and the control mode based on the selected setpoint is controlled by the master machine.

Cascade control is used by default for both machines when setpoint 1 selected (standard control).

The 'Yes' value of P154 on the slave machine becomes inaccessible if P28 = Yes.

**D) Hourly scheduling :**

La programmation horaire de 2 machines en parallèle sera gérée par les paramètres de régulation de la machine maître si P27 = OUI la programmation horaire de la machine esclave devient inaccessible.

### 22.1.5 - Machine status menu :

If there are no general faults and the automatic operation inputs are closed, a submenu (overrides the fault message) is added to the machine status menu :

or

```
M A S T E R     S L A V E     C T R L
M A S T E R     M A C H I N E
S L A V E     M A C H I N E
```

# 23 - ACTUATION OF THE ELECTRONIC EXPANSION VALVE

## 23.1 - With Alco driver and display

Only fault feedback signals from the valve are managed in this case

## 23.2 - With VCM driver

This configuration corresponds to using the electronic expansion valve with the VCM expansion board and on which the ALCO EXV miniboard with the software is connected.

When P42 is set to this value, the control and view parameters for the Alco electronic expansion valve can be accessed.

The compressor on/off signals authorising the expansion valve to move, as well as the low temperature and suction temperature signals, will be transmitted over a bus link.

### 23.2.1 - Menus if P42 = VCM :

► **Main menu :**

```
10 - ELEC  EXP.  VALVE
```

► **Electronic expansion valve configuration menu :**

```
P601  CIRCUIT  1
VALVE  TYPE              EX4
```

```
P602  CIRCUIT  1
SUPERHEAT  STP        6°C
```

```
P603  CIRCUIT  1
MOP  POINT            YES
```

```
P604  CIRCUIT  1
MOP  VALUE          15°C
```

```
P605  OPNG  C1  EXV
START  AIR  CON    XXX%
```

```
P606  OPNG  C1  EXV
START  HEAT  PUMP  XXX%
```

```
P607  OPENING  TIME
START-UP  CIRCUIT  1    XXSS
```

```
P608  SLOW  MODE
CIRCUIT  1  EXV              NO
```

```
P611  CIRCUIT  2
VALVE  TYPE              EX4
```

```
P612  CIRCUIT  2
SUPERHEAT  STP        6°C
```

```
P613  CIRCUIT  2
MOP  POINT          YES
```

```
P614  CIRCUIT  2
MOP  VALUE          15°C
```

```
P615  OPNG  C2  EXV
START  AIR  CON    XXX%
```

```
P616  OPNG  C2  EXV
START  HEAT  PUMP  XXX%
```

```
P617  OPENING  TIME
START-UP  C2              XXS
```

```
P618  CIRCUIT  2
SLOW  MODE              NO
```

Parameters P608 and P618 are visible only if P2 ≠ reversible air-to-water

► **Operation parameters :**

```
P 3 2 5   C 1   E X V
O P E N I N G                    X X X %
```

```
P 3 5 5   C 2   E X V
O P E N I N G                    X X X %
```

```
P 5 5 8   C I R 1   E X V   V E R S I O N
N O .   X X . Y Y   V C M   X X . Y Y
```

```
P 5 5 9   C I R 2   E X V   V E R S I O N
N O .   X X . Y Y   V C M   X X . Y Y
```

### 23.2.2  -  Manual EXPANSION VALVE MODE if P42 = VCM :

If Test Mode is set to 'Yes' it retains all standard testing functionalities and provides access to the manual override menu for the electronic expansion valves when **–** is pressed.

► **Manual override of expansion valves : (opening and closing)**

If P3 = 1, access to EXV TEST.1 mode only.

Press **+** and **–** to change expansion valves.

► **Display :**

```
E X V   T E S T . 1
E X V   T E S T . 2
```

When either test mode is confirmed (**OK**), access is to the settings menu is provided.

► **Display :**

```
      E X V   T E S T   C X
A U T O
```

The expansion valve remains in automatic mode the entire time AUTO is displayed. To enter settings mode, press **OK**.
- To send a signal to open the valve, press **+** → The percentage immediately higher than the percentage of opening requested by the controller will appear.
- To send a signal to close the valve, press **–**  → The percentage immediately lower than the percentage of opening requested by the controller will appear.

To adjust the valve's percentage of opening to the desired value, press + and **–**. This percentage can be changed in increments of 1%.

► **Display :**

```
      E X V   T E S T   C X
O P E N I N G   X X X %
```

To exit manual mode, press **Reset**.

The expansion valve will automatically return to automatic mode if no buttons are pressed on the console for 15 minutes.

### 23.2.3  -  Control of electronic expansion valve at start-up if P42 = VCM :

► **Comment :**
- The expansion valve's percentage of opening and slow mode (set to 'No') are forced when the compressor is turned on.
- The percentage of opening values in air conditioning and heat pump modes as well as the forcing time can be adjusted using their corresponding parameters.

### 23.2.4  -  Control of the LP sensor :

► **If P42 = VCM :**
- The LP sensor fault has a time delay of 120 seconds at power-up. It is not taken into account when the unit is off or at the end of the defrosting cycle during pressure balancing.
- The default value of P36 and P38 becomes 17.3 b.

# 24 - IMPORTANT INFORMATION REGARDING THE CONTROL OF AN INVERTER COMPRESSOR

- Parameters P195 (ΔP for power reduction) and P144 (interstage differential) are visible even though there is just one compressor. P144 (interstage differential) has an adjustment range of 0.5 to 10°C.
- Parameters P145, P146, P147 and P148 are hidden if P7 = INVERTER and supply control is selected. On the other hand, when P141 = supply or return, parameters P143 and P144 remain visible and are set to a default value of 1.5°C.
- Output 3 (stage 2, circuit) on terminal block J3 on the motherboard is used to inform the variable speed drive of any faults requiring the compressor to be shut off. As a result, the compressor will be shut off if a fault is detected (the contact opens).
- Start-up time delay: P66 (Visible only if P7 = INVERTER. Default value of 120 seconds. Adjustable between 0 to 300 seconds in 30 second increments). This time delay corresponds to the minimum time allowed for the compressor control voltage to reach its maximum value of 10 V (value corresponding to the compressor's 90 Hz frequency). In other terms, the compressor will not reach 90 Hz until the end of this time delay even if it is requested to do so by the network's heat load.
- Parameter P192 (maximum fan speed threshold) becomes visible. Its default value is 8.0 V.
- The order in which the compressors turn on and off will be given via output 2 on terminal block J3 on the motherboard (stage 1, circuit 1).
- The compressor speed will be adjusted by an 0-10 V modulating signal (output 2-3 on terminal block J2 on the motherboard).

The following protections are enabled only if P7 = INVERTER:

These limitations are due to the compressor technology.

## A) If the evaporating temperature drops to or below 20°C for 1 minute :

The minimum frequency in both heating mode and cooling mode becomes 50 Hz until the evaporating temperature rises to or above 15°C for 1 minute.

## B) If the condensing temperature rises to or above 60°C for 1 minute :

The minimum frequency in both heating mode and cooling mode becomes 50 Hz until the condensing temperature rises to or above 58°C for 1 minute.

## C) Maximum pressure difference :

### ■ During water heating :

If HP ≥ 4 × LP + 13.5, 120 seconds after start-up, the controller adjusts the control setpoint so as not to push the compressors near their limits too often.

If necessary, a coil defrosting cycle will be forced on.

► **Information message :**

```
U N I T    Δ P b a r    L I M I T
O P T I M I S E D    O P E R A T I O N
```

### ■ During water chilling :

If HP ≥ 4 × LP + 13.6, the unit reduces its power by either reducing the compressor speed to 50 Hz or by turning off the compressor.

► **Information message :**

```
C P    D E L T A    L I M I T
P W R    R E D U C T I O N    x x m i n
```

► **Fault function :** (enabled in cooling mode and heating mode)

Operation :
The max. Δp threshold is set at HP 4 × BP + 15.6

### ■ If this fault causes at least 5 shutdowns in 24 hours :
- Corresponding circuit shut off.
- 30 min. time delay (in seconds in test mode)
- Fault output off
- Circuit fault LED on console flashes.

```
F A U L T    D E L T A    P    x x m n
X    C U T ( S )    I N    2 4 H
```

### ■ If this fault causes more than 5 shutdowns in 24 hours :
- Corresponding circuit shut off.
- Fault output on
- Circuit fault LED on console lit steady.

```
    C I R C U I T    B R E A K    x
    C P    D E L T A    P    F A U L T
```

## 24 - IMPORTANT INFORMATION REGARDING THE CONTROL OF AN INVERTER COMPRESSOR

**D) Compressor driver fault :**

Terminals 2-3 on terminal block J5 on the controller motherboard receive signals indicating faults on the Danfoss compress driver. Only alarms that shut down the compressor are received.

When contact 4-6 on the driver opens, the driver is in alarm mode. The following message should appear on the controller console: This function is activated 5 seconds after the power is turned on

```
        M A C H I N E     O F F
        O U T   T E M P .   T O O   L O W
```

- Compressor shut off
- Automatic acknowledgement
- Fault stored in memory in case of a mains power failure
- Fault saved in fault memory
- Relay in On position
- Compressor driver fault relay on relay board in On position
- General fault LED lit steady

An optimised frosting control system has been developed :

Called DEGIPAC (P159 = optimised), it defrosts the evaporator coils only when frost has actually formed on them instead of based on the frosting time (P159 = fixed). It does so by continuously monitoring the difference in temperature between the coil and the outdoor air. If this difference is abnormally high, it turns on the defrost cycle. DEGIPAC makes it possible to continue producing hot water for hours during cold, dry weather without having to defrost the coils. As a result, it improves the seasonal COP.

Parameter P161 is used to advance (if P161 < default value) or delay (if P161 > default value) the start of the defrost cycle.
- Defrost cycle for reversible machines with split circuits (where P2 = 3 and P11 = split)
  The defrost cycle is turned on when any of the following occur:
  The discharge temperature is too high (see discharge protection in heating mode);
  Ice is detected on the coil by the sensors on the coils. In this case, defrosting is performed by only one circuit at a time to ensure a minimum supply of hot water for the system;
  A difference in pressure, where HP > LP +13.5 for 120 seconds if INVERTER compressors are used.

- Defrost cycle for reversible machines with intertwined or mixed circuits (where P2 = reversible air-to-water and P11 = intertwined or mixed). In this case, defrosting is performed by both circuits at the same time.
  Defrosting is possible only when the water return temperature is high enough to ensure that the heat exchanger will not freeze when the cycle is reversed.
    Defrosting is triggered by the low-pressure sensor that reads the lowest value.

```
C I R C U I T     X     B E I N G
          D E F R O S T E D
```

- If this temperature is too low (< P52 + 8 K if there are 2 compressors per circuit and < P52+16 K if there is 1 compressor per circuit) and there is no way to increase it, the unit will shut off, save the fault in memory, and display the following message :

```
            C I R C U I T     B R E A K     x
  D E F R O S T I N G     I M P O S S I B L E
```

- If the temperature can be raised via the second circuit, a boiler or electric auxiliary heaters, the following message will appear :

```
W A T E R     T E M P .     R I S I N G
F O R     D E F R O S T I N G
```

- If this temperature exceeds 26°C, the circuit rises to maximum temperature before the four-way valve reverses and stays at maximum temperature during defrosting in order to minimise the defrosting time.
- If this temperature drops below 26°C, the circuit rises to maximum temperature before the four-way valve reverses and lowers in temperature during defrosting to prevent frost from forming on the heat exchanger.

**Note : During the defrosting cycle, the controller continuously monitors the temperatures and pressures to prevent frost from forming on the heat exchanger and thus turning on the protections.**

This is why the fans may turn on in reverse for certain machine sizes and in normal direction during a defrosting cycle.

## 26.1 - Presentation

This function allows the weekly management of liquid chillers by selecting :
- 6 programming stages (maxi).
- 6 holidays zones (maxi).

## 26.2 - Definition of the programming stages

**Setting :**

Starting time

Ending time

Selected days (M.T.W.T.F.S.S.)

Type of regulation: Setting 1 – Stop/Setting 2 – Stop/setting 1 – setting 2 / setting 2 – setting 1/non valid.

**Setting by fault :**

Starting hour: 0h00

Ending hour: 0h00

Validated days: none

Type of regulation not validated.

## 26.3 - Definition of holiday zones.

**Settings:**

Type of zone: non valid, stop, running on setting 1, running on setting 2.

Starting date dd-mm

Ending date dd-mm

Setting by fault Non valid, from 01-01 to 01-01

## 26.4 - Operation

When putting under voltage or when setting the time, the information on the machine status are updated as a function of the programming settings.

The user can change the status of his unit (Run/Stop – ½ setting regulation) but if a time range or a holiday zone is active, the information will be updated at the starting or ending time of the programming

In the case where at least one time range or one holiday zone is validated, the parameter P120 is forced on « 2 per console or BMS » and cannot be modified.

When going under test mode, the programming becomes non active. When leaving the test mode, the unit status information are updated as a function of the programming settings.

In case of range overlapping, the running mode has priority over the stop mode and setting 1 over setting 2.

Same thing in case of overlapping of zones

If a programme stage is active (# non validated) and the real day is selected, the status of the unit is as follows :

| Type of programme | Status before starting time | Status before starting time and ending time | Status after ending time |
|---|---|---|---|
| CSG1 -stop | Off | Running on setting 1 | Off |
| CSG2 -stop | Off | Running on setting 2 | Off |
| STP1-STP2 | Running on setting 2 | Running on setting 1 | Running on setting 2 |
| STP2-STP1 | Running on setting 1 | Running on setting 2 | Running on setting 1 |

**If at least one time range or one holiday zone is validated, alternate the message machine stopped or setting/temp with a message in order to signal to the user that the status will be updated on next status change of time range. Display of each of these messages for 3 seconds.**

■ **Message to be displayed :**

```
   H O U R L Y    P R O G R A M M I N G
   O N
```

■ **Access principle :**

Through menu 9: "9 PROGRAMMING"

```
9 - P R O G R A M M I N G
```

- If validated by key "ENTER", 2 sub-menus "HOURLY PROGRAMMING" and "HOLIDAY ZONES" appear.

```
        T I M E T A B L E
             D A Y S   O F F
```

Through keys **+** and **–** , select one of the 2 sub- menus, then validate with "**ENTER**"

■ **Position of the cursor :**

When surfing in the various menus, the cursor is located at the top, on the left.

For modifying the settings, it is located at the bottom right side, last but one character.
- When entering the « TIME RANGE » menu "

► **Display :**

2nd line display: ⎫
Control mode ⎭
```
T I M E T A B L E   N °   x                          ↑
                                                     ↓
```
⎰ N° of selected
⎱ spacing, from 1 to 6

Unroll the time range with key **+** or **–** then validate with key "ENTER"

Once the time range has been selected, the regulation type has to be chosen.

By pressing "Enter", we have access to the setting. By pressing key **+** or **–**, the following menus appear.

For validation,press "Enter".

```
T Y P E   O F   C O N T R O L                        ↑
          S E T   P O I N T 1   –   O F F            ↓
```

```
T Y P E   O F   C O N T R O L                        ↑
          S E T   P O I N T 2   –   O F F            ↓
```

```
T Y P E   O F   C O N T R O L                        ↑
          S E T   P . 1 – S E T   P . 2             ↓
```

```
T Y P E   O F   C O N T R O L                        ↑
          S E T   P . 2 – S E T   P . 1             ↓
```

```
T Y P E   O F   C O N T R O L                        ↑
              N O   V A L I D                        ↓
```

Once the regulation has been validated, « days selected » appears

```
S E L E C T   D A Y S                                ↑
         M   T   W   T   F   S   S                   ↓
```

By pressing Enter, days are selected: key "**+**" to validate the day – key "**–**" to remove the validation.

Set in this order the starting hour/starting minute/ending hour/ending minute

```
S T A R T   O F   T I M E       y y H x x            ↑
E N D   O F   T I M E           y y H x x            ↓
```

By pressing "ENTER", set hours, then minutes.

Any modification leads to the updating of the unit status.

Any type of setting is possible (starting time < ending time, starting time = ending time, starting time > ending time)

If the ending time ≤ starting time, the programme is considered to be ending on the following day.

If one enters in the menu "HOLIDAY ZONES"

► **Display :**

2nd line display: ⎫
zone type ⎭
```
    D A Y S   O F F   N °   x                        ↑
                                                     ↓
```
⎰ N° of zone selected,
⎱ from 1 to 6

Select the n° of the holiday zone to be set by pressing "**ENTER**".

■ **Setting text :**

```
T Y P E    O F    Z O N E                              ↑
                       N O    V A L I D                ↓
```

```
T Y P E    O F    Z O N E                              ↑
                              S T O P                   ↓
```

```
T Y P E    O F    Z O N E                              ↑
                    S E T    P O I N T 1               ↓
```

```
T Y P E    O F    Z O N E                              ↑
                    S E T    P O I N T 2               ↓
```

Starting day and ending day

Set in the following order:

Starting day /starting month /ending day /ending month.

```
D A T E    O F    S T A R T    D D / M M               ↑
D A T E    O F    E N D        D D / M M               ↓
```

All types of settings are possible (starting day < ending day, starting day = ending day, starting day > ending day)

If the ending day < starting day, the programme is considered to be ending the year after.

■ **Operation of holiday zones :**

If a holiday zone is active (starting date ≤ present date ≤ ending date), **the time ranges become non active**.

The unit operating status becomes the one of the active zone (stop, running on setting 1 or running on setting 2).

At the end of the holiday zone, if no time zone is validated, the operation is the one existing at the start of the holiday zone.

Example:

Prog 1: 7-12h STP1-STP2    **MTW   TF**

Prog 2: 10-18h STP1-stop    **MT   TF**

Holiday zone: 10-08 / 30-08 : stop



**Prog 1: MTWTF**

**Prog 2 : MT  TF**

**Result :**



**Status: MT  TF**
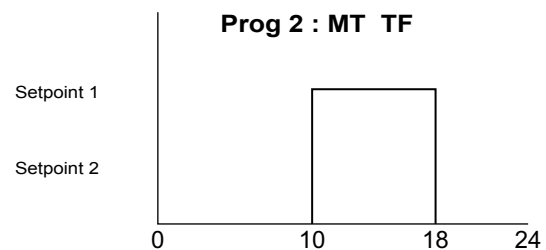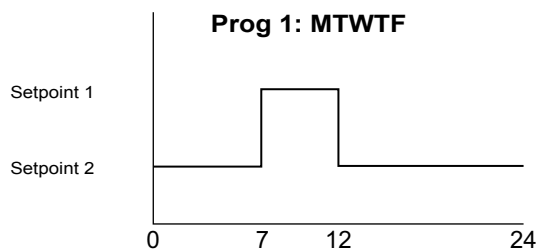
**Status: T**
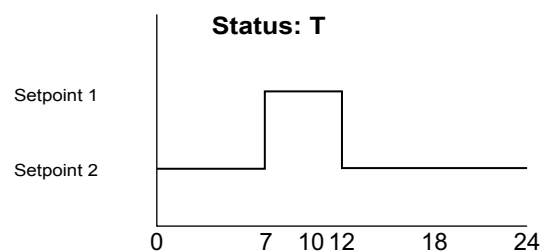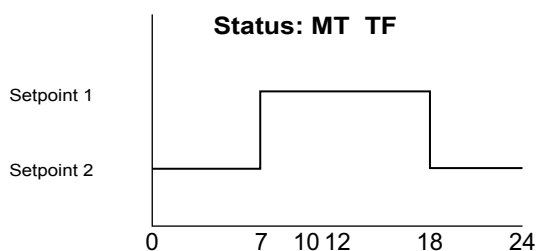
Saturday and Sunday not being selected in the hourly programming, the unit is therefore stopped.

The unit is stopped between 10th August and 30th August, this period being selected as holiday zone.

# 27 - MANAGEMENT OF A REFRIGERANT FLUID LEAK AND LEAK FAULT DETECTOR

When the option is present on the machine, the P104 parameter allows the BUS connection with the CAREL leak detector(s) to become operational.

■ **P104 :**

Access level = 2

```
P 1 0 4    L E A K    D E T E C T I O N
                                        N O
```

Réglages possibles : OUI ; NON

Valeur par défaut = NON

- Le paramètre P104.1 sert à temporiser la prise en compte de l'information de défaut remontée par le ou les détecteurs de fuites CAREL

■ **P104.1 :**

Niveau d'accès = 2

Affichage si P104 = OUI

```
P 1 0 4 . 1    L E A K    D E T E C T I O N
T I M E    D E L A Y      1 . 0    m i n
```

Possible settings: 0 to 5 minutes in increments of 30 seconds

Default value = 1 min

## 27.1 - Link between the CAREL detector and the controller :

The CAREL detector and the controller are linked through an RS 485 connection using the Modbus protocol by linking to the MOLEX terminal block available for the last additional card, apart from in the following cases :

- When only the energy management option is present, the connection should be made using the dedicated RS 485 connection on the DIRIS module.
- When only the variable speed pump option is present, the connection should be made using the dedicated RS 485 connector on the frequency inverter.

The detector unit should always be the last component in the loop; thus the last CAREL unit in the loop should be equipped with line termination resistance.

When a machine has two circuits, there will be two detectors linked in series inside the unit provided by CAREL; thus there will only be one connection between the unit and the regulator.

## 27.2 - Management of faults when a leak is detected by the CAREL unit if P104 = YES :

In a machine with two circuits, the fault will be managed per circuit.

The fault is managed even when the machine is stopped.

The fault will be taken into account when the detector signals a P104 fault for 1 second.

■ **If a fault occurs:**
   • Staged or forced stop of the compressors in the circuit concerned
- Pump switched on even if "standby mode" is active
   • Add to the fault memory
   • Machine fault output on
   • General fault LED on console lit steady

► **Display :**

```
          M A C H I N E    O F F
C I R C U I T    X    L E A K    F A U L T
```

■ **Resetting :**

RESET button.

- Message displayed in the fault memory

```
C I R C U I T    X    L E A K    F A U L T
```

## 27.3 - Management of faults if communication (bus) with the CAREL unit is lost if P104 = YES

If the connection between one of the two detectors and the controller is lost for 10 seconds or more, the following message will be displayed :

```
L I N K    F A U L T
C I R C U I T    X    D E T E C T O R
```

# 27 - MANAGEMENT OF A REFRIGERANT FLUID LEAK AND LEAK FAULT DETECTOR

■ **If a fault occurs**
- No staged or forced stop of the compressors in the circuit concerned
- Circuit fault LED flashing
- Fault added to fault memory
- Fault relay stuck

■ **Resetting :**

Automatic
- Message displayed in the fault memory

| L I N K   C X   D E T E C T O R |
|---|

## 27.4 - Management of sensor faults in the CAREL detector if P104 = YES :

If a sensor fault occurs in the detector BUS connection, the following message will be displayed on the controller console :

| S E N S O R   F A U L T |
|---|
| C I R C U I T   X   D E T E C T O R |

■ **If a fault occurs :**
- No staged or forced stop of the compressors in the circuit concerned
- Circuit fault LED flashing
- Fault added to fault memory
- Fault relay stuck

■ **Resetting :**

Automatic
- Message displayed in the fault memory

| C X   D E T E C T O R   S E N S O R |
|---|

## 27.5 - Reading parameters :

■ **P291 :**
- Information delivered by the CAREL detector

| P 2 9 1     L E A K   D E T E C T E D |
|---|
| I N   C I R C U I T   1       Y E S |

■ **P291.1 :**
- Information delivered by the CAREL detector

| P 2 9 1 . 1     L E A K   D E T E C T E D |
|---|
| I N   C I R C U I T   2       Y E S |

Electrical values are measured by means of an external module that is connected to a current transformer and exchanges data with the controller via bus connection.

When the option is present on the machine, the parameter P 15.1 allows the bus communication with the electrical value measurement module to become operational.

```
P 1 5 . 1      E L E C T R I C A L    V A L U E
M E A S U R E M E N T S                      N O
```

YES; NO

Default value = NO

The parameter P15.2 allows you to control the type of electrical network for the electrical value measurement module

```
P 1 5 . 2    T Y P E    D E    R E S E A U
E L E C T R I Q U E S    N E T            3 B L
```

Possible settings: 1BL, 2BL,3BL,3NBL,4BL and 4NBL

Default value = 3 BL

The parameter P 16 allows control of the primary current transformer (CT) rating.

Display if P 15.1 = Yes

```
P 1 6          P R I M A R Y    C T
R A T I N G                      x x x x x A
```

Programmable between 5 to 1000 A in increments of 1 with 400 A as the default value

The parameter P 17 allows you to set the secondary current transformer (CT) rating.

Display if P 15.1 = Yes

```
P 1 7   S E C O N D A R Y    C T
R A T I N G                      5 A
```

Can be set to 1 or 5, with 5 A as the default

The parameter P 117 enables access to the power input limit function and selection of its activation mode.

Display if P 15.1 = Yes

```
P 1 1 7      P O W E R    I N P U T
L I M I T A T I O N                      N O
```

Possible settings: no, permanent, by on/off input and yes by bus.

Default value = NO

The by on/off input command takes place on terminal block J6, terminals 7-9 of the main board, in which case all other "load shedding" inputs will be inactive.

The parameter P 118.1 allows control of the value to be considered for load shedding on the power input.

Display if P 117 ≠ No

```
P 1 1 8 . 1      M A X I M U M    P O W E R
L E V E L                      x x x x K W
```

Programmable between 15 to 400 kW in increments of 1 with 200 kW as the default value

## 28.1 - Management of load shedding on a power input threshold :

This function aims to prevent the machine from exceeding the power input threshold set by P118.1, by turning off the control stages.

It is inactive or deactivated in the following cases:

During a defrosting cycle, when reducing the power to the setpoint, in case of an on/off command or automated command, if the neutral zone is entered (P119 = "Cooling/heating auto by outdoor temperature), in test mode, if there is no communication with the DIRIS module for 2 minutes.

## 28.2 - Reading parameters :

```
  P 2 7 3 . 1    S U P P L Y   V O L T .
U 1 : x x x V    U 2 : x x x V    U 3 : x x x V
```

```
P 2 7 4 . 1   M A C H I N E
A B S O R B E D   P         x x x . x A x . x A
```

```
P 2 7 6 . 1   E L E C   P O W E R
C O N S U M E D                   x x x x k W h
```

```
P 2 7 5 . 1   M A C H I N E
A B S O R B E D                   X X X X . X k W
```

```
P 2 9 3   P O W E R
M O N I T O R I N G   A C T I V E    X X X
```

YES/NO depending on the power load shedding request, regardless of the activation mode.

■ **Resetting P 276.1 :**

The value in parameter P276.1 displays the total electrical power consumed. The user has the option to reset this counter as follows:

Once the parameter is displayed, press the applicable button and the following message will appear :

```
P 2 7 6 . 1   E L E C   P O W E R
C O N S U M E D                   R E S E T
```

Once the message above to reset the counter is displayed, press the enable button and then press the escape button once the counter is reset to return to the reading parameter (now set at zero).

```
P 2 7 6 . 1   E L E C   P O W E R
C O N S U M E D                   0 0 0 0 0 K W H
```

## 28.3 - Display in the Measured values and Machine status menus :

If P15.1 = YES, in addition to the usual measured values, the electrical values appear as follows :

```
U 1 : X X X V    U 2 : X X X V    U 3 : X X X V
T O T A L   C   I N P U T :    X X X . X   A
T O T A L   P   I N P U T :   X X X . X   k W
```

If load shedding is active in the Machine status menu, the following message will appear :

```
        L O A D   S H E D D I N G   O N
      A B S O R B E D   P O W E R
```

- Maintenance messages can be viewed in the Machine status menu.
  They are first displayed one after the other ahead of other types of messages, alongside arrows ↑↓ acknowledging that the FGAS message has priority.
- Once all the maintenance messages have been shown once, they are moved to the bottom of the Machine status menu behind other types of messages.
- All the maintenance parameters are regrouped in menu 17 which can be accessed from level 2

```
1 7 - M A I N T E N A N C E
```

## 29.1 - FGAS tightness check reminder :

Parameter P 900 enables activation and regulation of the check frequency

```
P 9 0 0    F G A S    T I G H T N E S S
C H E C K    R E M I N D E R                N O
```

Possible setting: no -03-06-12 months
Default value = NO
Visible irrespective of the type of machine.

The count begins when the function is activated
The following message will appear in the Maintenance status menu :

```
F G A S   C H E C K   I N   X X   D
C A L L   S T E   M A I N T E N A N C E
```

- The message is displayed:
- 15 days before the provisional date of the check (P900) every 3 months
- 21 days before the provisional date of the check (P900) every 6 or 12 months

The counter decreases each day from the date it was first displayed.

The reminder message will remain on the user interface of the unit until the maintenance operator acknowledges it with the following parameter:

The parameter P 901 allows the operator to reset the reminder counter

```
P 9 0 1    R E S E T   F G A S
C H E C K
```

Once the parameter is displayed, press the applicable button and the following message will appear :

```
P 9 0 1    R E S E T   F G A S
C H E C K                        O K
```

Visible if P900 ≠ No

Press the enable button to reset the counter, press ESCape once reset is enabled to exit, otherwise the counter will not be reset.

This function will be activated by default ex works.

## 29.2 - Maintenance reminder :

The "Maintenance reminder" function will be activated independently of the "FGAS tightness check" described above.

The parameter P 910 enables activation of the REMINDER function and regulation of its management mode

```
P 9 1 0    M A I N T E N A N C E   C H E C K
R E M I N D E R                N O
```

Possible settings: no or hours or days or months
Default value = NO
Visible irrespective of the type of machine.
Parameter P 911 allows you to set the REMINDER frequency

■ **For reminder (P 910) in hours**

```
P 9 1 1    M A I N T E N A N C E   C H E C K
F R E Q U E N C Y     x x x x   h o u r s
```

Possible setting: 1 to 9999 hrs
Default value = 2000 hrs

■ **For reminder (P 910) in months**

| P | 9 | 1 | 1 | | M | A | I | N | T | E | N | A | N | C | E | | C | H | E | C | K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | R | E | Q | U | E | N | C | Y | | | x | x | | m | o | n | t | h | s | | |

Possible setting: 1 to 99 months
Default value = 12 months
The counter starts once the P 911 value is enabled.

If the function is activated, the following message appears in the Maintenance status menu :

■ **For reminder (P 910) in months**

| M | A | I | N | T | E | N | A | N | C | E | | I | N | | X | X | | D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | A | L | L | | S | T | E | | M | A | I | N | T | E | N | A | N | C | E |

■ **For reminder (P 910) in hours**

| M | A | I | N | T | E | N | A | N | C | E | | I | N | | X | X | X | | h | r | s |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | A | L | L | | S | T | E | | M | A | I | N | T | E | N | A | N | C | E | | |

**The message is displayed :**

■ **For reminder in months:**

10 days before the provisional date of the check if P 912 < 3 months

20 days before the provisional date of the check if 3 ≤ P 912 < 6 months

20 days before the provisional date of the check if P 912 ≥ 6 months

■ **For reminder in hours:**

150 hrs before the provisional date of the check if P 912 < 1000 hrs.

300 hrs before the provisional date of the check if 1000 hrs ≤ P 912 < 2000 hrs.

300 hrs before the provisional date of the check if P 912 ≥ 2000 hrs.

The counter progresses every hour or month from the moment it was first displayed up to the scheduled date.

The reminder message remains on the user interface of the unit until the maintenance operator acknowledges it in the following manner:

The parameter P 912 allows the operator to reset the reminder counter

| P | 9 | 1 | 2 | | R | E | S | E | T | | M | A | I | N | T | E | N | A | N | C | E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | H | E | C | K | | | | | | | | | | | | | | | | | |

Once the parameter is displayed, press the enable button and the following message will appear :

| P | 9 | 1 | 2 | | R | E | S | E | T | | M | A | I | N | T | E | N | A | N | C | E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | H | E | C | K | | | | | | | | | | | | | | O | K | | |

- Visible if P910 ≠ No

Press the enable button to reset the counter, press ESCape once reset is enabled to exit, otherwise the counter will not be reset.

This function will not be activated ex works

## 29.3 - Useful information for both functions :

When the count reaches the scheduled maintenance date, the general fault LED flashes and the fault relay is triggered until the counter is reset

If the count is in months, precision is specified in days.

In the event that the hour or date is changed after activating a reminder function, the one that was set at the time of activation is taken into account for starting the count. This means that if the set date is shifted towards the end date of the count, the count values will decrease (function test)

By contrast, if there is a large shift between the date and hour displayed by the controller and the real values, after being set, it is makes more sense to reset the counters for maintenance functions.

The data linked to the periodic maintenance checks described above is available on the controller bus (customer access bits), and can therefore return to the levels of BMS/CMS, apart from the counter resets.

The data will also return to supervision level.

# 30 - COMMUNICATION PROTOCOL

## 1 - Communication medium.

### ■ RS485

3-pin connector on J11
- terminal 1: A or +
- terminal 2: B or –
- terminal 3: connected to earth for shielding if desired

Two lights provide information on the status of the transmission (see Section 3.1, control board) :
- D50 → Receive LED. Usually off; flashes when a message is received by the board.

If this light remains on, the bus is reversed. Swap terminals 1 and 2 on J11.
- D52 → Send LED. Usually off; lights up when the CPU sends a message over the bus.

### ■ Transmission mode.

### ■ Serial, asynchronous, half duplex, RTU mode.
- 1 start bit,
- 8 data bits,
- The parity is set via parameter P702,
- The number of stop bits is set via parameter P703,
- The transmission speed is set via parameter P701,
- The unit number on the bus is set via parameter P705.

### ■ Coding of analogue values.

Standard 32-bit IEEE format (2 registers).

Order of values.

Ordre des valeurs :
- If P704 = No → low order, high order.
- Si P704 = Yes → high order, low order.

**Note: the write functions are enabled if parameter P706 is set to "Remote, CMS…"**

### ■ Function codes used.

1 or 2: read n bits

3 or 4: read multiple registers (16 bits)

5: write one bit …………..

6: write register function………

8: read diagnostics counters

11: read event counter

15: write n bits

16: write multiple registers (16 bits)

**Note: the write functions are enabled if parameter P103 is set to "Remote, BMS…)**

### ■ Error codes :

1: function code unknown

2: address incorrect

3: data error

## 2 - Transmission mode via Ethernet

### ■ RJ45,

**Very important : 1 single simultaneous Ethernet connection is supported.**

In all cases, the link between the controller and the CMS functions via a crossover cable. Use of a straight cable depends on the CMS
- The IP address is set via parameter P711
- The sub-net mask is set via parameter P712
- The port address is set via parameter P713

### ■ Coding of analogue values.

Standard 32-bit IEEE format (2 registers).

Order of values:
- If P714 = NO → low order, high order
- Si P714 = Yes → high order, low order

**Note : the write functions are enabled if parameter P715 is set to "Remote, CMS…"**

### ■ 3 - Supported functions

### ■ Function codes used.

1 or 2: read n bits

3 or 4: read multiple registers (16 bits)

5: write one bit function…………..

6: write register function………

8:

11:

15: write n bits function

16: write multiple registers (16 bits) function

**Note : lthe write functions are enabled if parameter P103 is set to "Remote, BMS…"**

### ■ Error codes :

1: function code unknown

2: address incorrect

3: data error

# 30 - COMMUNICATION PROTOCOL

## 30.1 - Registers accessible by customer

| Register No. hexadecimal | Register No. decimal | Description | Format | Type | |
|---|---|---|---|---|---|
| **Registers accessible in read-only mode (Functions 3 or 4)** | | | | | |
| 0x01 | 1 | Controller name | Decimal | Read-only | 33 = Chiller/heat pump controller |
| 0x02 | 2 | Actual operating mode | Decimal | Read-only | |
| 0x3 and 0x4 | 3 and 4 | Outdoor temperature | Float | Read-only | |
| 0x5 and 0x6 | 5 and 6 | Control setpoint | Float | Read-only | |
| 0x7 and 0x8 | 7 and 8 | Evaporator inlet temperature | Float | Read-only | |
| 0x9 and 0xa | 9 and 10 | Evaporator outlet temperature | Float | Read-only | |
| 0xb and 0xc | 11 and 12 | Condenser temperature | Float | Read-only | |
| 0x13 | 19 | Number of stages on | Char | Read-only | Available with versions 09.00 and higher |
| 0x20 and 0x21 | 32 and 33 | P285 Heating mode runtime (in hours) | Float | Read-only | |
| 0x22 and 0x23 | 34 and 35 | P286 Cooling mode runtime (in hours) | Float | Read-only | |
| 0x24 and 0x25 | 36 and 37 | P287 Pump 1 runtime (in hours) | Float | Read-only | |
| 0x26 and 0x27 | 38 and 39 | P288 Pump 2 runtime (in hours) | Float | Read-only | |
| 0x28 and 0x29 | 40 and 41 | P310 Number of starts, stage 1, circuit 1 | Float | Read-only | |
| 0x2a and 0x2b | 42 and 43 | P311 Stage 1, circuit 1 runtime | Float | Read-only | |
| 0x2c and 0x2d | 44 and 45 | P313 Number of starts, stage 2, circuit 1 | Float | Read-only | |
| 0x2e and 0x2f | 46 and 47 | P314 Stage 2, circuit 1 runtime | Float | Read-only | |
| 0x30 and 0x31 | 48 and 49 | P340 Number of starts, stage 1, circuit 2 | Float | Read-only | |
| 0x32 and 0x33 | 50 and 51 | P341 Stage 1, circuit 2 runtime | Float | Read-only | |
| 0x34 and 0x35 | 52 and 53 | P343 Number of starts, stage 2, circuit 2 | Float | Read-only | |
| 0x36 and 0x37 | 54 and 55 | P344 Stage 2, circuit 2 runtime | Float | Read-only | |
| 0x50 and 0x51 | 80 and 81 | Voltage between phase 1 and 2 | Float | Read-only | V |
| 0x52 and 0x53 | 82 and 83 | Voltage between phase 2 and 3 | Float | Read-only | V |
| 0x54 and 0x55 | 84 and 85 | Voltage between phase 1 and 3 | Float | Read-only | V |
| 0x68 and 0x69 | 104 and 105 | Input current | Float | Read-only | A |
| 0x6a and 0x6b | 106 and 107 | Instantaneous power consumption | Float | Read-only | kW |
| 0x6c and 0x6d | 108 and 109 | Electrical power consumed | Float | Read-only | kWh |
| 0x6e | 110 | No. of days before F gas tightness check | Decimal | Read-only | |
| 0x6f | 111 | No. of days or hours before maintenance | Decimal | Read-only | |
| **Registers accessible in read mode (Functions 3 or 4) and write mode (Function 16)** | | | | | |
| 0x101 and 0x102 | 257 and 258 | P121 Cooling setpoint 1 | Float | Read/Write | |
| 0x103 and 0x104 | 259 and 260 | P122 Cooling setpoint 2 | Float | Read/Write | |
| 0x105 and 0x106 | 261 and 262 | P123 Heating setpoint 1 | Float | Read/Write | |
| 0x107 and 0x108 | 263 and 264 | P124 Heating setpoint 2 | Float | Read/Write | |
| 0x109 and 0x10a | 265 and 266 | P125,1 Setpoint for 4 mA in cooling mode | Float | Read/Write | |
| 0x10b and 0x10c | 267 and 268 | P125,2 Setpoint for 4 mA in heating mode | Float | Read/Write | |
| 0x10d and 0x10e | 269 and 270 | P126,1 Setpoint for 20 mA in cooling mode | Float | Read/Write | |
| 0x10f and 0x110 | 271 and 272 | P126,2 Setpoint for 20 mA in heating mode | Float | Read/Write | |
| 0x116 | 278 | P910 Maintenance check reminder | Decimal | Read/Write | |
| 0x117 | 279 | P911 Maintenance check frequency | Usi | Read/Write | Hours if P910 is in hours Months if P910 is in months |
| **Registers accessible in read mode (Functions 3 or 4) and write mode (Functions 6 or 16)** | | | | | |
| 0x200 | 512 | Year | Decimal | Read/Write | 0 to 99 |
| 0x201 | 513 | Month | Decimal | Read/Write | 1 to 12 |
| 0x202 | 514 | Day of the month | Decimal | Read/Write | 1 to 31 |
| 0x203 | 515 | Day of the week | Decimal | Read/Write | 1 to 7 (1: Monday, 2: Tuesday, etc.) |
| 0x204 | 516 | Hour | Decimal | Read/Write | 0 to 23 |
| 0x205 | 517 | Minutes | Decimal | Read/Write | 0 to 59 |

## 30.2 - Customer access bits

| Hexadecimal bit No. | Bit No. decimal | Description | Type | |
|---|---|---|---|---|
| **Read-only bit (functions 1 or 2)** |
| 0x01 | 1 | P103 Control type | Read-only | 0: Local, 1: Remote |
| 0x02 | 2 | Operating summary (On/Off and automatic operation input closed) | Read-only | 1 = On |
| 0x03 | 3 | State of pump 1 output | Read-only | 1 = On |
| 0x04 | 4 | State of pump 2 output | Read-only | 1 = On |
| 0x05 | 5 | Output state, stage 1, circuit 1 | Read-only | 1 = on |
| 0x06 | 6 | Output state, stage 2, circuit 1 | Read-only | 1 = On |
| 0x07 | 7 | Output state, stage 1, circuit 2 | Read-only | 1 = On |
| 0x08 | 8 | Output state, stage 2, circuit 2 | Read-only | 1 = On |
| 0x09 | 9 | State of auxiliary electric heater 1 or boiler | Read-only | 1 = On |
| 0x0a | 10 | State of auxiliary electric heater 2 | Read-only | 1 = On |
| 0x0b | 11 | State of auxiliary electric heater 3 | Read-only | 1 = On |
| 0x0c | 12 | State of auxiliary electric heater 4 | Read-only | 1 = On |
| 0x0d to 0x0f reserved |
| 0x10 | 16 | General fault summary (1 fault below present) | Read-only | 1 = Fault |
| 0x11 | 17 | Phase controller fault | Read-only | 1 = Fault |
| 0x12 | 18 | Water flow fault | Read-only | 1 = Fault |
| 0x13 | 19 | Pump 1 fault | | |
| 0x14 | 20 | Pump 2 fault | Read-only | 1 = Fault |
| 0x15 | 21 | Pump fault, 1 loop | Read-only | 1 = Fault |
| 0x16 | 22 | Pump fault, 2 loops | Read-only | 1 = Fault |
| 0x17 | 23 | Heat exchanger inlet sensor fault | Read-only | 1 = Fault |
| 0x18 | 24 | Heat exchanger outlet sensor fault | Read-only | 1 = Fault |
| 0x19 | 25 | Outdoor temperature sensor fault | Read-only | 1 = Fault |
| 0x1a | 26 | Condenser sensor fault | Read-only | 1 = Fault |
| 0x1b | 27 | Manifold outlet sensor fault | Read-only | 1 = Fault |
| 0x1c | 28 | Fan fault | Read-only | 1 = Fault |
| 0x1d | 29 | EEPROM FAULT | Read-only | 1 = Fault |
| 0x1e | 30 | Inlet loop fault sensor (MULTI CHILLER/HEAT PUMP controller) | Read-only | 1 = Fault |
| 0x1f | 31 | Outlet loop fault sensor (MULTI CHILLER/HEAT PUMP controller) | Read-only | 1 = Fault |
| 0x20 | 32 | AÉRO controller link fault | Read-only | 1 = Fault |
| 0x21 | 33 | Outdoor temperature too high in cooling mode | Read-only | 1 = Fault |
| 0x22 | 34 | Change of operating mode fault | Read-only | 1 = Fault |
| 0x23 | 35 | Winter protection | Read-only | 1 = Fault |
| 0x24 | 36 | Exchanger ambient sensor fault | Read-only | 1 = Fault |
| 0x25 to 0x3f reserved |
| 0x40 | 64 | Circuit 1 fault summary | Read-only | 1 = Fault |
| 0x41 | 65 | Stage 1, circuit 1 fault | Read-only | 1 = Fault |
| 0x42 | 66 | Stage 2, circuit 1 fault | Read-only | 1 = Fault |
| 0x43 | 67 | Manual HP fault, circuit 1 | Read-only | 1 = Fault |
| 0x44 | 68 | HP fault, circuit 1 pressure sensor | Read-only | 1 = Fault |
| 0x45 | 69 | Circuit 1 LP fault | Read-only | 1 = Fault |
| 0x46 | 70 | Water frosting fault, circuit 1 | Read-only | 1 = Fault |
| 0x47 | 71 | Refrigerant frosting fault, circuit 1 | Read-only | 1 = Fault |
| 0x48 | 72 | Exchanger frosting fault, circuit 1 | Read-only | 1 = Fault |
| 0x49 | 73 | Discharge fault, stage 1, circuit 1 | Read-only | 1 = Fault |
| 0x4a | 74 | Discharge fault, stage 2, circuit 1 | Read-only | 1 = Fault |
| 0x4b | 75 | Defrosting fault, circuit 1 | Read-only | 1 = Fault |
| 0x4c | 76 | Expansion valve fault, circuit 1 | Read-only | 1 = Fault |
| 0x4d | 77 | Stepper motor fault, circuit 1 expansion valve | Read-only | 1 = Fault |
| 0x4e | 78 | Low superheat fault, circuit 1 | Read-only | 1 = Fault |
| 0x4f | 79 | High superheat fault, circuit 1 | Read-only | 1 = Fault |
| 0x50 | 80 | VCM module fault, expansion valve 1 | Read-only | 1 = Fault |
| 0x51 | 81 | Exchanger outlet sensor fault, circuit 1 | Read-only | 1 = Fault |

| Hexadecimal bit No. | Bit No. decimal | Description | Type | |
|---|---|---|---|---|
| 0x52 | 82 | Exchanger freon sensor fault, circuit 1 | Read-only | 1 = Fault |
| 0x53 | 83 | Sensor fault, coil A, circuit 1 | Read-only | 1 = Fault |
| 0x54 | 84 | Sensor fault, coil B, circuit 1 | Read-only | 1 = Fault |
| 0x55 | 85 | Sensor fault, coil C, circuit 1 | Read-only | 1 = Fault |
| 0x56 | 86 | Sensor fault, coil D, circuit 1 | Read-only | 1 = Fault |
| 0x57 | 87 | Discharge sensor fault, stage 1, circuit 1 | Read-only | 1 = Fault |
| 0x58 | 88 | Discharge sensor fault, stage 2, circuit 1 | Read-only | 1 = Fault |
| 0x59 | 89 | Circuit 1 HP sensor fault | Read-only | 1 = Fault |
| 0x5a | 90 | Circuit 1 LP sensor fault | Read-only | 1 = Fault |
| 0x5b | 91 | Circuit 1 suction sensor fault | Read-only | 1 = Fault |
| 0x5c | 92 | Circuit 1 liquid sensor fault | Read-only | 1 = Fault |
| 0x5d | 93 | Circuit 1 exp. valve board link fault | Read-only | 1 = Fault |
| 0x5e | 94 | Link fault, additional board for reversible | Read-only | 1 = Fault |
| 0x5f | 95 | Tsat discharge fault, Inverter compressor | Read-only | 1 = Fault |
| 0x60 | 96 | Mechanical fault, Inverter compressor | Read-only | 1 = Fault |
| | | 0x61 to 0x7f reserved | | |
| 0x80 | 128 | Load shedding, stage 1, circuit 1 | Read-only | 1 = Load shedding |
| 0x81 | 129 | Load shedding, stage 2, circuit 1 | Read-only | 1 = Load shedding |
| | | 0x82 to 0x9f reserved | | |
| 0x100 | 256 | Circuit 2 fault summary | Read-only | 1 = Fault |
| 0x101 | 257 | Stage 1, circuit 2 fault | Read-only | 1 = Fault |
| 0x102 | 258 | Stage 2, circuit 2 fault | Read-only | 1 = Fault |
| 0x103 | 259 | Manual HP fault, circuit 2 | Read-only | 1 = Fault |
| 0x104 | 260 | HP fault, circuit 2 pressure sensor | Read-only | 1 = Fault |
| 0x105 | 261 | Circuit 2 LP fault | Read-only | 1 = Fault |
| 0x106 | 262 | Water frosting fault, circuit 2 | Read-only | 1 = Fault |
| 0x107 | 263 | Refrigerant frosting fault, circuit 2 | Read-only | 1 = Fault |
| 0x108 | 264 | Exchanger frosting fault, circuit 2 | Read-only | 1 = Fault |
| 0x109 | 265 | Discharge fault, stage 1, circuit 2 | Read-only | 1 = Fault |
| 0x10a | 266 | Discharge fault, stage 2, circuit 2 | Read-only | 1 = Fault |
| 0x10b | 267 | Defrosting fault, circuit 2 | Read-only | 1 = Fault |
| 0x10c | 268 | Expansion valve fault, circuit 2 | Read-only | 1 = Fault |
| 0x10d | 269 | Stepper motor fault, circuit 2 expansion valve | Read-only | 1 = Fault |
| 0x10e | 270 | Low superheat fault, circuit 2 | Read-only | 1 = Fault |
| 0x10f | 271 | High superheat fault, circuit 2 | Read-only | 1 = Fault |
| 0x110 | 272 | VCM module fault, expansion valve 2 | Read-only | 1 = Fault |
| 0x111 | 273 | Exchanger outlet sensor fault, circuit 2 | Read-only | 1 = Fault |
| 0x112 | 274 | Exchanger freon sensor fault, circuit 2 | Read-only | 1 = Fault |
| 0x113 | 275 | Sensor fault, coil A, circuit 2 | Read-only | 1 = Fault |
| 0x114 | 276 | Sensor fault, coil B, circuit 2 | Read-only | 1 = Fault |
| 0x115 | 277 | Sensor fault, coil C, circuit 2 | Read-only | 1 = Fault |
| 0x116 | 278 | Sensor fault, coil D, circuit 2 | Read-only | 1 = Fault |
| 0x117 | 279 | Stage 1, circuit 2 discharge sensor fault | Read-only | 1 = Fault |
| 0x118 | 280 | Stage 2, circuit 2 discharge sensor fault | Read-only | 1 = Fault |
| 0x119 | 281 | Circuit 2 HP sensor fault | Read-only | 1 = Fault |
| 0x11a | 282 | Circuit 2 LP sensor fault | Read-only | 1 = Fault |
| 0x11b | 283 | Circuit 2 suction sensor fault | Read-only | 1 = Fault |
| 0x11c | 284 | Circuit 2 liquid sensor fault | Read-only | 1 = Fault |
| 0x11d | 285 | Circuit 2 exp. valve board link fault | Read-only | 1 = Fault |
| 0x11e | 286 | Link fault, additional board for reversible | Read-only | 1 = Fault |
| | | 0x11f to 0x13f reserved | | |
| 0x140 | 320 | Load shedding, stage 1, circuit 2 | Read-only | 1 = Load shedding |
| 0x141 | 321 | Load shedding, stage 2, circuit 2 | Read-only | 1 = Load shedding |
| 0x142 | 322 | Fgas maintenance to be performed | Read-only | 1 = Maintenance required |
| 0x143 | 323 | Fgas maintenance fault | Read-only | 1 = Fault |
| 0x144 | 324 | Maintenance to be performed | Read-only | 1 = Maintenance required |
| 0x145 | 325 | Maintenance fault | Read-only | 1 = Fault |

| Hexadecimal bit No. | Bit No. decimal | Description | Type | |
|---|---|---|---|---|
| **Read (Functions 1 or 2) and write (Functions 5 or 15) bit** | | | | |
| 0x200 | 512 | On/Off | Read/Write | 1 = On |
| 0x201 | 513 | Control set to setpoint 1 or 2 | Read/Write | 1 = Control set to setpoint 2 |
| 0x202 | 514 | Heating or cooling operation | Read/Write | 1 = Heating |
| 0x203 | 515 | Load shedding via Modbus, stage 1, circuit 1 (different from 0 x 140) | Read/Write | 1 = Off |
| 0x204 | 516 | Load shedding via Modbus, stage 2, circuit 1 | Read/Write | 1 = Off |
| 0x205 | 517 | Load shedding via Modbus, stage 1, circuit 2 | Read/Write | 1 = Off |
| 0x206 | 518 | Load shedding via Modbus, stage 2, circuit 2 | Read/Write | 1 = Off |
| **Read bit (Functions 1 or 2)  → Available with versions 09.00 and higher** | | | | |
| 0x220 | 544 | On/Off summary (1 = keypad on/off = 1 and all automaic operation controls closed and no oil warm-up time and no faults) | Read-only | |
| 0x221 | 545 | 1 = Cooling possible | Read-only | |
| 0x222 | 546 | 1 = Heating possible | Read-only | |
| 0x223 | 547 | 1 = 1 stage on | Read-only | |
| 0x224 | 548 | 1 = Maximum available power reached | Read-only | |
| 0x225 | 549 | 1 = A major fault preventing output has occurred | Read-only | |
| 0x226 | 550 | 1 = A reset fault has occurred but output is possible | Read-only | |
| 0x227 | 551 | 1 = A fault requiring servicing has occurred | Read-only | |

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