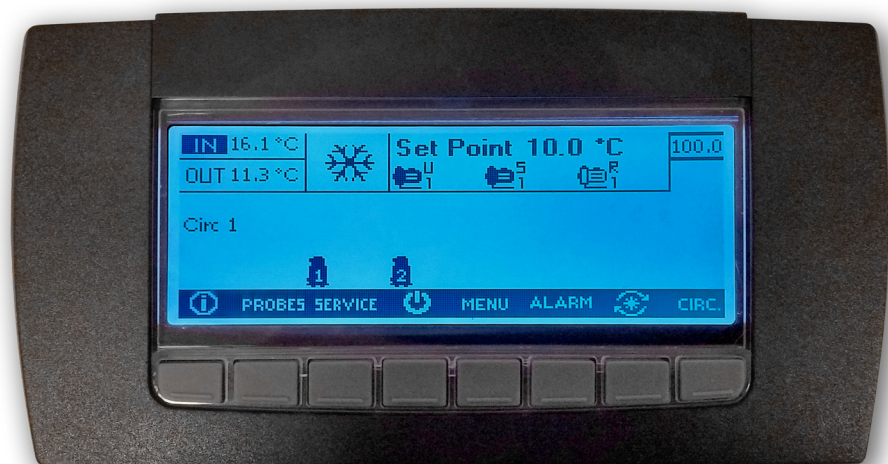


# Controller manual

EN

## Service

10-06-2024



### Series:

Sigma Sky

Sigma Zero

Tetris W Rev

Titan W Sky



**BlueBox**   
by Swegon

---

**Page intentionally blank**

---

# Contents

|          |                                                                          |           |
|----------|--------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Introduction</b>                                                      | <b>9</b>  |
| 1.1      | General                                                                  | 9         |
| 1.1.1    | <i>Purpose of the manual</i>                                             | 9         |
| 1.1.2    | <i>IPG315D controller functions</i>                                      | 9         |
| 1.1.3    | <i>Recommendations for digital security</i>                              | 9         |
| 1.2      | Digital Services                                                         | 10        |
| 1.2.4    | <i>Product data sheet Digital Services</i>                               | 10        |
| 1.3      | "Service" branch                                                         | 12        |
| 1.3.1    | <i>Programming the Parameters</i>                                        | 13        |
| 1.3.2    | <i>Compressors</i>                                                       | 14        |
| 1.3.3    | <i>Auxiliary heating</i>                                                 | 14        |
| 1.3.4    | <i>Water pumps</i>                                                       | 14        |
| 1.3.5    | <i>"Control panel"</i>                                                   | 15        |
| 1.3.6    | <i>Status of inputs and outputs</i>                                      | 15        |
| <b>2</b> | <b>Software functions</b>                                                | <b>17</b> |
| 2.1      | Unit ON/OFF function management                                          | 17        |
| 2.2      | Set point management                                                     | 18        |
| 2.2.1    | <i>Dynamic Set Point</i>                                                 | 18        |
| 2.2.2    | <i>Dynamic set point from external air probe</i>                         | 19        |
| 2.2.3    | <i>Dynamic set point from signal</i>                                     | 21        |
| 2.2.4    | <i>Dynamic set point from digital input (dual set point)</i>             | 22        |
| 2.3      | Energy Trend                                                             | 23        |
| 2.3.5    | <i>Logs</i>                                                              | 24        |
| 2.4      | Smart Grid ready                                                         | 26        |
| 2.4.1    | <i>Enable</i>                                                            | 26        |
| 2.4.2    | <i>Operating mode 1</i>                                                  | 26        |
| 2.4.3    | <i>Operating mode 2</i>                                                  | 27        |
| 2.4.4    | <i>Operating mode 3</i>                                                  | 27        |
| 2.4.5    | <i>Operating mode 4</i>                                                  | 27        |
| 2.4.6    | <i>References on user interface</i>                                      | 28        |
| 2.5      | Swegon Inside                                                            | 29        |
| 2.6      | Thermoregulation                                                         | 30        |
| 2.6.1    | <i>Proportional inlet control</i>                                        | 30        |
| 2.6.2    | <i>Outlet control with neutral zone and PID</i>                          | 32        |
| 2.7      | Time bands                                                               | 34        |
| 2.7.1    | <i>General</i>                                                           | 34        |
| 2.7.2    | <i>Time band-based switch-off</i>                                        | 34        |
| 2.7.3    | <i>Energy saving</i>                                                     | 35        |
| 2.8      | Limitation of refrigeration capacity                                     | 36        |
| 2.8.1    | <i>Limitation of refrigeration capacity from pressure probe</i>          | 37        |
| 2.8.2    | <i>Limitation of refrigeration capacity from amperometric transducer</i> | 39        |
| 2.8.3    | <i>Limitation of refrigeration capacity from digital input</i>           | 40        |
| 2.8.4    | <i>Limitation of refrigeration capacity from BMS</i>                     | 40        |

|        |                                                                   |    |
|--------|-------------------------------------------------------------------|----|
| 2.9    | Circuits and compressors                                          | 41 |
| 2.9.1  | <i>Starting and stopping of the compressors</i>                   | 41 |
| 2.9.2  | <i>Activation of the compressors between the circuits</i>         | 42 |
| 2.9.3  | <i>Balance sequence criteria</i>                                  | 42 |
| 2.9.4  | <i>Saturation sequence criteria</i>                               | 42 |
| 2.9.5  | <i>Capacity balancing principle</i>                               | 43 |
| 2.9.6  | <i>Capacity saturation principle</i>                              | 43 |
| 2.10   | Source-side heat exchanger management                             | 44 |
| 2.10.1 | <i>Modulating signal</i>                                          | 45 |
| 2.10.2 | <i>Management of the analogue output for the modulating valve</i> | 45 |
| 2.11   | User-side pumps                                                   | 47 |
| 2.11.1 | <i>Management of unit without pumps or with one pump</i>          | 48 |
| 2.11.2 | <i>Management of 2 pumps</i>                                      | 49 |
| 2.11.3 | <i>Management of the pumps in antifreeze function</i>             | 51 |
| 2.11.4 | <i>Pulse Function</i>                                             | 52 |
| 2.11.5 | <i>Pump alarms</i>                                                | 53 |
| 2.12   | User-side pump                                                    | 54 |
| 2.13   | Source-side pumps                                                 | 55 |
| 2.13.1 | <i>Management of unit without pumps or with one pump</i>          | 55 |
| 2.13.2 | <i>Management of 2 pumps</i>                                      | 56 |
| 2.13.3 | <i>Management of the pumps in antifreeze function</i>             | 58 |
| 2.13.4 | <i>Source-side pump alarms</i>                                    | 59 |
| 2.14   | Heat recovery pumps                                               | 60 |
| 2.14.1 | <i>Management of one or two heat recovery pumps</i>               | 60 |
| 2.14.2 | <i>Heat recovery pump alarms</i>                                  | 60 |
| 2.15   | Liquid injection valve                                            | 62 |
| 2.16   | Oil return                                                        | 63 |
| 2.16.1 | <i>Oil return for on-off compressors connected in parallel</i>    | 63 |
| 2.17   | Heat recovery                                                     | 65 |
| 2.17.1 | <i>Enabling and activation of recovery</i>                        | 65 |
| 2.17.2 | <i>Recovery management</i>                                        | 66 |
| 2.17.3 | <i>Recovery alarms</i>                                            | 67 |
| 2.18   | Desuperheater                                                     | 68 |
| 2.18.1 | <i>Desuperheater activation</i>                                   | 68 |
| 2.18.2 | <i>Desuperheater management</i>                                   | 69 |
| 2.19   | Antifreeze control in recovery system/desuperheater               | 70 |
| 2.19.1 | <i>Antifreeze control in recovery system/desuperheater</i>        | 70 |
| 2.19.2 | <i>Management of the pumps in antifreeze function</i>             | 71 |
| 2.20   | Pump down                                                         | 72 |
| 2.20.1 | <i>Pump down during switch-off</i>                                | 72 |
| 2.20.2 | <i>Pump down alarms</i>                                           | 73 |
| 2.21   | Refrigerant leak detector management                              | 74 |
| 2.21.1 | <i>Function management</i>                                        | 74 |
| 2.21.2 | <i>Password-protected counter reset</i>                           | 75 |
| 2.22   | Refrigerant leak detection management                             | 76 |

|        |                                                                                 |     |
|--------|---------------------------------------------------------------------------------|-----|
| 2.22.1 | <i>Stop due to refrigerant leak</i>                                             | 76  |
| 2.22.2 | <i>Refrigerant leak warning</i>                                                 | 76  |
| 2.22.3 | <i>Refrigerant leak alarms</i>                                                  | 77  |
| 2.23   | <b>Anti-freeze heaters</b>                                                      | 78  |
| 2.23.1 | <i>Heater set point and differential</i>                                        | 78  |
| 2.23.2 | <i>Reference probe</i>                                                          | 79  |
| 2.24   | <b>Auxiliary heating</b>                                                        | 80  |
| 2.24.1 | <i>Conditions as the air temperature changes</i>                                | 80  |
| 2.24.2 | <i>Auxiliary heating with the same set point as operation in heat pump mode</i> | 81  |
| 2.24.3 | <i>Auxiliary heating with set point linked to operation in heat pump mode</i>   | 82  |
| 2.24.4 | <i>Auxiliary heating with independent set point</i>                             | 83  |
| 2.25   | <b>"ACS" function</b>                                                           | 84  |
| 2.25.1 | <i>General</i>                                                                  | 84  |
| 2.25.2 | <i>Enable/Disable buttons and view pages</i>                                    | 86  |
| 2.25.3 | <i>Changes in operation</i>                                                     | 86  |
| 2.25.4 | <i>"ACS" temperature regulation</i>                                             | 89  |
| 2.25.5 | <i>Forced exit from "ACS"</i>                                                   | 91  |
| 2.25.6 | <i>Time bands for "ACS" function</i>                                            | 92  |
| 2.25.7 | <i>Max. setpoint compensation in heating mode</i>                               | 93  |
| 2.25.8 | <i>Heater management</i>                                                        | 94  |
| 2.25.9 | <i>Anti legionella cycle</i>                                                    | 95  |
| 2.26   | <b>Flowzer</b>                                                                  | 97  |
| 2.26.1 | <i>General</i>                                                                  | 99  |
| 2.26.2 | <i>"VP" function</i>                                                            | 99  |
| 2.26.3 | <i>"DT" function</i>                                                            | 100 |
| 2.26.4 | <i>"VDE" function</i>                                                           | 103 |
| 2.26.5 | <i>"VD" function</i>                                                            | 104 |
| 2.26.6 | <i>"VFPP" function</i>                                                          | 105 |
| 2.26.7 | <i>"VPS" function</i>                                                           | 107 |
| 2.27   | <b>SMART Link</b>                                                               | 109 |
| 2.27.1 | <i>Parametrization of the controller</i>                                        | 109 |
| 2.27.2 | <i>Serial connection</i>                                                        | 110 |
| 2.28   | <b>SMARTLink +</b>                                                              | 111 |
| 2.28.1 | <i>Serial connection</i>                                                        | 111 |
| 2.28.2 | <i>Function activation</i>                                                      | 111 |
| 2.28.3 | <i>Determination of operating mode (only for heat pump units)</i>               | 114 |
| 2.28.4 | <i>Setpoint calculation</i>                                                     | 114 |
| 2.29   | <b>Energy meter</b>                                                             | 115 |
| 2.29.1 | <i>Viewing of measured parameters</i>                                           | 115 |
| 2.29.2 | <i>Limitation of absorbed current using "Energy meter"</i>                      | 116 |
| 2.30   | <b>Reversal of operation on the water</b>                                       | 117 |
| 2.30.1 | <i>Pumps between the valves and the heat exchangers</i>                         | 117 |
| 2.30.2 | <i>Valves between the pumps and the heat exchangers</i>                         | 118 |
| 2.31   | <b>Electronic expansion valve</b>                                               | 120 |
| 2.31.1 | <i>Superheating management</i>                                                  | 121 |
| 2.31.2 | <i>Control in high superheating conditions</i>                                  | 121 |
| 2.31.3 | <i>Control in low superheating conditions</i>                                   | 122 |
| 2.31.4 | <i>Control in MOP conditions</i>                                                | 122 |

|          |                                                                |            |
|----------|----------------------------------------------------------------|------------|
| 2.31.5   | Control in LOP conditions                                      | 123        |
| <b>3</b> | <b>Alarms</b>                                                  | <b>124</b> |
| 3.1      | Introduction                                                   | 124        |
| 3.1.1    | Automatic/Manual procedure and alarm reset                     | 124        |
| 3.2      | Unit alarms                                                    | 125        |
| 3.2.1    | Flow switch alarm                                              | 125        |
| 3.2.2    | Source-side flow switch alarm                                  | 127        |
| 3.2.3    | Antifreeze alarms                                              | 128        |
| 3.2.4    | Source-side antifreeze alarms                                  | 130        |
| 3.2.5    | Low incoming water temperature alarm                           | 131        |
| 3.2.6    | High incoming water temperature alarm                          | 131        |
| 3.2.7    | Wrong phase sequence alarm                                     | 132        |
| 3.2.8    | Maximum/minimum voltage alarm                                  | 132        |
| 3.2.9    | Alarms for expansion modules not connected                     | 133        |
| 3.2.10   | Flowzer VFPP-VPS alarm                                         | 133        |
| 3.2.11   | Energy meter alarm                                             | 133        |
| 3.2.12   | "RTC" clock alarm                                              | 134        |
| 3.2.13   | Internal memory alarm                                          | 134        |
| 3.3      | Function alarms                                                | 135        |
| 3.3.1    | Pump alarms                                                    | 135        |
| 3.3.2    | Recovery alarms                                                | 137        |
| 3.3.3    | Pump down alarms                                               | 137        |
| 3.3.4    | Refrigerant leak alarms                                        | 138        |
| 3.3.5    | Alarms concerning refrigerant leak detector sensor maintenance | 138        |
| 3.3.6    | Fast Restart alarms                                            | 139        |
| 3.3.7    | "ACS" alarms                                                   | 140        |
| 3.3.8    | Alarms relating to 2-zone function (GIT option)                | 142        |
| 3.3.9    | Tank thermoregulation alarms (TSS option)                      | 142        |
| 3.3.10   | Auxiliary heating alarm                                        | 142        |
| 3.4      | Circuit alarms                                                 | 143        |
| 3.4.1    | High-pressure alarms                                           | 143        |
| 3.4.2    | High discharge gas temperature alarm                           | 144        |
| 3.4.3    | Alarm for low difference between high and low pressure         | 145        |
| 3.4.4    | Probe low pressure alarm                                       | 146        |
| 3.4.5    | Forcing of capacity reduction from low pressure probe          | 147        |
| 3.4.6    | Forcing of capacity reduction from high pressure probe         | 148        |
| 3.4.7    | Low superheating alarm                                         | 149        |
| 3.4.8    | Expansion module XEV20D not connected alarm                    | 149        |
| 3.5      | Compressor alarms                                              | 150        |
| 3.5.1    | Compressor Overload Protection Alarm                           | 150        |
| 3.5.2    | Compressor maintenance alarm                                   | 150        |
| 3.6      | Probe error alarms                                             | 151        |
| 3.6.1    | Temperature probes                                             | 151        |
| 3.6.2    | Pressure probes                                                | 155        |
| 3.7      | System alarms                                                  | 158        |
| 3.7.1    | Alarms in Multilogic and Multifree systems                     | 158        |
| 3.7.2    | Alarms in systems with Smart Link+ function                    | 159        |
| 3.8      | Configuration alarms                                           | 160        |

|          |                                                                                                |            |
|----------|------------------------------------------------------------------------------------------------|------------|
| <b>4</b> | <b>FAQ</b>                                                                                     | <b>161</b> |
| 4.1      | Frequently Asked Questions                                                                     | 161        |
| 4.2      | Switching the unit on and off                                                                  | 161        |
| 4.2.1    | <i>Switch the unit on and off from the keypad</i>                                              | 161        |
| 4.2.2    | <i>Switch the unit on and off from external OK signal</i>                                      | 161        |
| 4.2.3    | <i>Switch the unit on and off from the BMS</i>                                                 | 161        |
| 4.3      | Changes in operation                                                                           | 161        |
| 4.3.1    | <i>Change of operating mode from cooling to heating from the keypad</i>                        | 161        |
| 4.3.2    | <i>Change of operating mode from heating to cooling and vice versa from external OK signal</i> | 161        |
| 4.3.3    | <i>Change of operating mode from heating to cooling and vice versa from the BMS</i>            | 162        |
| 4.4      | Changing the setpoint                                                                          | 162        |
| 4.4.1    | <i>Change of the set point in cooling operating mode from the keypad</i>                       | 162        |
| 4.4.2    | <i>Change of set point in heating operating mode from the keypad</i>                           | 162        |
| 4.4.3    | <i>Change of set point in heating operating mode from the BMS</i>                              | 162        |
| 4.4.4    | <i>Change of the second set point in cooling operating mode from the keypad</i>                | 162        |
| 4.4.5    | <i>Change of the second set point in heating operating mode from the keypad</i>                | 162        |
| 4.4.6    | <i>Change of the set point from external OK signal</i>                                         | 162        |
| 4.4.7    | <i>Time band setup procedure</i>                                                               | 163        |
| 4.5      | Managing recovery                                                                              | 164        |
| 4.5.1    | <i>Activate and deactivate recovery from the keypad</i>                                        | 164        |
| 4.5.2    | <i>Activate and deactivate recovery from external OK signal</i>                                | 164        |
| 4.5.3    | <i>Change of the recovery set point from the keypad</i>                                        | 164        |
| 4.6      | "ACS" management                                                                               | 165        |
| 4.6.1    | <i>Switch the "ACS" on and off using the keypad.</i>                                           | 165        |
| 4.6.2    | <i>Switch the air conditioning system on and off using the keypad.</i>                         | 165        |
| 4.6.3    | <i>Switch the "ACS" on and off by means of an external OK signal.</i>                          | 165        |
| 4.6.4    | <i>Switch the air conditioning system on and off by means of an external OK signal.</i>        | 165        |
| 4.6.5    | <i>Editing "ACS" setpoint</i>                                                                  | 165        |
| 4.7      | Management from BMS                                                                            | 166        |
| 4.7.1    | <i>RS485 serial connection</i>                                                                 | 166        |
| 4.7.2    | <i>RS485 serial line</i>                                                                       | 166        |
| 4.7.3    | <i>Enable ON/OFF from the BMS</i>                                                              | 166        |
| 4.7.4    | <i>Enable the change of operating mode from the BMS</i>                                        | 167        |
| 4.7.5    | <i>Enable the change of set point from the BMS</i>                                             | 167        |
| 4.7.6    | <i>Enable the change of operating mode from I/O</i>                                            | 167        |
| 4.7.7    | <i>Change of the settings of the "BMS" serial communication</i>                                | 167        |
| 4.8      | Resetting of partial counters                                                                  | 168        |
| 4.8.1    | <i>Resetting the compressor hours of operation and starts</i>                                  | 168        |
| 4.8.2    | <i>Resetting the number of starts of the compressors</i>                                       | 168        |
| 4.8.3    | <i>Resetting of the number of hours of operation of the pumps</i>                              | 169        |
| 4.9      | Controller functions                                                                           | 170        |
| 4.9.1    | <i>Updating the time and date of the controller</i>                                            | 170        |
| 4.9.2    | <i>Changing the IP addresses</i>                                                               | 170        |
| 4.9.3    | <i>Recovery of the "Service" password</i>                                                      | 170        |
| 4.10     | Replacements                                                                                   | 171        |
| 4.10.1   | <i>Replacing the electronic expansion valve driver</i>                                         | 171        |

---

|        |                                                            |     |
|--------|------------------------------------------------------------|-----|
| 4.11   | WEB pages                                                  | 172 |
| 4.11.1 | Access to controller WEB pages                             | 172 |
| 4.11.2 | Where to find the controller “MAC address”                 | 172 |
| 4.12   | Swegon Inside                                              | 173 |
| 4.12.1 | The unit can be connected to Swegon INSIDE.                | 173 |
| 4.12.2 | How to access the Swegon INSIDE screens in the unit        | 173 |
| 4.12.3 | How to enable/disable Swegon INSIDE                        | 173 |
| 4.12.4 | How to view the certificate expiry date                    | 174 |
| 4.12.5 | Validity of ID certificate for connection to Swegon INSIDE | 174 |
| 4.12.6 | What to do if the ID certificate has expired or is missing | 175 |
| 4.12.7 | How to gain access to the Swegon INSIDE portal             | 176 |
| 4.12.8 | Information displayed in the Swegon INSIDE portal          | 177 |

---

# 1 INTRODUCTION

---

## 1.1 General

---

Some information on the use of this manual.

### 1.1.1 Purpose of the manual

The purpose of this manual is to provide all information regarding the software functions of the controller for the units listed on the cover and it is complementary to the controller installation and programming manual.

This manual is the “SERVICE” version, that is, it is intended only for after-sales service technicians and Factory technicians. Information regarding installation of the units and relevant tests and checks for the first starting is not given in this manual. It is taken for granted that the unit has been installed correctly, the tests and checks prior to start-up have been carried out and that routine maintenance is carried out, according to the information given in the “Installation, operation and maintenance” manual for the units.

We thank in advance all those who will wish to let us know of any errors, omissions, sections requiring further explanation or operations that have not been included.

### 1.1.2 IPG315D controller functions

The software application for the electronic microprocessor controller of the iPro IPG315D series was designed to manage refrigerant units and heat pumps.

Through appropriate configuration, this gives the possibility of managing a wide range of units with relevant specific functionalities.

By management of refrigerant units we mean safe control of operation of their component parts, during their various operating stages.

There are various sizes of modules in the iPro electronic microprocessor controller family. Through flexibility of the software, this allows their use to be optimized by using those that have the necessary number of inputs and outputs for each application.

The IPG315D board is connected to the various modules and communicates with them through a high speed, highly reliable field bus.

The user interface of the controller is a graphic LCD display having 8 multifunction buttons.

### 1.1.3 Recommendations for digital security

This unit is designed for connection to an Ethernet network.

Unit networking must be implemented by technicians who can take the appropriate security measures required to prevent system violations.

In particular:

- We recommend that access to the unit controller be restricted to the network inside the organization. System exposure to the Internet is strongly not recommended.
- If remote access is required, the connection must be encrypted via SSL/TLS or VPN and through a firewall configuration within the internal IT environment.
- The authorization to use a remote access must only be granted to equipment that the organization has supplied and approved, as specified in the previous item.

---

## 1.2 Digital Services

The information below is referred to the units controlled by advanced controllers, set up for connection to Swegon cloud services.

### 1.2.4 Product data sheet Digital Services

#### 1.2.4.1 Connectivity

The product is equipped with functionality that, when enabled, will connect to the Swegon INSIDE Cloud when given access to the internet. Such connection is made either through the building's local internet access point or by using a supplied modem. When connecting through the building's internet access point, the local firewall must be configured to allow traffic according to the firewall settings.

The functionality is by default disabled and can be enabled in the product. By enabling this functionality the customer agrees to the general terms and conditions for Digital Service, DS-23.

The customer can disable the connection to the Swegon INSIDE Cloud in the product user interface at any time.

#### 1.2.4.2 Which data is sent

Through the connection to Swegon INSIDE Cloud, the product will exchange data to Swegon INSIDE Cloud about certain actions and parameter settings of the product. Each data point has different thresholds for when to send data to Swegon, therefore the data sent depends on the data point type and configuration. The data is sent in intervals, at which point the data is aggregated together with other data from that interval.

#### 1.2.4.3 Who has access to the data

The data sent to Swegon INSIDE Cloud is used by Swegon for purposes of performance, functionality and development of the product.

Consequently, Swegon has the right to use the data sent from all products connected to Swegon INSIDE Cloud.

The data is used in accordance with Swegon's DS-23 general terms and conditions, and our sales agreement with the customer.

#### 1.2.4.4 Requirements

To connect a product to Swegon INSIDE Cloud, a secure internet connection via the property's internal network or via Swegon's external modem is required.

In addition to a secure internet connection, a valid certificate for each individual product is also required to approve them to share data with INSIDE Cloud.

Some products will come with a valid certificate out of the factory, while other products need to be equipped with a certificate to authorize the product to share data.

**To find out if the product is INSIDE Ready (i.e. ready to share data) or not visit INSIDE Ready | [www.swegon.com](http://www.swegon.com).**

#### 1.2.4.5 Safety

The Swegon INSIDE product is connected to azure IoT Hub.

The connection uses MQTT and is secured using TLS and client certificates (MTLS). DigiCert is used as registration authority and key management.

DigiCert is used as registration authority and key management.

The Swegon cloud platform uses Azure SaaS offerings for hosting of applications and APIs.

Digital services communicate with Swegon Cloud using standard technologies such as Rest APIs and message Queues.

Users and authorization is handled by an internal identity provider.

#### 1.2.4.6 Firewall settings for Swegon Cloud

Swegon cloud solution is using Microsoft Azure services and certificates from DigiCert to secure the connection.

If the firewall in front of the products is allowing outbound traffic to internet it will work.

If the firewall is set up to control outbound traffic the following ports and destinations must be allowed.

If only filtering on ports, 443 and 8883 are used.

| Domain (including sub domain)                                                                                                      | Port     | Protocol   | Notes                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------|----------|------------|------------------------------------------------------------------------------------------|
| *.azure-devices-provisioning.net (dps-Swegon-Cloud-common-we.azure-devices-provisioning.net global.azure-devices-provisioning.net) | 443 8883 | https mqtt | Azure Device Provisioning Service                                                        |
| *.azure-devices.net (iot-SwegonCloud-prod-we.azure-devices.net)                                                                    | 443 8883 | https mqtt | Azure IoT Hub                                                                            |
| *.blob.core.windows.net (stswciotfilestorageprod.blob.core.windows.net)                                                            | 443      | https      | Azure storage                                                                            |
| clientauth.one.digicert.com                                                                                                        | 443      | https      | DigiCert Enrolment over Secure Transport (EST) for certificate enrolment and reenrolment |



Additional instructions on how to make the connection to **"Swegon INSIDE Cloud"** are available in the controller manual.

### 1.3 "Service" branch

In the "Service" branch, which is password-protected, access is gained to loops of screens are accessed for programming and managing the controller and the various functions present in the unit.

Login using personal credentials is necessary to browse password-protected menus. After login, it is possible to gain access to a protected menu for the following thirty minutes without having to enter the password again.

When access to a password-protected branch is activated, the symbol "**LOGOUT**" may appear on the bottom left-hand side of some screens.

When the "**LOGOUT**" button is clicked, the password must be entered again.

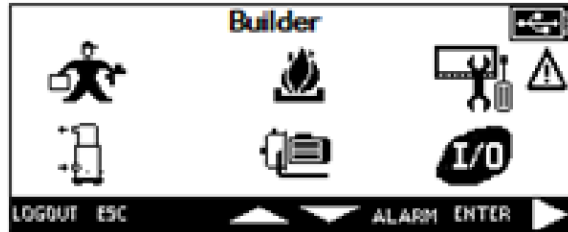


Fig. 1 "Service" screen

In the service branch, the loops of screens that allow access to the various functions are identified by the following icons:

-  branch of screens regarding the parameters for programming the functions of the unit;
-  or  branches of screens regarding management of the compressors;
-  branch of screens regarding management of auxiliary heating;
-  branch of screens regarding management of the pumps;
-  branch of screens regarding management of the files for programming and updates;
-  branch of screens regarding the status of the inputs and outputs of the controller.

The presence of icons is linked to the active functions in the controller.

To enter a branch of screens, with buttons  and  the selection is made, and is to be confirmed with button **ENTER**

### 1.3.1 Programming the Parameters



After selecting icon  and on confirming with button **ENTER** you will access a set of branches of screens for setting the parameters that regard the functions of the unit.

With buttons  and  you can scroll the individual branches, with buttons  and  you can go to the next or previous screen of the same branch.

The screens of the parameters of the selected branch are accessed with the enter button.

The following branches are present:

- "ST : Thermoregulation", in which the parameters of group "ST" are stored;
- "CF : Configuration", in which the parameters of group "CF" are located;
- "SP : Machine set-up", in which the parameters of group "SP" are located;
- "SD: Dynamic Setpoint", in which the parameters of group "SD" are stored;
- "ES : ES and automatic ON/OFF", in which the parameters of group "ES" are located;
- "AH: Auxiliary heating", in which the parameters of group "AH" are located;
- "CO : Compressor", in which the parameters of group "CO" are located;
- "SL : Stepless control", in which the parameters of group "SL" are located;
- "PA : Water pump", in which the parameters of group "PA" are located;
- "PD: Pump Down", in which the parameters of group "PD" are stored;
- "UN: Unloading", in which the parameters of group "UN" are stored;
- "FA : Ventilation", in which the parameters of group "FA" are located;
- "AR: Anti-freeze Heaters", in which the parameters of group "AR" are stored;
- "DF: Defrost", in which the parameters of group "DF" are stored;
- "RC: Heat Recovery", in which the parameters of group "RC" are stored;
- "FC : Free-cooling function", in which the parameters of group "FC" are located;
- "PAL : Alarm parameters", in which the parameters of group "PAL" are located;
- "ET: Electronic Valve", in which the parameters of group "ET" are stored;
- "CA : Calibration of analogue inputs", in which the parameters of group "CA" are located;
- "MS : Multilogic", in which the parameters of group "MS" are located;
- "MS\_FC : Multi Free", in which the parameters of group "MS\_FC" are located;
- "ENV : Envelope", in which the parameters of group "ENV" are stored;
- "ACS = Hot Sanitary Water" in which the parameters of the "ACS" unit are stored;
- "FMG: Flowzer", in which the parameters of group "FMG" are stored;
- "SML: SmartLink+", in which the parameters of group "SML" are stored;

Whereas the branches are always present in the menu, the parameters in them are linked to activation of the relevant function in the unit.

In each screen, when a parameter is selected, its description appears on the last line.

The parameters involved are shown in the descriptions of the functions.

### 1.3.2 Compressors



After selecting icon  and on confirming with button **ENTER** you will access the screens that allow you to activate and deactivate the individual compressors and reset the number of hours of operation and the number of starts.

In each screen, with buttons  and  you can go to the next or previous screen of the same loop.

In units with multi-compressor refrigerant circuits, with buttons  and  you can change the selection of the compressor. On reaching the last one, you will be taken to the next screen, whereas from the first you will be taken to the previous one.

With button **ENB/DIS** operation of the selected compressor is enabled or disabled.

With button **RESET HOURS** the partial hours of operation of the selected compressor are set to zero.

With button **RESET STARTS** the number of starts of the selected compressor is set to zero.

The compressors of one refrigerant circuit are present in each screen.

With button **ESC** you return to the previous menu.



Check that the compressor you want to work on is selected before pressing the buttons of the above functions.

### 1.3.3 Auxiliary heating



Icon  is present in the main screen of the "Service" branch only if management of it is included.

On selecting it and confirming with button **ENTER** you will access the screens where the main control parameters are summarized.

The parameters present depend on the operating mode set for auxiliary heating with the "AH" parameters of the "Parameter

Programming" branch that can be accessed from icon  that is also present in the main screen of the service branch

You can move around the screen with buttons  and , and using these buttons, you can change the value after selecting it with button **SET**.

With the same button **SET** the changed value should be confirmed.

With button **ESC** you will return to the main screen of the service branch.

### 1.3.4 Water pumps



Icon  is present in the main screen of the "Service" branch only if there is provision for management of at least one pump in the controller.

On selecting it and confirming with button **ENTER** you will access the screens that allow you to activate and deactivate the individual pumps and reset the number of hours of operation.

The number of screens making up the branch is linked to the number of pumps present in the unit.

In each screen, with buttons  and  you can go to the next or previous screen of the same branch.

With buttons  and  you can change the selection of the pump.

With button **ENB/DIS** operation of the selected pump is enabled or disabled.

With button **RESET HOURS** the partial hours of operation of the selected pump are set to zero.

With button **ESC** you return to the previous menu.

### 1.3.5 "Control panel"



After selecting icon  and on confirming with button **ENTER** you will access the "Control panel" screen in which there are controls for managing the programming files and the settings of the serial communication of the controller.

The functions of this branch are described in the "Control panel" chapter regarding installation of the software.

### 1.3.6 Status of inputs and outputs



After selecting icon  and on confirming with button **ENTER** you will access a set of branches of screens that allow you to see the status of the digital and analogue inputs and outputs of all the boards that manage the unit.

The following branches are present in the "I/O status" screen:

- "Analogue inputs";
- "Digital inputs";
- "Digital outputs";
- "Analogue outputs";

With buttons  and  you can scroll the individual branches, and on confirming with button **ENTER** you will access the relevant screens.

#### 1.3.6.1 "Analogue inputs"

In this set of screens, you can see the status of the analogue inputs.

The first screen shows the inputs of the Master board.

With buttons  and  you will access the screens where the analogue inputs of the expansion boards are shown.

With button **XEV** you will access the screens where the analogue inputs of the drivers that manage the expansion valves are shown.

For each input, there may be:

- The value read from the input;
- "N.C.", if the input is not configured via software;
- "N.P.", if the input is not present in the board;
- "ERR" if a sensor is not connected to the input or the sensor is not working;
- "ON", if the input is configured as digital and is closed;
- "OFF", if the input is configured as digital and is open;

Each input is identified with the prefix "Pb" that refers to the reference shown in the relevant board.

#### 1.3.6.2 "Digital inputs"

In this set of screens, you can see the status of the digital inputs.

The first screen shows the inputs of the Master board.

With buttons  and  you will access the screens where the digital outputs of the expansion boards are shown.

For each output, there may be:

- "Closed";
- "Open";
- "N.C.", if the input is not configured via software.

Each input is identified with the prefix "DI" that refers to the reference shown in the relevant board.

---

### 1.3.6.3 "Digital outputs"

In this set of screens, you can see the status of the digital outputs.

The first screen shows the outputs of the Master board.

With buttons ◀ and ▶ you will access the screens where the digital outputs of the expansion boards are shown.

For each output, there may be:

- "ON", if the output is closed;
- "OFF", if the output is open;
- "N.C.", if the output is not configured via software.

Each output is identified with the prefix "RL" that refers to the reference shown in the relevant board.

### 1.3.6.4 "Analogue outputs"

In this set of screens, you can see the status of the analogue outputs.

The first screen shows the outputs of the Master board.

With buttons ◀ and ▶ you will access the screens where the analogue outputs of the expansion boards are shown.

For each output, there may be:

- The value present on the output;
- "N.C.", if the output is not configured via software;
- "ON", if the output is configured as digital and is closed;
- "OFF", if the output is configured as digital and is open;

Each output is identified with the prefix "OUT" that refers to the reference shown in the relevant board.

---

## 2 SOFTWARE FUNCTIONS

---

For management of the units, special software is loaded into the controller.

The software consists of a combination of functions dedicated to the conditions in which the units may have to work.

The following chapters describe all the functions managed by the software, from common functions present in all units to functions dedicated to specific operations.



Some of the functions described here may be available only on specific versions or sizes, or according to the selected accessories.

### 2.1 Unit ON/OFF function management

---

The unit can be switched on and off using the keypad, with an external OK signal through a digital input, via a serial port from the BMS, or using the WEB pages.

The unit switch-on/off procedures are illustrated in the FAQ section.



The controller uses different procedures to manage the unit On-Off function, based on the control signal used.

After the unit receives the OK signal to get started, irrespective of its source, the controller enables the pump, where fitted, and thermoregulation, in accordance with the safety times of the compressors. The logics used to start the different components and the corresponding setup parameters are illustrated in the next chapters.

The unit stop procedure varies depending on the source of the stop control signal.

If the control signal is output by the user interface or via WEB pages, the controller instantly stops the compressors and the pump, if fitted, after a few seconds.

If the control signal is output by a digital input or via a serial port from the BMS, unit stopping is not instant. In this case, the controller starts a stopping procedure which consists in the completion of any active cycle, for instance completion of a de-frost cycle or the oil recovery procedure, in compliance with the safety times required for the switch-off of the compressors and the pump, if fitted.



If the unit switch-off signal comes from a digital input or from a serial port in the BMS, the unit will continue to operate for a few minutes, as is normal.

## 2.2 Set point management

The control set point mainly depends on parameters ST1 and ST4.

The relevant settable minimum and maximum setpoint parameters are shown below.

| Parameter | Min. | Max. | UM | Description                  |
|-----------|------|------|----|------------------------------|
| ST1       | ST2  | ST3  | °C | Chiller - Setpoint           |
| ST2       | -50  | ST3  | °C | Chiller - Minimum Setpoint   |
| ST3       | ST2  | 110  | °C | Chiller - Maximum Setpoint   |
| ST4       | ST5  | ST6  | °C | Heat Pump - Setpoint         |
| ST5       | -50  | ST6  | °C | Heat pump - Minimum Setpoint |
| ST6       | ST5  | 110  | °C | Heat Pump - Maximum Setpoint |

There are additional functions that allow an offset to be changed (added or subtracted) at these set point values.

If the Active Set Point in the chiller function is called SA\_CHILLER and the Active Set Point in the heat pump function is called SA\_HEATPUMP, we obtain:

- $SA\_CHILLER = ST1 + \text{DynamicSetPoint Offset} + \text{Energy\_Saving\_Offset}$ ;
- $SA\_HEATPUMP = ST4 + \text{DynamicSetPoint Offset} + \text{Energy\_Saving\_Offset}$ .



Even though, in the following descriptions of the various operations, ST1 and ST4 are shown as reference, the controller really uses the actual active set points "SA\_CHILLER" and "SA\_HEATPUMP".

If the calculated set point in chiller mode is lower than the minimum set point ST2, then SA\_CHILLER=ST2. The same applies if the set point is higher than the maximum set point in chiller mode: SA\_CHILLER=ST3.

If the calculated set point in heat pump mode is lower than the minimum set point ST5, then SA\_HEATPUMP =ST5. The same applies if the set point is higher than the maximum set point in heat pump mode: SA\_HEAT\_PUMP=ST6.

### 2.2.1 Dynamic Set Point

The dynamic set point is a function enabled by the manufacturer.

The reference parameters in managing the dynamic set point are described below.

| Parameter | Min | Max | UM | Description                                                                                 |
|-----------|-----|-----|----|---------------------------------------------------------------------------------------------|
| SD1       | 0   | 6   | -  | Dynamic Setpoint type                                                                       |
| SD2       | 0   | 2   | -  | States of the unit in which it is active                                                    |
| SD10      | 0   | 55  | °C | Outside air - Compensation Activation Temperature CH                                        |
| SD11      | 0   | 15  | °C | Outdoor temperature - Intervention band compensation in chiller mode                        |
| SD12      | -10 | 15  | °C | Outdoor temperature - Max increase/decrease setpoint in chiller mode                        |
| SD13      | -50 | 110 | °C | Dinamic Setpoint probe - Max increase/decrease setpoint in chiller mode                     |
| SD14      | ST2 | ST3 | °C | Dinamic setpoint Digital input - Setpoint active with remote digital in chiller mode        |
| SD20      | 0   | 55  | °C | Outside air - Compensation Activation Temperature HP                                        |
| SD21      | 0   | 15  | °C | Outdoor temperature - Intervention band compensation in heat pump mode                      |
| SD22      | -10 | 15  | °C | Outdoor temperature - Max increase/decrease setpoint in heat pump mode                      |
| SD23      | -50 | 110 | °C | Dinamic Setpoint probe - Max increase/decrease setpoint in heat pump mode                   |
| SD24      | ST5 | ST6 | °C | Dinamic setpoint Digital input - Setpoint active with remote digital open in heat pump mode |

Depending on parameter SD1, up to 6 types of dynamic set points can be managed:

- from external air probe;
- from 4-20mA signal;
- from 0-1V signal;
- from 0-10V signal;
- from 0-20mA signal;
- from digital input.

### 2.2.2 Dynamic set point from external air probe

To obtain the set point change from external air probe, it is necessary to have parameter SD1=1.

In chiller operating mode, the parameters involved are shown in the table.

| Parameter | Value | UM | Description                                                          |
|-----------|-------|----|----------------------------------------------------------------------|
| ST1       | 7     | °C | Chiller - Setpoint                                                   |
| SD1       | 1     | -  | Dynamic Setpoint type                                                |
| SD10      | 30    | °C | Outside air - Compensation Activation Temperature CH                 |
| SD11      | 5     | °C | Outdoor temperature - Intervention band compensation in chiller mode |
| SD12      | 5     | °C | Outdoor temperature - Max increase/decrease setpoint in chiller mode |

With reference to the values set in the table, this corresponds to the graphical representation of the set point change as regards the air temperature value shown in the figure.

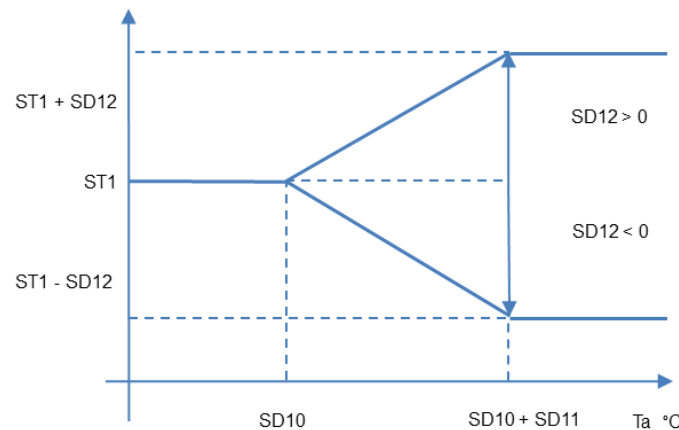


Fig. 2 Change in set point as the air temperature changes in chiller operating mode

**Where "Ta" is the value of the outside air temperature.**

The following is obtained:

- If the outside air temperature is  $< SD10$ , the offset value to add to ST1 is 0;
- If the outside air temperature is  $> SD10 + SD11$ , the offset value to add to ST1 is SD12;
- If the outside air temperature is  $\geq SD10$  and  $\leq SD10 + SD11$ , the offset value to add to ST1 can vary between 0 and SD12.

With the values in the table, the set point will be:

- $SA\_CHILLER = ST1 + 0.0 = 7.0^{\circ}\text{C}$ ;
- $SA\_CHILLER = ST1 + 5.0 = 12.0^{\circ}\text{C}$ ;
- $SA\_CHILLER = ST1 + (\text{from } 0.0 \text{ to } 5.0) = \text{from } 7.0^{\circ}\text{C} \text{ to } 12.0^{\circ}\text{C}$ .

In heat pump operating mode, the parameters involved are indicated in the table.

| Parameter | Value | UM | Description                                                            |
|-----------|-------|----|------------------------------------------------------------------------|
| ST4       | 40    | °C | Heat Pump - Setpoint                                                   |
| SD1       | 1     | -  | Dynamic Setpoint type                                                  |
| SD20      | 15    | °C | Outside air - Compensation Activation Temperature HP                   |
| SD21      | 5     | °C | Outdoor temperature - Intervention band compensation in heat pump mode |
| SD22      | 5     | °C | Outdoor temperature - Max increase/decrease setpoint in heat pump mode |

With reference to the values set in the table, this corresponds to the graphical representation of the set point change as regards the air temperature value shown in the figure.

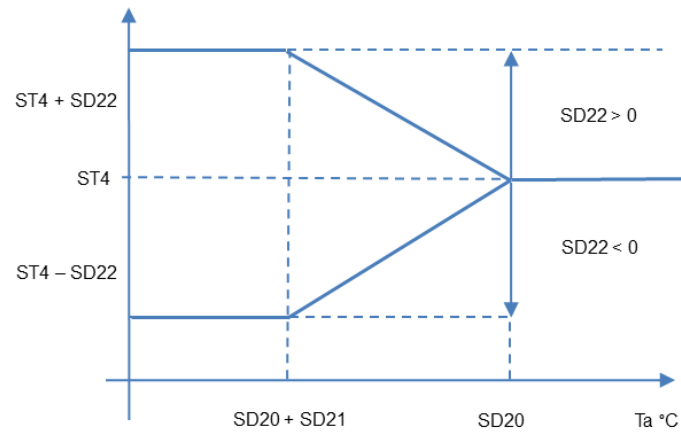


Fig. 3 Change in set point as the air temperature changes in heat pump operating mode

**Where "Ta" is the value of the outside air temperature.**

The following is obtained:

- If the outside air temperature is  $> SD20$ , the offset value to add to  $ST4$  is 0;
- If the outside air temperature is  $< SD20 - SD21$ , the offset value to add to  $ST4$  is  $SD22$ ;
- If the outside air temperature is  $\leq SD20$  and  $\geq SD20 - SD21$ , the offset value to add to  $ST4$  can vary between 0 and  $SD22$ .

With the values in the table, the set point will be:

- $SA\_HEAT\_PUMP = ST4 + 0.0 = 40.0^{\circ}C$ ;
- $SA\_HEAT\_PUMP = ST4 + 5.0 = 45.0^{\circ}C$ ;
- $SA\_HEAT\_PUMP = ST4 + (\text{from } 0.0 \text{ to } 5.0) = \text{from } 40.0^{\circ}C \text{ to } 45.0^{\circ}C$ .

### 2.2.3 Dynamic set point from signal

The type of signal used is 4-20mA, 0-1V, 0-10V and 0-20mA.

To obtain the set point change from signal, it is necessary to have parameter SD1=2/3/4/5 respectively for the 4 types of signal.

In chiller operating mode, the parameters involved are shown in the table.

| Parameter | Value | UM | Description                                                             |
|-----------|-------|----|-------------------------------------------------------------------------|
| ST1       | 7     | °C | Chiller - Setpoint                                                      |
| SD1       | 4     | -  | Dynamic Setpoint type                                                   |
| SD13      | 5     | °C | Dinamic Setpoint probe - Max increase/decrease setpoint in chiller mode |

With reference to the values set in the table, this corresponds to the graphical representation of the set point change shown in the figure.

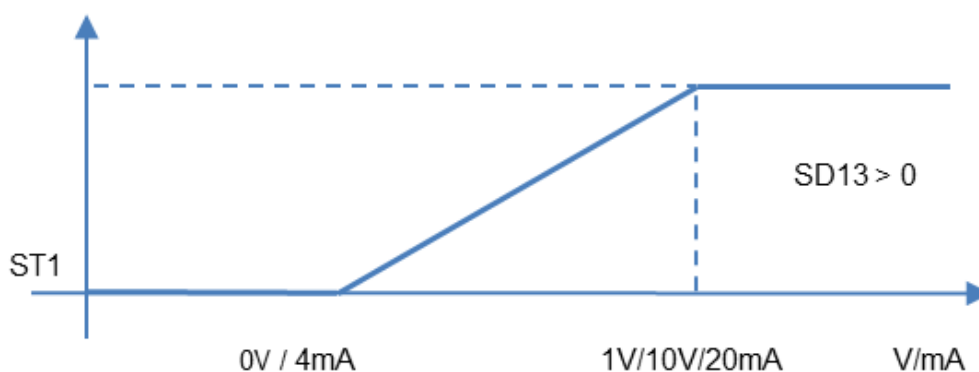


Fig. 4 Change in set point as the analogue signal changes in chiller operating mode

**Where "V/mA" is the value of the analogue signal.**

The following is obtained:

- If the analogue input reads the signal at the minimum value (0V), the offset value to add to ST1 is 0;
- If the analogue input reads the signal at the maximum value (10V), the offset value to add to ST1 is SD13;
- If the analogue input reads the signal between the minimum and maximum value (0-10V), the offset value to add to ST1 can vary from 0 to SD13.

With the values in the table, the set point will be:

- $SA\_CHILLER = ST1 + 0.0 = 7.0^{\circ}C$ ;
- $SA\_CHILLER = ST1 + 5.0 = 12.0^{\circ}C$ ;
- $SA\_CHILLER = ST1 + (\text{from } 0.0 \text{ to } 5.0) = \text{from } 7.0^{\circ}C \text{ to } 12.0^{\circ}C$ .

In heat pump operating mode, the parameters involved are indicated in the table.

| Parameter | Value | UM | Description                                                               |
|-----------|-------|----|---------------------------------------------------------------------------|
| ST4       | 40    | °C | Heat Pump - Setpoint                                                      |
| SD1       | 4     | -  | Dynamic Setpoint type                                                     |
| SD23      | 5     | °C | Dinamic Setpoint probe - Max increase/decrease setpoint in heat pump mode |

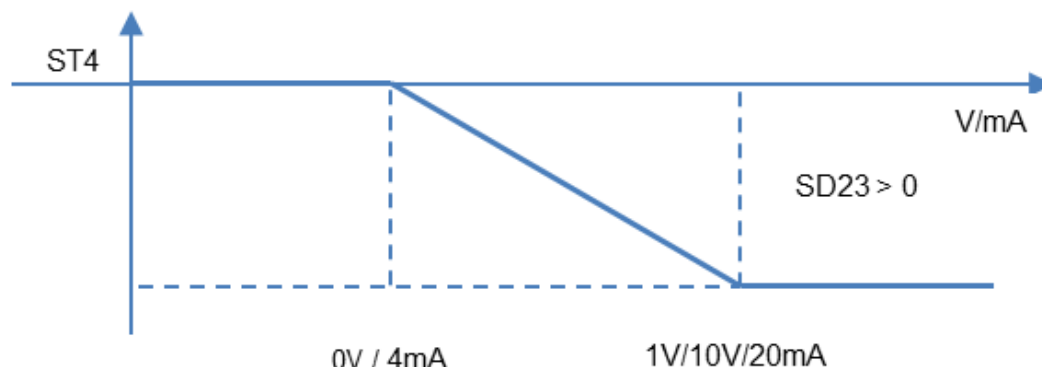


Fig. 5 Change in set point as the analogue signal changes in heat pump operating mode

Where "V/mA" is the value of the analogue signal.

The following is obtained:

- If the analogue input reads the signal at the minimum value (0V), the offset value to subtract from ST4 is 0;
- If the analogue input reads the signal at the maximum value (10V), the offset value to subtract from ST4 is SD23;
- If the analogue input reads the signal between the minimum and maximum value (0-10V), the offset value to subtract from ST4 can vary from 0 to SD23.

With the values in the table, the set point will be:

- SA\_HEAT\_PUMP = ST4 - 0.0 = 40.0°C;
- SA\_HEAT\_PUMP = ST4 - 5.0 = 35.0°C;
- SA\_HEAT\_PUMP = ST4 - (from 0.0 to 5.0) = from 40.0°C to 35.0°C.

## 2.2.4 Dynamic set point from digital input (dual set point)

To obtain the set point change from digital input, it is necessary to have parameter SD1=6.

The parameters involved in chiller and heat pump operation are shown in the table.

| Parameter | Value | UM | Description                                                                                 |
|-----------|-------|----|---------------------------------------------------------------------------------------------|
| ST1       | 7     | °C | Chiller - Setpoint                                                                          |
| ST4       | 40    | °C | Heat Pump - Setpoint                                                                        |
| SD1       | 6     | -  | Dynamic Setpoint type                                                                       |
| SD14      | 12    | °C | Dinamic setpoint Digital input - Setpoint active with remote digital in chiller mode        |
| SD24      | 45    | °C | Dinamic setpoint Digital input - Setpoint active with remote digital open in heat pump mode |

When the digital input dedicated to this function is closed, the change to the second set point takes place. With the values in the table, the set point will be:

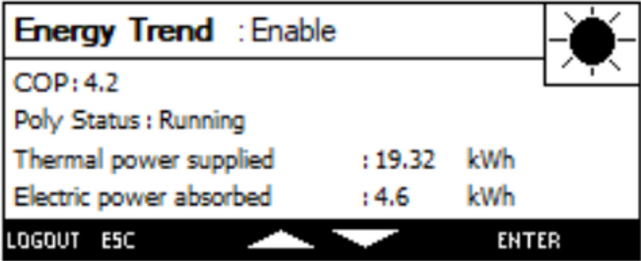
- In chiller operating mode, with digital input open SA\_CHILLER = ST1 = 7.0°C;
- In chiller operating mode, with digital input closed SA\_CHILLER = SD14 = 12.0°C;
- In heat pump operating mode, with digital input open SA\_HEAT PUMP = ST4 = 40.0°C;
- In heat pump operating mode, with digital input closed SA\_HEAT PUMP = SD24 = 45.0°C.

## 2.3 Energy Trend

The function “Energy trend” is featured on units as an option.

This function estimates the unit operational efficiency (“EER” when operating in cooling mode or “COP” when operating in heating mode) as the current operating conditions and the set parameters change.

If you wish to access the data estimated by the function, go to the main menu and select the function “ENERGY TREND” with the arrow, after which press the button “ENTER” to confirm.



The “EER” or “COP” values and the delivered and absorbed power values used for the calculation are not measured, but only estimated using models referred to unit operation.

The direct measurement of these values may be different from the values displayed in the controller screen.

The function is only active after a long enough time has elapsed for parameter stabilization within the intended unit operating range and it is updated as these values change.



In special cases of unit operation, such as free cooling, heat recovery, use of a supplementary source and production of domestic hot water (“ACS” function), the efficiency estimation process is suspended and the controller resets the values to zero.

The purpose of this function is to give the user information as required to optimise unit use.

Whenever efficiency reduction is checked over a prolonged period of time, a message is output to warn the user about the need, if any, to perform unscheduled maintenance.

### 2.3.5 Logs

The measured operating values are not only viewed on the display, but they are also recorded in the controller memory over time.

The values are recorded in the “logs”.

“EnergyTrendHours” is used to record the values concerning the energy absorbed and generated on an hourly basis, and the number of minutes the unit has been in operation every hour.

“EnergyTrendHistory” is used to record the values concerning the energy absorbed and generated on a daily basis, and the number of hours the unit has been in operation every day.

The “logs” can be downloaded from a USB pen drive or the WEB pages. These are “.txt” text files that can be easily added to a spreadsheet.

In the files, an initial line shows the acronyms that identify the values recorded in each column.

The values recorded are whole numbers. The value may in some cases need to be divided by 100 in order for it to match the unit of measurement.

The tables below are useful to interpret the values stored in the “logs”.

#### File “EnergyTrendHours.txt”

| Reference      | Description                                            | U of M | (*)k |
|----------------|--------------------------------------------------------|--------|------|
| DATE_TIME      | Date and time, expressed as yyymmddhh                  |        | 1    |
| EN_IN_CH       | Energy absorbed on an hourly basis in chiller mode     | [kWh]  | 100  |
| EN_OUT_CH      | Energy generated on an hourly basis in chiller mode    | [kWh]  | 100  |
| EER_AVG        | Average hourly EER                                     |        | 100  |
| EN_IN_HP       | Energy absorbed on an hourly basis in heat pump mode   | [kWh]  | 100  |
| EN_OUT_HP      | Energy generated on an hourly basis in heat pump mode  | [kWh]  | 100  |
| COP_AVG        | Average daily COP                                      |        | 100  |
| EN_IN_DHW      | Energy absorbed on an hourly basis in ACS mode         | [kWh]  | 100  |
| EN_OUT_DHW     | Energy generated on an hourly basis in ACS mode        | [kWh]  | 100  |
| COP_AVG        | Average hourly COP for ACS                             |        | 100  |
| MIN_CH         | Minutes of operation in chiller mode                   | [min]  | 1    |
| MIN_HP         | Minutes of operation in heat pump mode                 | [min]  | 1    |
| MIN_DHW        | Minutes of operation in ACS mode                       | [min]  | 1    |
| MIN_OUT_OF_SIM | Minutes in which unit operation could not be simulated | [min]  | 1    |

#### (\*) k = conversion coefficient by which the values in the column are divided

Each line is referred to an hour of operation.

The columns “minutes of operation” show the minutes within the hour in which the function was active.

The values are entered in the history log at minute “00” of each hour in the day.

In the event of a power failure to the unit, the data recorded in the hour are lost.

The calculation of the EER and COP values is not managed in “domestic hot water” mode - the corresponding columns are always “0”, and the hours of operation are counted.

The controller memory can store the hourly values recorded for over 12 months.

As soon as the memory is filled up, the new records overwrite the oldest records.



If the operating data need to be used for yearly analyses, we recommend downloading the log “EnergyTrendHours.txt” at least once a year.

#### File "EnergyTrendHistory.txt"

| Reference    | Description                                                | U.M   |
|--------------|------------------------------------------------------------|-------|
| DATE         | Date type yyyyymmdd                                        |       |
| EN_IN_CH     | Energy absorbed on a daily basis in chiller mode           | [kWh] |
| EN_OUT_CH    | Energy generated on a daily basis in chiller mode          | [kWh] |
| EER_AVG      | Average daily EER                                          |       |
| EN_IN_HP     | Energy absorbed on a daily basis in heat pump mode         | [kWh] |
| EN_OUT_HP    | Energy generated on a daily basis in heat pump mode        | [kWh] |
| COP_AVG      | Average daily COP                                          |       |
| EN_IN_DHW    | Energy absorbed on a daily basis in ACS mode               | [kWh] |
| EN_OUT_DHW   | Energy generated on a daily basis in ACS mode              | [kWh] |
| COP_AVG      | Average daily COP for ACS                                  |       |
| H_CH         | Daily hours of operation in chiller mode                   | [h]   |
| H_HP         | Daily hours of operation in heat pump mode                 | [h]   |
| H_DHW        | Daily hours of operation in ACS mode                       | [h]   |
| H_OUT_OF_SIM | Daily hours in which unit operation could not be simulated | [h]   |

**The values in all columns except for the "DATE" column must be divided by 100.**

Each line is referred to a day of operation.

The columns "hours of operation" show the hours within the day in which the function was active.

The values are entered in the history log at "00:00" each day.

In the event of a power failure to the unit, the data recorded in the hour are lost.

The calculation of the EER and COP values is not managed in "domestic hot water" mode - the corresponding columns are always "0", and the hours of operation are counted.

The controller memory can store the values recorded on a daily basis, which cover the total operating values of the unit.

## 2.4 Smart Grid ready

The two digital inputs provided help override thermoregulation to operation in hot mode. This function does not trigger when thermoregulation is operating in cold mode.

Units are always provided with this function although it is not enabled.

When the function is enabled, the status of the two featured digital inputs combined activates the 4 operating modes listed in the table.

| Operating mode | Status DI1 | Status DI2 | Description                                                                                                                                              |
|----------------|------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1              | Closed     | Open       | Thermoregulation in hot mode is disabled for as long as the condition persists, but in any case the max. time set in parameter "AH18" is never exceeded. |
| 2              | Open       | Open       | Thermoregulation follows the demand of the stored operating setpoint.                                                                                    |
| 3              | Open       | Closed     | Thermoregulation follows the demand of dedicated "setpoint 1".                                                                                           |
| 4              | Closed     | Closed     | Thermoregulation follows the demand of dedicated "setpoint 2".                                                                                           |

The parameters involved are shown in the table.

| Parameter | Min | Max | UM   | Description                              |
|-----------|-----|-----|------|------------------------------------------|
| SP21      | 0   | 2   | -    | Smart Grid Enable                        |
|           |     |     |      | 0 = disabled                             |
|           |     |     |      | 1 = enabled without supplementary source |
|           |     |     |      | 2 = enabled with supplementary source    |
| AH18      | 1   | 999 | min. | Maximum override time to OFF             |
| AH19      | ST5 | ST6 | °C   | Setpoint1 in operating mode 3            |
| AH20      | ST5 | ST6 | °C   | Setpoint2 in operating mode 4            |

The value in parameter "SP21" is set to "0" (function disabled) in the factory. The value in parameter "AH18" is set to 120 minutes.

The values in parameters "AH19" and "AH20" are set with the same value as parameter "ST4".



The installer is responsible for enabling the function and setting up suitable values for operation.

### 2.4.1 Enable

All water heating units are configured to manage this function.

The units are shipped from the factory with the function disabled via software.

The function is enabled using parameter "SP21".

When the function is enabled, the operation of the digital inputs in the terminal board is active. The wiring diagram shows the involved terminals.

All units are configured to manage this function.

The units are shipped from the factory with the function disabled via software.

The function is enabled using parameter "SP21".

When the function is enabled, the operation of the digital inputs in the terminal board is active. The wiring diagram shows the involved terminals.

### 2.4.2 Operating mode 1

Activation of this operating mode requires that digital input "1" is closed and output "2" is open. After mode activation, the controller stops thermoregulation in hot mode as long as the condition persists; in any case the time setpoint value stored in parameter "AH18" is never exceeded.

If the status of the digital inputs does not change and consequently the operating mode fails to change, the controller will restart normal thermoregulation operation in hot mode after the time set in parameter "AH18" has elapsed.

As soon as normal operation is restored, a change in the digital input status is required for the next stop.

---

If the “ACS” function is featured, this operating mode stops it.

If a seasonal mode change occurs during operation in heating mode or where the “ACS” function is enabled in cooling mode, the unit performs thermoregulation in cooling mode.

### **2.4.3 Operating mode 2**

Activation of this operating mode requires that both digital input “1” and “2” are open. When it is activated, the controller controls thermoregulation in hot mode following the active operating setpoint.

This combination of digital inputs prevents the “Smart Grid Ready” from having an impact on unit operation.

### **2.4.4 Operating mode 3**

Activation of this operating mode requires that digital input “1” is open and output “2” is closed.

When it is activated, the controller overrides thermoregulation in heating mode to “setpoint1” which is set with the value in parameter “AH19”.

This setpoint value prioritises all the settings that are used to control the variation of the operating setpoint.

If the unit is operating in cooling mode, the override process is ignored.

The override process may at all times be stopped by stopping the unit.

### **2.4.5 Operating mode 4**

Activation of this operating mode requires that digital input “1” and “2” are closed.

If thermoregulation in hot mode was not active when “setpoint2” was overridden, the function will be ignored.

When it is activated, the controller overrides thermoregulation in heating mode to “setpoint2” which is set with the value in parameter “AH20”.

When parameter “SP21” is set to “2” in this operating mode, the supplementary sources fitted in the unit are started without taking into account the outside air temperature threshold “AH2”.

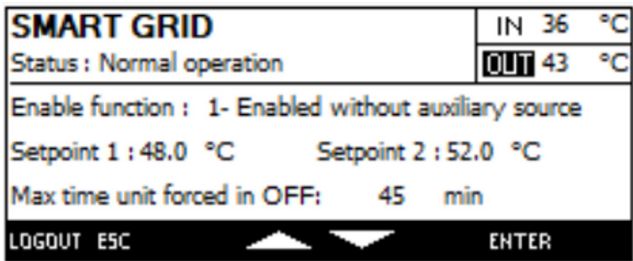
This setpoint value prioritises all the settings that are used to control the variation of the operating setpoint.

If the unit is operating in cooling mode, the override process is ignored.

The override process may at all times be stopped by stopping the unit.

2.4.6 References on user interface

The function can be managed using the parameters described above or using the user interface. When “setpoint” is selected in the main screen, a click on the “Smart Grid ready” icon and entry of the relevant password give access to a screen where the two setpoint values and the maximum overriding time of hot mode shutdown are enabled and set up.



The main screen shows whether the “Smart Grid ready” function (identified by acronym “SM-GR”) is enabled and it is in “overridden stop” condition. If the acronym “SG1” or “SG2” appears in the main screen, the setpoint displayed is the setpoint connected to the status of the digital inputs of the function. The “ON/OFF” screen shows whether the unit is “OFF” following an override due to the “Smart Grid ready” function.

---

## 2.5 Swegon Inside

Starting from the second half of 2023, the manufactured units have been provided with digital certificates which offer the possibility to enable the “Swegon Inside” function.

This function gives the user safe access to the identification and operating parameters of the unit via the cloud.

Access requires that the user creates his/her own account on our website (<https://www.swegon.com/it/support/software/>).

To create the account, scroll the website page down until the header “Software for connected products”.

Click the link “Create account for INSIDE portal”, fill out the form with the required information, and then press “SUBMIT”.

The information you need to enter is found in the unit nameplate on the side of the electric panel or in the decal affixed inside the door of the electrical panel: alternatively, you can press the Info button in the controller.

Registration is confirmed by email to the address specified. A few days are required for the function to be activated.

After a few days have elapsed, data can be read in the section of the Swegon website (<https://www.swegon.com/it/support/software/>) named “Software for connected products” by clicking the link “Go to INSIDE portal” where you have to log in.

The certificate requires that the connection is activated within two years from its issue.



A connection between a fixed unit IP and the Internet is required.

If you wish to enable the “Swegon Inside” function on units that were manufactured before week 24 of 2023, the minimum requirements below must be checked:

1. controller iPro, code MIDX125A or MIDX126A, with App Version 711.138.129;
2. user interface code MIDX130A;
3. App Version 711.138.129;
4. HMI Version 7\*.\*.\*;
5. Web Version 711.146.42.

If problems are experienced, please contact the Swegon after-sales service network.

## 2.6 Thermoregulation

The thermoregulation of the unit depends on parameter ST9 that determines on which temperature probe the controller must guarantee maintenance of the temperature set as the set point, and on parameter ST11 that determines the type of control.

With the combination of settings, it is possible to have:

- ST9 = 0 and ST11 = 0 - proportional input registration;
- ST9 = 5 and ST11 = 1 - output registration with neutral zone and PID;
- ST9 = 5 and ST11 = 2 - output registration with neutral zone and PID for units featuring inverter compressors;

### 2.6.1 Proportional inlet control

The parameters involved in proportional thermoregulation on evaporator inlet probe are shown below.

| Parameter | Min | Max  | UM   | Description                                                                       |
|-----------|-----|------|------|-----------------------------------------------------------------------------------|
| ST1       | ST2 | ST3  | °C   | Chiller - Setpoint                                                                |
| ST2       | -50 | ST3  | °C   | Chiller - Minimum Setpoint                                                        |
| ST3       | ST2 | 110  | °C   | Chiller - Maximum Setpoint                                                        |
| ST4       | ST5 | ST6  | °C   | Heat Pump - Setpoint                                                              |
| ST5       | -50 | ST6  | °C   | Heat pump - Minimum Setpoint                                                      |
| ST6       | ST5 | 110  | °C   | Heat Pump - Maximum Setpoint                                                      |
| ST7       | 0.1 | 25.5 | °C   | Chiller - Proportional control band                                               |
| ST8       | 0.1 | 25.5 | °C   | Heat pump - Proportional control band                                             |
| CO4       | 1   | 999  | sec. | Minimum time between two activation different compressors                         |
| CO5       | 1   | 999  | sec. | Min. time between de-activation of 2 compressors/Min. Time between step decrement |

Proportional control is applied in units with scroll compressors with control of the temperature measured on the evaporator inlet probe.

In the case of scroll compressors, they represent the steps that contribute to thermoregulation. Each step requested by the thermoregulator is therefore a request to switch on a compressor.

| Parameter | Min | Max | UM | Description                             |
|-----------|-----|-----|----|-----------------------------------------|
| CF7       | 1   | 3   | -  | Number of compressor steps in circuit 1 |
| CF8       | 1   | 3   | -  | Number of compressor steps in circuit 2 |
| CF9       | 1   | 3   | -  | Number of compressor steps in circuit 3 |
| CF10      | 1   | 3   | -  | Number of compressor steps in circuit 4 |

The number of steps to be activated is calculated with the following formula:

$$ST7 / (CF7 + CF8 + CF9 + CF10)$$

The proportional band is divided by the number of compressors or capacity reductions present in the configuration parameters (defined by the manufacturer). Each step will therefore have the same weight.

Consecutive activation of steps takes place with a delay equal to the value of parameter CO4. But deactivation takes place according to the value of parameter CO5.

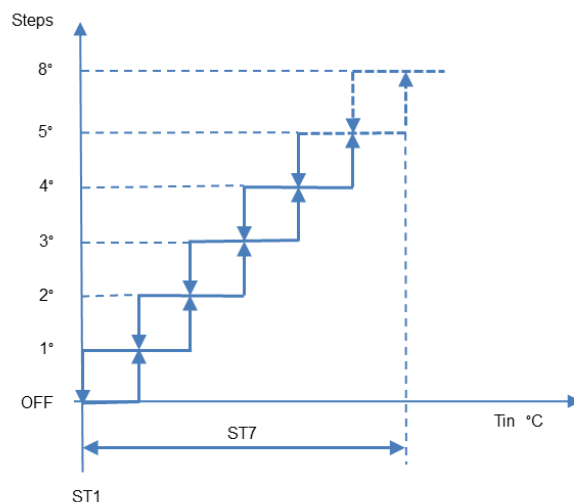


Fig. 6 Graphical representation of steps in Chiller operating mode

Example of proportional control in chiller mode. “Tin” indicates the water temperature at the inlet of the unit. In the case of Heat Pump, the following formula is used to calculate the number of resources to be activated:  $ST8/(CF7 + CF8 + CF9 + CF10)$

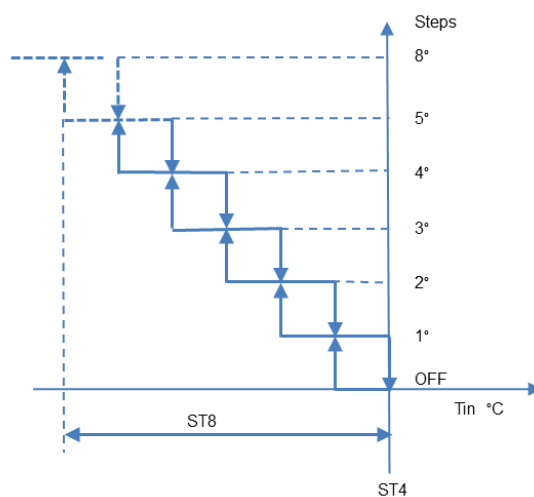


Fig. 7 Graphical representation of steps in Heat Pump operating mode

As can be seen in the graphs, the greater the distance of the water temperature (in these cases measured on the inlet of the unit) from the setpoint, the greater the number of resources/compressors enabled.

## 2.6.2 Outlet control with neutral zone and PID

The reference probe is placed on the common outlet of the evaporator. The resources (compressors) are activated/deactivated depending on a set point and a differential, complying with the reference delays.

| Parameter | Min. | Max. | UM  | Description                                                |
|-----------|------|------|-----|------------------------------------------------------------|
| ST1       | ST2  | ST3  | °C  | Chiller - Setpoint                                         |
| ST2       | -50  | ST3  | °C  | Chiller - Minimum Setpoint                                 |
| ST3       | ST3  | 50°C | °C  | Chiller - Maximum Setpoint                                 |
| ST4       | ST5  | ST6  | °C  | Heat Pump - Setpoint                                       |
| ST5       | -50  | ST5  | °C  | Heat pump - Minimum Setpoint                               |
| ST6       | ST5  | 999  | °C  | Heat Pump - Maximum Setpoint                               |
| ST18      | 0.1  | 25.5 | °C  | With NZ or PID, Chiller - Activation zone offset           |
| ST19      | 0.1  | 25.5 | °C  | With NZ or PID, Heat Pump - Activation zone offset         |
| ST20      | 0.1  | 25.5 | °C  | With NZ or PID, Chiller - De-activation zone offset        |
| ST21      | 0.1  | 25.5 | °C  | With NZ or PID, Heat Pump - De-activation zone offset      |
| ST22      | ST23 | 999  | Sec | With ZN or PID, Chiller - Maximum activation time          |
| ST23      | 0    | ST22 | Sec | With NZ or PID, Chiller - Min. activation time             |
| ST24      | ST25 | 999  | Sec | With ZN or PID, Chiller - Maximum de-activation time       |
| ST25      | 0    | ST24 | Sec | With NZ or PID, Chiller - Min. de-activation time          |
| ST26      | ST27 | 999  | Sec | With ZN or PID, Heat pump - Maximum activation time        |
| ST27      | 0    | ST26 | Sec | With NZ or PID, Heat Pump - Minimum activation time        |
| ST28      | ST29 | 999  | Sec | With ZN or PID, Heat Pump - Maximum de-activation time     |
| ST29      | 0    | ST28 | Sec | With ZN or PID, Heat pump - Minimum de-activation time     |
| ST30      | 0.1  | 25.5 | °C  | With NZ or PID, Chiller - Neutral zone band                |
| ST31      | 0.1  | 25.5 | °C  | With NZ or PID, Heat Pump - Neutral zone band              |
| ST32      | -50  | 110  | °C  | Limit threshold for operation in chiller mode (prevention) |

Example of control with neutral zone in chiller mode

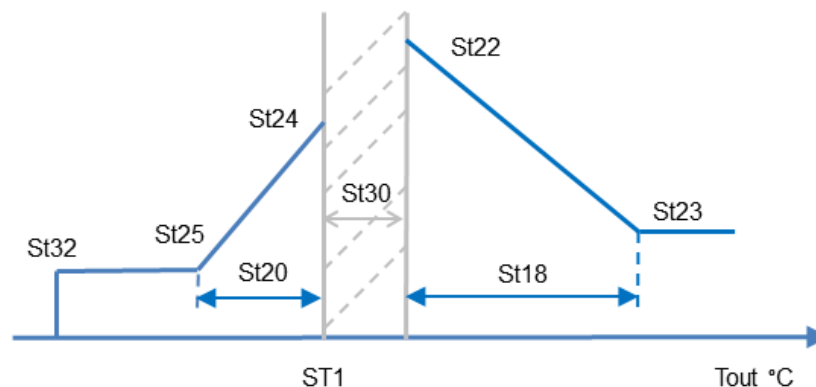


Fig. 8 Graphical representation of operation in chiller mode and outlet control

As long as the reference water temperature is more than ( $>$ )  $ST1 + ST30$ , the compressors of the unit will be activated complying with the delays included in parameters  $ST22$  and  $ST23$ .

If the water temperature is included in the values that determine the neutral zone, the compressors will be activated only if at least one compressors of the unit is already on.

If the reference temperature is less than ( $<$ )  $ST1$  and more than ( $>$ )  $ST1 - ST20$ , then the capacity of the compressors is progressively reduced and the compressors are progressively deactivated complying with the delays included in parameters  $ST24$  and  $ST25$ .

If the temperature is  $< ST32$ , the compressors are switched off immediately. In this case, no alarm signal is shown.

### Example of control with neutral zone in heat pump mode

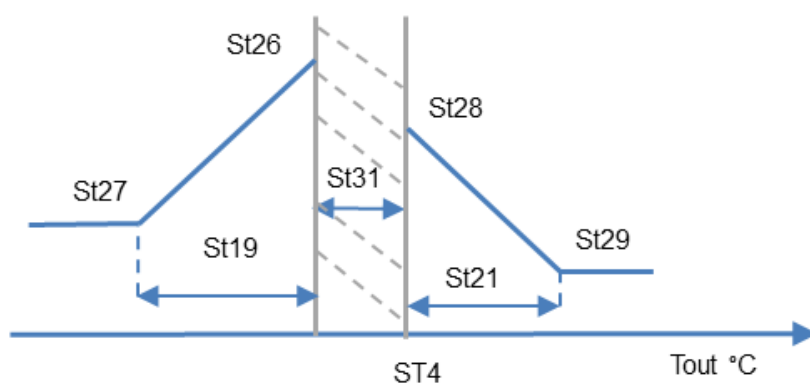


Fig. 9 Graphical representation of operation in heat pump mode and outlet control

As long as the reference water temperature is less than ( $<$ )  $ST4 - ST31$ , the compressors of the unit will be activated complying with the delays included in parameters  $ST27$  and  $ST26$ .

If the water temperature is included in the values that determine the neutral zone, the compressors will be activated only if at least one compressors of the unit is already on.

If the reference temperature is more than ( $>$ )  $ST4$  and less than ( $<$ )  $ST4 + ST21$ , then the capacity of the compressors is progressively reduced and the compressors are progressively deactivated complying with the delays included in parameters  $ST28$  and  $ST29$ .

## 2.7 Time bands

### 2.7.1 General

The controller offers the possibility to control unit switch-on and switch-off and energy saving according to time bands.

The system enables setting 3 time bands and selecting one of the 7 possible combinations for each day in the week.

The time bands in parameter cluster “ES” are the same time bands used for unit switch-off (“Auto shutdown”) and for energy saving (“Energy saving”).

The parameters used to manage this function are shown in the table.

| Parameter | Min   | Max  | UM | Description                                             |
|-----------|-------|------|----|---------------------------------------------------------|
| ES1       | 0     | 144  | hr | Start of first Time Band                                |
| ES2       | 0     | 144  | hr | End of first Time Band                                  |
| ES3       | 0     | 144  | hr | Start of second Time Band                               |
| ES4       | 0     | 144  | hr | End of second Time Band                                 |
| ES5       | 0     | 144  | hr | Start of third Time Band                                |
| ES6       | 0     | 144  | hr | End of third Time Band                                  |
| ES7       | 0     | 7    | -  | Monday variation                                        |
| ES8       | 0     | 7    | -  | Tuesday variation                                       |
| ES9       | 0     | 7    | -  | Wednesday variation                                     |
| ES10      | 0     | 7    | -  | Thursday variation                                      |
| ES11      | 0     | 7    | -  | Friday variation                                        |
| ES12      | 0     | 7    | -  | Saturday variation                                      |
| ES13      | 0     | 7    | -  | Sunday variation                                        |
| ES14      | -25.0 | 25.0 | °C | Offset to be added to setpoint in chiller mode          |
| ES15      | 0.0   | 25.5 | °C | Proportional band to be used in chiller mode            |
| ES16      | -25.0 | 25.0 | °C | Offset to be subtracted from setpoint in heat pump mode |
| ES17      | 0.0   | 25.5 | °C | Proportional band to be used in heat pump mode          |
| ES18      | 0     | 7    | -  | Time band, switch-off, Monday                           |
| ES19      | 0     | 7    | -  | Time band, switch-off, Tuesday                          |
| ES20      | 0     | 7    | -  | Time band, switch-off, Wednesday                        |
| ES21      | 0     | 7    | -  | Time band, switch-off, Thursday                         |
| ES22      | 0     | 7    | -  | Time band, switch-off, Friday                           |
| ES23      | 0     | 7    | -  | Time band, switch-off, Saturday                         |
| ES24      | 0     | 7    | -  | Time band, switch-off, Sunday                           |

The three time bands are defined by setting the parameters from “ES1” to “ES6”, which establish the beginning and the end of the time band.

The time is defined with a 10 minute precision.

The time bands, the unit switch-off time, and management of energy saving can be set up using the relevant parameters or the user interface (ref. FAQ section in User Manual).

### 2.7.2 Time band-based switch-off

The parameters between “ES18” and “ES24” are used to match each week day to the unit off times either using a time band or a combination of the set time bands.



The band start time is the unit stop time; the band end time is the unit start time.

When the unit is switched to “OFF” based on the time band, the symbol of a clock appears in the main screen under the text “OFF”.

---

### 2.7.3 Energy saving

This function is used to edit the unit operating setpoint with the help of an “offset” and to enter a new differential.

When the “Energy saving” function is active, the “Offset” setpoint in parameter “ES14” is algebraically added to the unit setpoint in cooling mode and the setpoint value in parameter “ES16” is subtracted from the unit setpoint in heating mode.

When the “Energy saving” function is active, which changes the operating setpoint of the unit, the symbol “€” appears on the right-hand side of the screen.

## 2.8 Limitation of refrigeration capacity

There are some operating conditions for which the refrigeration capacity of the unit can be limited automatically or necessarily.

Limitation can be done in 4 different ways:

- from pressure probe (always present)
- from amperometric transformer (accessory)
- from digital input (accessory);
- from BMS.

All the parameters involved with this function are shown in the table.

| Parameter | Min | Max  | UM  | Description                                              |
|-----------|-----|------|-----|----------------------------------------------------------|
| UN1       | 0   | 1    | -   | Unloading from digital input                             |
| UN2       | 0   | 1    | -   | Unloading from Supervision                               |
| UN3       | 0   | 1    | -   | Unloading from low/high pressure transducer              |
| UN4       | 0   | 1    | -   | Unloading from Amperometric Transformer                  |
| UN5       | 0.0 | 99.9 | bar | High pressure - Unloading Setpoint in chiller mode       |
| UN6       | 0.0 | 25.5 | bar | High pressure - Unloading differential in chiller mode   |
| UN7       | 0.0 | 99.9 | bar | High pressure - Unloading Setpoint in heat pump mode     |
| UN8       | 0.0 | 25.5 | bar | High pressure - Unloading differential in heat pump mode |
| UN9       | 0.0 | 99.9 | bar | Low pressure - Unloading Setpoint in chiller mode        |
| UN10      | 0.1 | 25.5 | bar | Low pressure - Unloading differential in chiller mode    |
| UN11      | 0.0 | 99.9 | bar | Low pressure - Unloading Setpoint in heat pump mode      |
| UN12      | 0.1 | 25.5 | bar | Low pressure - Unloading differential in heat pump mode  |
| UN13      | 0   | 100  | %   | Max. percentage circuit limit with capacity reduction    |
| UN14      | 0   | 100  | %   | Inverter scroll - Unloading Percentage                   |
| UN17      | 0   | 999  | min | Capacity reduction activation time limit                 |
| UN18      | 0   | 999  | min | Time between two capacity reductions of the same circuit |
| UN19      | 0   | 500  | A   | Minimum full-scale value of 4mA current probe            |
| UN20      | 50  | 1000 | A   | Maximum full-scale value of 20mA current probe           |
| UN21      | 10  | 1000 | A   | Current capacity reduction threshold                     |
| UN22      | 0   | 500  | A   | Current capacity reduction differential                  |
| ST13      | 0   | 100  | %   | Unit capacity limit (On/Off compressors and inverter)    |
| ST23      | 0   | 60   | s   | With NZ or PID, Chiller - Min. activation time           |
| ST25      | 0   | 60   | s   | With NZ or PID, Chiller - Min. de-activation time        |

### 2.8.1 Limitation of refrigeration capacity from pressure probe

In some operating situations of the unit (too high condensing pressures or too low evaporating pressures) it may be useful to limit the capacity of the compressor.

The parameters involved in limitation of refrigeration capacity with reference to condensing pressure are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                              |
|-----------|-------|-----|----------------------------------------------------------|
| UN3       | 1     | -   | Unloading from low/high pressure transducer              |
| UN5       | 39.0  | Bar | High pressure - Unloading Setpoint in chiller mode       |
| UN6       | 3.0   | Bar | High pressure - Unloading differential in chiller mode   |
| UN7       | 39.0  | Bar | High pressure - Unloading Setpoint in heat pump mode     |
| UN8       | 5.0   | Bar | High pressure - Unloading differential in heat pump mode |
| UN13      | 30    | %   | Max. percentage circuit limit with capacity reduction    |
| UN14      | 65    | %   | Inverter scroll - Unloading Percentage                   |
| UN17      | 2     | Min | Capacity reduction activation time limit                 |
| UN18      | 2     | Min | Time between two capacity reductions of the same circuit |

Activation of capacity reduction in the circuit takes place when the following conditions are verified:

- in chiller operating mode, when the condensing pressure is higher than UN5;
- in heat pump operating mode, when the condensing pressure is higher than UN7;

Deactivation of capacity reduction in the circuit takes place when the following conditions are verified:

- in chiller operating mode, when the condensing pressure is lower than UN5 - UN6;
- in heat pump operating mode, when the condensing pressure is lower than UN7 - UN8.

The parameters involved in limitation of refrigeration capacity with reference to evaporating pressure are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                              |
|-----------|-------|-----|----------------------------------------------------------|
| UN3       | 1     | -   | Unloading from low/high pressure transducer              |
| UN9       | 4.5   | Bar | Low pressure - Unloading Setpoint in chiller mode        |
| UN10      | 1.0   | Bar | Low pressure - Unloading differential in chiller mode    |
| UN11      | 2.5   | Bar | Low pressure - Unloading Setpoint in heat pump mode      |
| UN12      | 1.0   | Bar | Low pressure - Unloading differential in heat pump mode  |
| UN13      | 30    | %   | Max. percentage circuit limit with capacity reduction    |
| UN14      | 65    | %   | Inverter scroll - Unloading Percentage                   |
| UN17      | 2     | Min | Capacity reduction activation time limit                 |
| UN18      | 2     | Min | Time between two capacity reductions of the same circuit |

Activation of capacity reduction in the circuit takes place when the following conditions are verified:

- in chiller operating mode, when the evaporating pressure is lower than UN9;
- in heat pump operating mode, when the evaporating pressure is lower than UN11.

---

Deactivation of capacity reduction in the circuit takes place when the following conditions are verified:

- in chiller operating mode, when the evaporating pressure is higher than UN9 + UN10;
- in heat pump operating mode, when the evaporating pressure is higher than UN11 + UN12;

Cooling capacity limitation in units with several steps per circuit depends on the value set in parameter "UN13".

The controller uses the percentage set in parameter "UN13" to calculate the number of steps to activate in the circuit.



The value of parameter "UN13" refers to the operating percentage (0 = the whole circuit deactivated; 100 = no capacity reduction).

## 2.8.2 Limitation of refrigeration capacity from amperometric transducer

Limitation of refrigeration capacity can be carried out through an amperometric transducer that measures the current drawn by the unit.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                    |
|-----------|-------|----|------------------------------------------------|
| UN4       | 1     | -  | Unloading from Amperometric Transformer        |
| UN19      | 50    | A  | Minimum full-scale value of 4mA current probe  |
| UN20      | 500   | A  | Maximum full-scale value of 20mA current probe |
| UN21      | 250   | A  | Current capacity reduction threshold           |
| UN22      | 50    | A  | Current capacity reduction differential        |

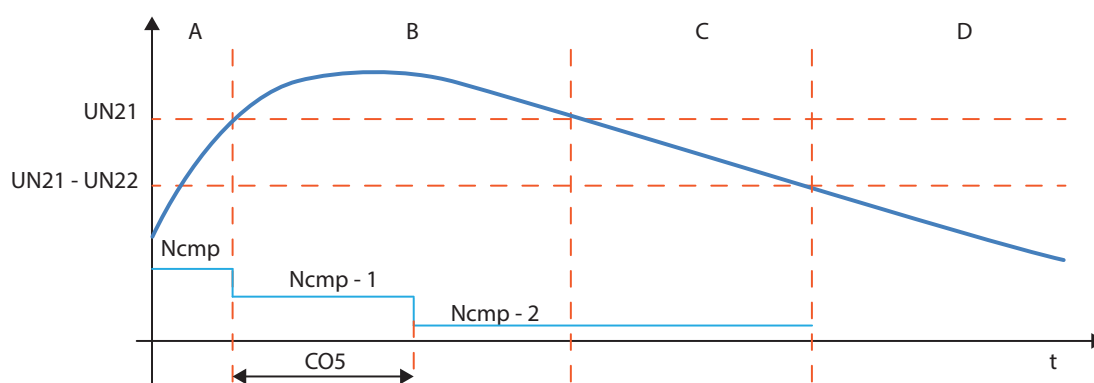


Fig. 10 Graphical representation of limitation of refrigeration capacity by the drawn current

Activation of forcing of capacity reduction of the unit takes place when the value of the current measured on the measurement input is  $> UN21$  (stage B). During this stage, the controller deactivates the compressors with a delay between each one until the value of the current returns to  $< UN21$ . If the value of the current is between  $UN21$  and  $UN21 - UN22$  (stage C), the controller does not carry out any change in capacity.

When the value of the current is  $< UN21 - UN22$  (stage D), the controller leaves the forcing of capacity reduction, and management of refrigeration capacity demand returns to thermoregulation.

### 2.8.3 Limitation of refrigeration capacity from digital input

Limitation of refrigeration capacity can be carried out from digital input.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                           |
|-----------|-------|----|-------------------------------------------------------|
| UN1       | 1     | -  | Unloading from digital input                          |
| ST13      | 30    | %  | Unit capacity limit (On/Off compressors and inverter) |

Cooling capacity limitation in units with several steps per circuit depends on the value set in parameter "ST13".

The controller uses the percentage set in parameter "ST13" to calculate the number of steps to activate in the circuit.



The value of parameter "ST13" refers to the operating percentage (0 = the whole circuit deactivated; 100 = no capacity reduction).



Forcing of capacity reduction can continue indefinitely.

### 2.8.4 Limitation of refrigeration capacity from BMS

Limitation of refrigeration capacity can be carried out from BMS.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                           |
|-----------|-------|----|-------------------------------------------------------|
| UN2       | 1     | -  | Unloading from Supervision                            |
| ST13      | 30    | %  | Unit capacity limit (On/Off compressors and inverter) |
| SP6       | 1     | -  | Enable BMS supervision writings                       |



To enable capacity reduction from BMS, parameter SP6 must also be enabled.  
The variable (Capacity Limit) that enables the function is shown below.

| Group          | Type | Addr. | Description     |
|----------------|------|-------|-----------------|
| Capacity Limit | 5    | 51536 | 0 = OFF; 1 = ON |

Cooling capacity limitation in units with several steps per circuit depends on the value set in parameter "ST13".

The controller uses the percentage set in parameter "ST13" to calculate the number of steps to activate in the unit.



The value of parameter "ST13" refers to the operating percentage (0 = unit deactivated; 100 = no capacity reduction).



Forcing of capacity reduction can continue indefinitely.

## 2.9 Circuits and compressors

To meet the thermoregulation request from the system, the controller activates and deactivates the compressors of the circuits present in the unit as required.

The management of individual compressors, and also of the combination of compressors, takes place according to the setting of the relevant parameters.

All the parameters involved in these management methods are shown in the table.

| Parameter | Min | Max | UM   | Description                                                                       |
|-----------|-----|-----|------|-----------------------------------------------------------------------------------|
| CO1       | 0   | 999 | s    | Minimum ON time                                                                   |
| CO2       | 0   | 999 | s    | Minimum OFF time                                                                  |
| CO3       | 0   | 999 | 10 s | Minimum time between 2 activations of the same compressor                         |
| CO4       | 1   | 999 | s    | Minimum time between two activation different compressors                         |
| CO5       | 1   | 999 | s    | Min. time between de-activation of 2 compressors/Min. Time between step decrement |
| CO7       | 0   | 999 | s    | Delay for activation of loads on unit switch-on (pumps, compressors)              |
| CO14      | 0   | 1   | -    | Compressor selection mode                                                         |
| CO15      | 0   | 2   | -    | Method of selection of circuits in the unit                                       |
| CO16      | 0   | 1   | -    | Criteria for selection of compressors in the selection of circuits                |

### 2.9.1 Starting and stopping of the compressors

Except in particular conditions, the compressors are started and stopped following a precise procedure.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                                                       |
|-----------|-------|------|-----------------------------------------------------------------------------------|
| CO1       | 300   | s    | Minimum ON time                                                                   |
| CO2       | 300   | s    | Minimum OFF time                                                                  |
| CO3       | 90    | 10 s | Minimum time between 2 activations of the same compressor                         |
| CO4       | 90    | s    | Minimum time between two activation different compressors                         |
| CO5       | 10    | s    | Min. time between de-activation of 2 compressors/Min. Time between step decrement |
| CO7       | 20    | s    | Delay for activation of loads on unit switch-on (pumps, compressors)              |
| CO15      | 2     | -    | Method of selection of circuits in the unit                                       |
| CO16      | 0     | -    | Criteria for selection of compressors in the selection of circuits                |

After the unit has started, even though there is a thermoregulation request, the controller ensures compliance with the minimum OFF time of the compressors.

The choice of circuit to be activated takes place through parameter CO15

The graph for the actual thermoregulation request and the respective switch-ons and switch-offs of the compressors is shown below.

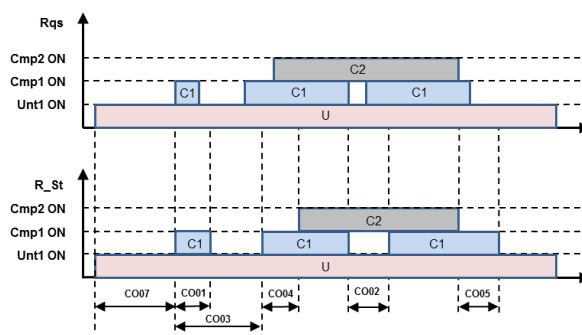


Fig. 11 Compressor management times

In the graph, beside the parameters of the function, there are the abbreviations that refer to:

- Rqs = thermoregulation request
- R\_St = actual status
- Unt = reference to the unit
- Cmp1 = reference to compressor 1
- Cmp2 = reference to compressor 2

### 2.9.2 Activation of the compressors between the circuits

In addition to controlling the switching on of the compressors, the controller manages their activation as regards the circuits present in the unit.

The application developed for the controller includes various management criteria.

According to unit type and system requirements, the most suitable one can be selected.



The units are programmed in such way that the compressor activation logics optimise the operating efficiency of the unit.

Contact our After-Sales Service department before editing the factory setup parameters.

### 2.9.3 Balance sequence criteria

Parameters CO14 and CO15 set to "2"

The setting of parameter CO16 shows whether the circuit and the compressor to be started first can be selected by switch-ons or by the hour.

Example of unit with 2 circuits.

If parameter CO16 = 0, as the capacity demand increases, the compressors with the lowest number of hours of operation are activated in sequence. As the capacity demand decreases, the compressors with the highest number of hours of operation are de-activated in sequence.

If parameter CO16 = 1, as the capacity demand increases, the compressor that has the lowest number of switch-ons is activated first. As the capacity demand decreases, the compressor that has the highest number of switch-ons is de-activated first.

### 2.9.4 Saturation sequence criteria

Parameter CO14 set to "2" and CO15 to "3"

The controller ensures saturation of resources in the circuit before also activating the next circuits.

The setting of parameter CO16 shows whether the circuit and the compressor to be started first can be selected by switch-ons or by the hour.

Example of unit with 2 circuits.

With parameter CO16 = 0, when the capacity demand increases, the first compressor to be activated is the one that has the lowest number of hours of operation in the circuit that has the lowest sum of hours of operation of all its compressors. Then the next compressor that has the lowest number of hours of operation in the same circuit is activated, and then, if present, the third compressor is activated before identifying, with the same criteria, the compressor of the next circuit to be started. When the capacity demand decreases, the first compressor to be switched off is the one that has the highest number of hours of operation in the circuit that has the highest sum of hours of operation of all its compressors. Then the compressor that has the highest number of hours of operation in the same circuit is deactivated, and then, if present, the third compressor is deactivated before identifying, with the same criteria, the compressor of the next circuit to be switched off.

With parameter CO16 = 1, when the capacity demand increases, the first compressor to be activated is the one that has the lowest number of starts in the circuit that has the lowest sum of starts of all its compressors. Then the next compressor that has the lowest number of starts in the same circuit is activated, and then, if present, the third compressor is activated before identifying, with the same criteria, the compressor of the next circuit to be started. When the capacity demand decreases, the first compressor to be switched off is the one that has the highest number of starts in the circuit that has the highest sum of the number of starts of all its compressors. Then the compressor that has the highest number of starts in the same circuit is deactivated, and then, if present, the third compressor is deactivated before identifying, with the same criteria, the compressor of the next circuit to be switched off.

---

### 2.9.5 Capacity balancing principle

Parameter CO15 set to "5"

The controller provides for demand distribution and balances it among the existing circuits.

Any demand increase is fulfilled by the circuit with fewer compressors in operation.

Any demand reduction is fulfilled by the circuit with more compressors in operation.

The sequence followed to start and to stop the compressors in one circuit is implemented with a view to balancing hours/starts, based on the value set in parameter CO16.

Based on the "Balancing sequence principle" that is enabled when parameter CO15 is set to "2", the "Capacity balancing principle" provides for demand distribution among the circuits existing in the unit.

### 2.9.6 Capacity saturation principle

Parameter CO15 set to "6"

The controller ensures saturation of resources in the circuit before also activating the next circuits.

The setting of parameter CO16 shows whether the circuit and the compressor to be started first can be selected by switch-ons or by the hour.

Example of unit with 2 circuits.

With parameter CO16 = 0, when the capacity demand increases, the first compressor to be activated is the one that has the lowest number of hours of operation in the circuit that has the lowest sum of hours of operation of all its compressors. Then the next compressor that has the lowest number of hours of operation in the same circuit is activated, and then, if present, the third compressor is activated before identifying, with the same criteria, the compressor of the next circuit to be started. When the capacity demand decreases, the first compressor to be switched off is the one that has the highest number of hours of operation in the circuit that has the highest sum of hours of operation of all its compressors. Then the compressor that has the highest number of hours of operation in the same circuit is deactivated, and then, if present, the third compressor is deactivated before identifying, with the same criteria, the compressor of the next circuit to be switched off.

With parameter CO16 = 1, when the capacity demand increases, the first compressor to be activated is the one that has the lowest number of starts in the circuit that has the lowest sum of starts of all its compressors. Then the next compressor that has the lowest number of starts in the same circuit is activated, and then, if present, the third compressor is activated before identifying, with the same criteria, the compressor of the next circuit to be started. When the capacity demand decreases, the first compressor to be switched off is the one that has the highest number of starts in the circuit that has the highest sum of the number of starts of all its compressors. Then the compressor that has the highest number of starts in the same circuit is deactivated, and then, if present, the third compressor is deactivated before identifying, with the same criteria, the compressor of the next circuit to be switched off.

This parameter works similarly to the "Saturation sequence principle".

The difference lays in that circuit saturation takes place irrespective of the value set in parameter CO14, which controls compressor selection; the reference value in this case is parameter CO16.

## 2.10 Source-side heat exchanger management

In units with source-side heat exchanger on the machine, the controller manages the source-side pumps for water circulation. Also, the controller can manage a 0/10V modulating output for condensation/evaporation control.

The 0/10V modulating output for condensation/evaporation control is controlled by the FA parameters. The parameters involved are shown in the table.

| Parameter | Min   | Max   | UM | Description                                                          |
|-----------|-------|-------|----|----------------------------------------------------------------------|
| FA1       | 1     | 4     | -  | Type of ventilation control                                          |
| FA2       | 0     | 1     | -  | Ventilation operating mode                                           |
| FA3       | 0     | 999   | s  | Ventilation Speed Up at start                                        |
| FA4       | 0     | 2     | -  | Single or separate ventilation                                       |
| FA5       | 0     | 999   | s  | Chiller - Pre-ventilation time before compressor start-up            |
| FA6       | 0     | 100   | %  | Chiller - Min. speed                                                 |
| FA7       | 30    | 100   | %  | Chiller - Max. speed                                                 |
| FA8       | -50.0 | 110.0 | °C | Chiller - Condensation setpoint for min. speed                       |
| FA9       | -50.0 | 110.0 | °C | Chiller - Condensing temperature for max. speed                      |
| FA14      | 0     | 100   | %  | Heat pump - Minimum speed                                            |
| FA15      | 30    | 100   | %  | Heat pump - Maximum speed                                            |
| FA16      | -50.0 | 110.0 | °C | Heat pump - Evaporation temperature for minimum speed                |
| FA17      | -50.0 | 110.0 | °C | Heat pump - Evaporation temperature for maximum speed                |
| FA21      | 0     | 100   | %  | Chiller - 1st step fans percentage                                   |
| FA22      | 0     | 100   | %  | Chiller - 2nd step fans percentage                                   |
| FA23      | 0     | 100   | %  | Chiller - 3rd step fans percentage                                   |
| FA24      | 0     | 100   | %  | Chiller - 4th step fans percentage                                   |
| FA25      | 0     | 100   | %  | Heat pump - 1st step fans percentage                                 |
| FA26      | 0     | 100   | %  | Heat pump - 2nd step fans percentage                                 |
| FA27      | 0     | 100   | %  | Heat pump - 3rd step fans percentage                                 |
| FA28      | 0     | 100   | %  | Heat pump - 4th step fans percentage                                 |
| FA29      | 0     | 1     | -  | Night shift - Enables function (only chiller mode)                   |
| FA30      | -50.0 | 110.0 | °C | Night shift - Temperature differential at min. speed in chiller mode |
| FA31      | -50.0 | 110.0 | °C | Night shift - Temperature differential at max. speed in chiller mode |
| FA32      | 00:00 | 24:00 | hr | Night shift - Start of time band (0÷ 24)                             |
| FA33      | 00:00 | 24:00 | hr | Night shift - End of time band (0÷ 24)                               |
| FA34      | 0     | 1     | -  | Night shift - Enable on Monday                                       |
| FA35      | 0     | 1     | -  | Night shift - Enable on Tuesday                                      |
| FA36      | 0     | 1     | -  | Night shift - Enable on Wednesday                                    |
| FA37      | 0     | 1     | -  | Night shift - Enable on Thursday                                     |
| FA38      | 0     | 1     | -  | Night shift - Enable on Friday                                       |
| FA39      | 0     | 1     | -  | Night shift - Enable on Saturday                                     |
| FA40      | 0     | 1     | -  | Night shift - Enable on Sunday                                       |
| FA43      | 15    | 115   | °C | Floating condensation - CH - Max. outside temperature                |
| PAL80     | 0     | 999   | s  | Fan overload - delay alarm                                           |
| PAL81     | 0     | 60    | -  | Fan overload - Maximun number alarms in one hours                    |

### 2.10.1 Modulating signal

There is just one modulating signal for condensation/evaporation control for all the refrigerant circuits of the unit.

The parameter involved is "FA4" and this is set to "1".

The modulating signal can be used to control a two-way or three-way valve.

### 2.10.2 Management of the analogue output for the modulating valve

The parameters involved in the chiller operating mode are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                               |
|-----------|-------|----|-----------------------------------------------------------|
| FA1       | 4     | -  | Type of ventilation control                               |
| FA2       | 0     | -  | Ventilation operating mode                                |
| FA3       | 2     | s  | Ventilation Speed Up at start                             |
| FA5       | 0     | s  | Chiller - Pre-ventilation time before compressor start-up |
| FA6       | 30    | %  | Chiller - Min. speed                                      |
| FA7       | 100   | %  | Chiller - Max. speed                                      |
| FA8       | 32.0  | °C | Chiller - Condensation setpoint for min. speed            |
| FA9       | 50.0  | °C | Chiller - Condensing temperature for max. speed           |

The function with relevant parameters is shown graphically below.

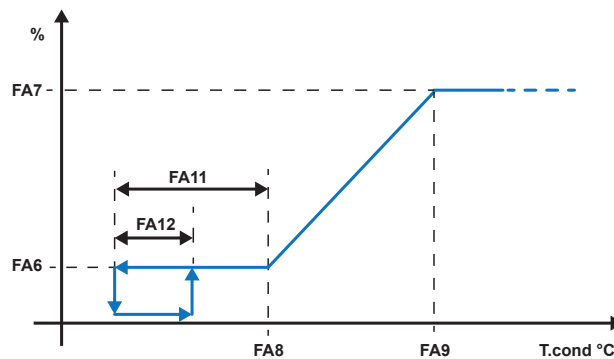


Fig. 12 Analogue output for condensation control

In chiller operating mode, the modulating valve opens, to allow the source-side water to flow when the condensing temperature is higher than  $FA8 - FA11 + FA12$ , and closes when the condensing temperature is lower than  $FA8 - FA11$ . When the condensing temperature is between values  $FA8$  and  $FA9$ , the analogue output signal causes the valve to modulate between the percentages of values  $FA6$  and  $FA7$ .

The parameters involved in the heat pump operating mode are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                           |
|-----------|-------|----|-------------------------------------------------------|
| FA1       | 4     | -  | Type of ventilation control                           |
| FA2       | 0     | -  | Ventilation operating mode                            |
| FA3       | 2     | s  | Ventilation Speed Up at start                         |
| FA14      | 30    | %  | Heat pump - Minimum speed                             |
| FA15      | 100   | %  | Heat pump - Maximum speed                             |
| FA16      | 12.0  | °C | Heat pump - Evaporation temperature for minimum speed |
| FA17      | 0.0   | °C | Heat pump - Evaporation temperature for maximum speed |
| FA19      | 3.0   | °C | Heat pump - Cut-off differential                      |
| FA20      | 1.0   | °C | Heat pump - Cut-off override                          |

The function with relevant parameters is shown graphically below.

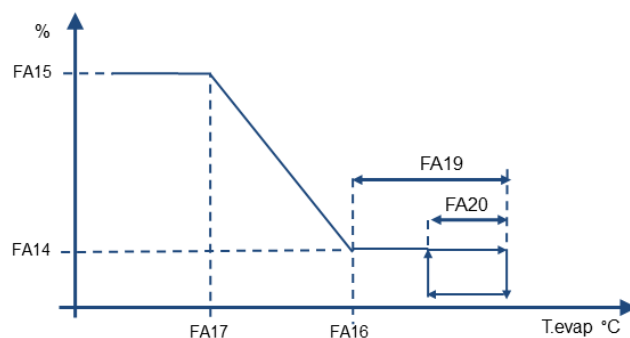


Fig. 13 Analogue output for evaporation control

In heat pump operating mode, the modulating valve opens, to allow the source-side water to flow when the evaporating temperature is lower than  $FA16 + FA19 - FA20$ , and is deactivated when the evaporating temperature is higher than  $FA16 + FA19$ . When the evaporating temperature is between values  $FA16$  and  $FA17$ , the analogue output modulates between the percentages of values  $FA14$  and  $FA15$ .

## 2.11 User-side pumps

Management of the pumps in the unit takes place based on the number of pumps configured.

The application manages the pumps through the setting of the PA parameters. The parameters involved are shown in the table.

| Parameter | Min   | Max   | UM   | Description                                                                    |
|-----------|-------|-------|------|--------------------------------------------------------------------------------|
| PA1       | 0     | 2     | -    | Users - Pump management                                                        |
| PA2       | 0     | 999   | 10 s | User - Compressor activation delay from pump start-up                          |
| PA3       | 0     | 999   | 10 s | Users - Pump Off delay from switch-off of compressors                          |
| PA4       | 0     | 999   | 10 s | Users - Pump Off delay from keypad / BMS / remote input switch-off             |
| PA5       | 0     | 4     | -    | Users - Type of rotation of pumps                                              |
| PA6       | 0     | 1     | -    | Users - Manual reversal of pumps                                               |
| PA7       | 0     | 999   | h    | Users - Number of hours of pump operation to carry out a rotation              |
| PA8       | 0     | 999   | s    | Users - Period of pumps ON simultaneously after rotation of pumps              |
| PA9       | 0     | 2     | -    | Users - Antifreeze - Action of pumps in case of antifreeze alarm with unit off |
| PA10      | 1     | 5     | -    | Users - Antifreeze - Selection of antifreeze probe                             |
| PA11      | -50.0 | 110.0 | °C   | Users - Antifreeze - Pump activation threshold on antifreeze probe             |
| PA12      | 0.1   | 25.5  | °C   | Users - Antifreeze - Pump deactivation differential on antifreeze probe        |
| PA13      | 0     | 1     | -    | User - Anti-sticking Enable anti-sticking function                             |
| PA14      | 0     | 999   | s    | Users - Pulse - Pump switch-off delay                                          |
| PA15      | 0     | 999   | m    | Users - Pulse - Interval of time in which the pump is on with compressors off  |
| PA16      | 0     | 999   | m    | Users - Pulse - Interval of time in which the pump is off with compressors off |
| PA17      | 0     | 999   | m    | Users - Pump shutdown delay by remote digital input                            |
| PA18      | 0     | 9999  | 10 h | Users - Threshold Hour meter pumps                                             |
| PA39      | 0     | 999   | s    | Users - Delay for pump activation from permission for valve opening            |
| PA40      | 0     | 999   | s    | Off time of pumps during rotation (VFPP)                                       |
| PA42      | 0     | 999   | s    | Users - Delay for valve closing from pump deactivation                         |
| PA49      | 0     | 1     | -    | User - Enabling pumps rotation only with compressors off                       |

Parameter PA1 determines the way in which the controller manages the pumps and therefore water circulation in the unit:

- 0 = Water circulation in the unit is not managed;
- 1 = Activation of water circulation (activation of a pump) follows activation of the unit;
- 2 = Activation of water circulation (activation of a pump), follows the status of the compressors and therefore the thermoregulation request.

If parameter PA1 = 2 (activation of water circulation follows thermoregulation) management of water circulation depends on parameter PA13:

- 0 = the pump is deactivated after delay PA3 and is activated with the thermoregulation request.
- 1 = the pump is deactivated after delay PA14; while the thermoregulation request is not present, the "Pulse" function is active.

### 2.11.1 Management of unit without pumps or with one pump

The parameters involved in activating the unit with one pump are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM   | Description                                                        |
|-----------|--------|------|--------------------------------------------------------------------|
| PA1       | 1 or 2 | -    | Users - Pump management                                            |
| PA2       | 6      | 10 s | User - Compressor activation delay from pump start-up              |
| PA3       | 3      | 10 s | Users - Pump Off delay from switch-off of compressors              |
| PA4       | 6      | 10 s | Users - Pump Off delay from keypad / BMS / remote input switch-off |
| PA17      | 1      | m    | Users - Pump shutdown delay by remote digital input                |

A graphical example is shown below of the sequence with which the following takes place: the switching on of the unit of the pump (parameter PA1 = 1 or 2) and of the compressors and their switching off when the switching off of the unit takes place from the keypad (pump delay PA4) and from remote OK signal (pump delay PA17).

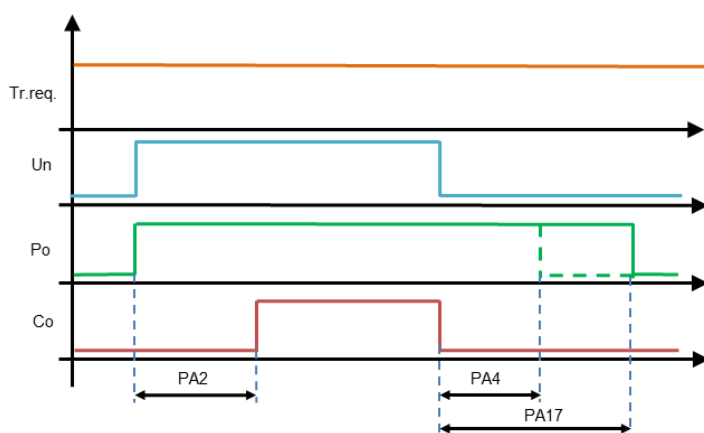


Fig. 14 Graph of the switching on and switching off of the unit, pump and compressor

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- Un = status of the unit
- Th.req. = thermoregulation request
- Po = status of the pump;
- Co = status of the compressors.



If management of at least one pump by the controller is not contemplated (parameter PA1 = 0), on starting, delay PA2 is not managed and, on switching off, delays PA4 and PA17 are not managed.

## 2.11.2 Management of 2 pumps

In the version with 2 pumps, these are always with one on standby while the other is working. The switching between pumps (to balance the hours of operation of each one), can be manual or automatic. In any case, switching takes place in case of breakdown.

The parameters involved in the management of two pumps are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM | Description                                                       |
|-----------|--------|----|-------------------------------------------------------------------|
| PA1       | 1 or 2 | -  | Users - Pump management                                           |
| PA5       | 3      | -  | Users - Type of rotation of pumps                                 |
| PA6       | 0      | -  | Users - Manual reversal of pumps                                  |
| PA7       | 8      | h  | Users - Number of hours of pump operation to carry out a rotation |
| PA8       | 5      | s  | Users - Period of pumps ON simultaneously after rotation of pumps |



Even if the unit is configured with double pump, parameter PA1 is always complied with.

The value of parameter PA5 determines the type of rotation of the pumps that can be:

- 0 = not managed;
- 1 = manual rotation; activation of the pump takes place in accordance with parameter PA6;
- 2 = rotation by number of starts; the pump with the lowest number of starts is activated;
- 3 = rotation by number of hours of operation; the pump with the lowest number of hours of operation is activated, and rotation between the pumps is forced when the active one reaches the number of hours set in parameter PA7.
- 4 = rotation by number of hours and starts; the pump with the lowest number of hours and starts is activated.

When parameter PA5 = 1, the pumps are activated in accordance with parameter PA6:

- PA6 = 0; the controller always activates pump 1;
- PA6 = 1; the controller always activates pump 2.



If the value of parameter PA5 is different from "0" or "1", forced rotation takes place automatically in case of breakdown.

If the value of parameter PA5 is "1" due to a flow switch alarm in case of breakdown of the pump selected with parameter PA6, rotation does not take place and the unit will stop.

The diagram below graphically shows the automatic rotation and the status of the thermoregulation request with the alarm of one of the pumps and of both of them.

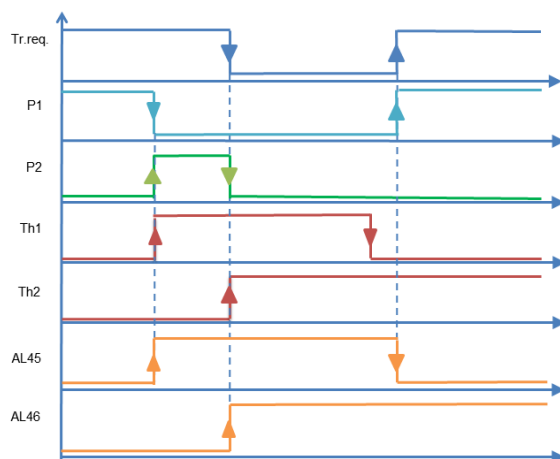


Fig. 15 Graphical representation of the alarms of the pumps

The graph shows:

1. the unit running with thermoregulation request ( $Tr.req = on$ ) and pump 1 active ( $P1 = on$ );
2. operation of the thermal overload protection of pump 1 ( $Th1 = on$ ) with activation of the relevant alarm ( $AL45 = on$ ), deactivation of pump 1 ( $P1 = off$ ) and activation of pump 2 ( $P2 = on$ );
3. operation of the overload protection of pump 2 ( $Th2 = on$ ) with activation of the relevant alarm ( $AL46 = on$ ), deactivation of pump 2 ( $P2 = off$ ) and of thermoregulation ( $Tr.req = off$ );
4. reset of the overload protection of pump 1 ( $Th1 = off$ );
5. reset of the alarm of pump 1 ( $AL45 = off$ ), activation of thermoregulation ( $Tr.req = on$ ), activation of pump 1 ( $P1 = on$ ).

### 2.11.3 Management of the pumps in antifreeze function

With the controller, there is the possibility of using system water circulation to prevent freezing of the heat exchanger during periods when the machine is stopped.



So that water circulation can impede freezing of the exchanger, the unit must be electrically powered and circulation must not be prevented by the status of valves and taps.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM | Description                                                                    |
|-----------|--------|----|--------------------------------------------------------------------------------|
| PA1       | 1 or 2 | -  | Users - Pump management                                                        |
| PA9       | 1      | -  | Users - Antifreeze - Action of pumps in case of antifreeze alarm with unit off |
| PA10      | 5      | -  | Users - Antifreeze - Selection of antifreeze probe                             |
| PA11      | 4.0    | °C | Users - Antifreeze - Pump activation threshold on antifreeze probe             |
| PA12      | 4.0    | °C | Users - Antifreeze - Pump deactivation differential on antifreeze probe        |

The value of parameter PA9 determines water circulation in unit OFF conditions or in any case with pumps deactivated:

- 0 = always deactivated
- 1 = activated at the same time as the antifreeze heaters
- 2 = activated with reference to the values of parameters PA11 and PA12

The value of parameter PA10 identifies the reference for activating the antifreeze protection and alarm that can be:

- PA10 = 1; the value read by the probe placed at the outlet of evaporator 1;
- PA10 = 2; the lowest value read out of the probes placed at the outlets of evaporator 1 and evaporator 2;
- PA10 = 3; the lowest value read out of the probes placed at the outlets of evaporator 3 and evaporator 4;
- PA10 = 4; the lowest value read out of the probes placed at the outlets of evaporator 1, evaporator 2, evaporator 3 and evaporator 4;
- PA10 = 5; the lowest value read out of the probes placed at the outlets of evaporator 1, evaporator 2, evaporator 3 and evaporator 4 and at the outlet in the common section;
- PA10 = 6; the value read by the external air probe.



If one of the set probes has an error, it is excluded. If only one probe is set, then the pump will stay switched off.

### 2.11.4 Pulse Function

The "Pulse" function allows the pump to be switched on and switched off based on some set times when the request for starting up the compressors from thermoregulation is not present.

This function combines activation of the pump of the unit with the thermoregulation request.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                                    |
|-----------|-------|----|--------------------------------------------------------------------------------|
| PA1       | 2     | -  | Users - Pump management                                                        |
| PA13      | 1     | -  | User - Anti-sticking Enable anti-sticking function                             |
| PA14      | 60    | s  | Users - Pulse - Pump switch-off delay                                          |
| PA15      | 5     | m  | Users - Pulse - Interval of time in which the pump is on with compressors off  |
| PA16      | 5     | m  | Users - Pulse - Interval of time in which the pump is off with compressors off |

The function is shown graphically in the diagram below.

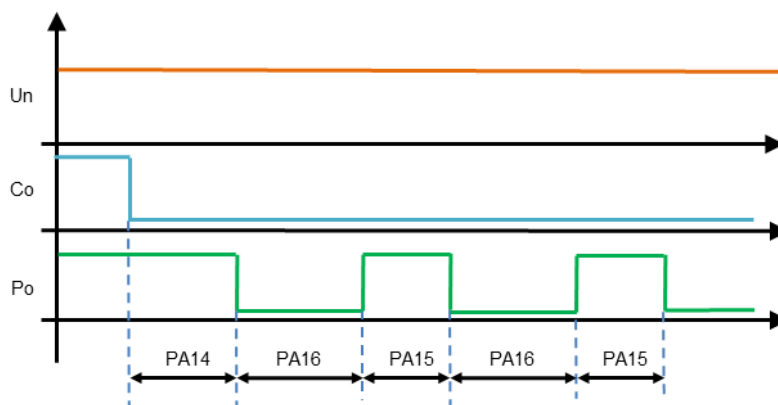


Fig. 16 "Pulse" function

In addition to the parameters of the table, the following abbreviations are present in the graph:

- Un = status of the unit
- Co = status of the compressors
- Po = status of the pumps.

### 2.11.5 Pump alarms

The alarms that regard the pumps are shown below.

#### Pump maintenance

|                       |                                                                         |
|-----------------------|-------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL143 maintenance of pump 1; AL144 maintenance of pump 2</b>         |
| Reason for activation | This is detected when the work hours exceed the value of parameter PA18 |
| Reset                 | On deletion of the hours in the Service menu                            |
| Alarm icon            | Flashing                                                                |
| AlarmLog              | Yes                                                                     |
| Buzzer                | Yes                                                                     |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                               |
| Pump in alarm         | Follows its control                                                     |
| The other devices     | They follow their control                                               |

#### Thermal overload protection of pumps

|                   |                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------|
| <b>Alarm code</b> | <b>AL45 Thermal overload protection of pump 1; AL46 Thermal overload protection of pump 2</b> |
| Reset             | With digital input closed                                                                     |
| Reset mode        | Always manual                                                                                 |
| Alarm icon        | Flashing                                                                                      |
| AlarmLog          | Yes                                                                                           |
| Buzzer            | Yes                                                                                           |
| <b>Devices</b>    | <b>Behaviour in the event of an alarm</b>                                                     |
| Pump              | Operation of the pump in alarm is prevented                                                   |
| The other devices | They follow their control                                                                     |

## 2.12 User-side pump

The controller can control a water circulation valve.



The water circulation valve is controlled by the controller in connection with the user-side pump.

The control process consists in the following:

- pump start-up is delayed so that the valve can open fully;
- valve closing is delayed after pump switch-off.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                         |
|-----------|-------|----|---------------------------------------------------------------------|
| PA39      | 90    | s  | Users - Delay for pump activation from permission for valve opening |
| PA42      | 90    | s  | Users - Delay for valve closing from pump deactivation              |

Below is a graphic illustration of the sequence followed to open and close the valve with respect to pump start-up and stop.

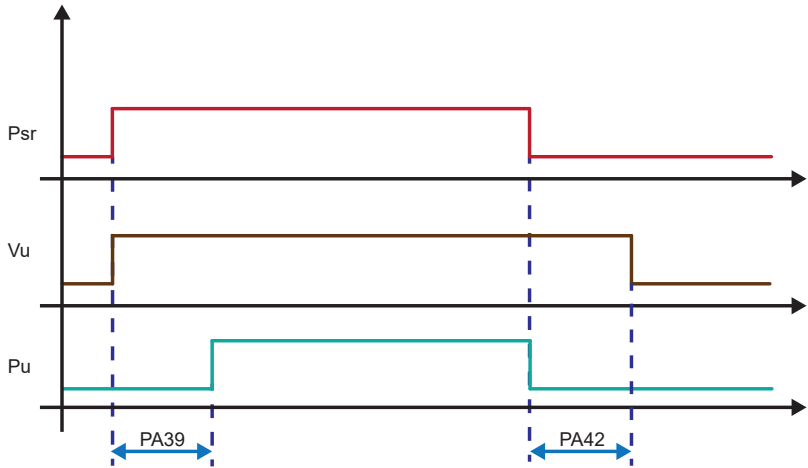


Fig. 17 Graph showing delayed valve opening and closing

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- Psr = request for pump start-up
- Vu = status of user-side valve
- Pu = status of user-side pump

The valve is always controlled in connection with the pump, irrespective of the control type selected in parameter PA1.

## 2.13 Source-side pumps

Management of the source-side pumps of the unit takes place based on the number of pumps configured.

The source-side pumps are also managed by the controller through the setting of the PA parameters. The parameters involved are shown in the table.

Normally, the starting up of the source-side pump is linked to the starting of at least one compressor of the unit and therefore parameter "PA24" is set to "2".

| Parameter | Min   | Max   | UM   | Description                                                                    |
|-----------|-------|-------|------|--------------------------------------------------------------------------------|
| PA24      | 0     | 2     | -    | Source - Pump management                                                       |
| PA25      | 0     | 999   | 10 s | Source - Compressor activation delay from starting of pump                     |
| PA26      | 0     | 999   | 10 s | Source - Pump Off delay from switch-off of compressors                         |
| PA27      | 0     | 999   | 10 s | Source - Pump Off delay from keypad / BMS / remote input switch-off            |
| PA28      | 0     | 4     | -    | Source - Type of rotation of pumps                                             |
| PA29      | 0     | 1     | -    | Source - Manual reversal of pumps                                              |
| PA30      | 0     | 999   | h    | Source - Number of hours of pump operation to carry out a rotation             |
| PA31      | 0     | 999   | s    | Source - Period of pumps ON simultaneously after rotation of pumps             |
| PA32      | 0     | 2     | -    | Source - Antifreeze - Action of pumps in case of antifreeze alarm and unit off |
| PA33      | 1     | 5     | -    | Source - Antifreeze. Selection of antifreeze probe                             |
| PA34      | -50.0 | 110.0 | °C   | Source - Antifreeze. Activation threshold of pumps on antifreeze probe         |
| PA35      | 0.1   | 25.5  | °C   | Source - Antifreeze. Activation differential of pumps on antifreeze probe      |
| PA36      | 0     | 999   | 10 h | Source/Recovery - Pump hour counter threshold                                  |

Parameter PA24 determines the way in which the controller manages the pumps and therefore water circulation in the unit:

- 0 = Water circulation in the unit is not managed;
- 1 = Activation of water circulation (activation of a pump) follows activation of the unit;
- 2 = Activation of water circulation (activation of a pump), follows the status of the compressors and therefore the thermoregulation request.

### 2.13.1 Management of unit without pumps or with one pump

The parameters involved in activating the unit with one pump are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM   | Description                                                         |
|-----------|--------|------|---------------------------------------------------------------------|
| PA24      | 0 or 2 | -    | Source - Pump management                                            |
| PA25      | 6      | 10 s | Source - Compressor activation delay from starting of pump          |
| PA26      | 3      | 10 s | Source - Pump Off delay from switch-off of compressors              |
| PA27      | 6      | 10 s | Source - Pump Off delay from keypad / BMS / remote input switch-off |

A graphical example is shown below of the sequence with which the following takes place: the switching on of the unit of the pump (parameter PA24 = 1 or 2) and of the compressors and their switching off when the switching off of the unit takes place from the keypad (pump delay PA27).

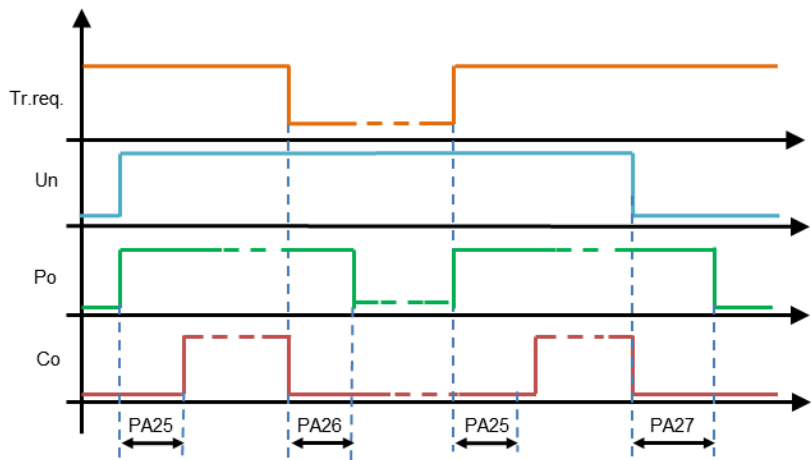


Fig. 18 Graph of the switching on and switching off of the unit, source-side pump and compressor

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- Un = status of the unit
- Th.req. = thermoregulation request
- Po = status of the pump;
- Co = status of the compressors.



If management of at least one pump by the controller is not contemplated (parameter PA24 = 0), on starting, delay PA25 is not managed and, on switching off, delays PA26 and PA27 are not managed.

### 2.13.2 Management of 2 pumps

In the version with 2 pumps, these are always with one on standby while the other is working. The switching between pumps (to balance the hours of operation of each one), can be manual or automatic. In any case, switching takes place in case of breakdown.

The parameters involved in the management of two pumps are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                        |
|-----------|-------|----|--------------------------------------------------------------------|
| PA24      | 1-2   | -  | Source - Pump management                                           |
| PA28      | 3     | -  | Source - Type of rotation of pumps                                 |
| PA29      | 0     | -  | Source - Manual reversal of pumps                                  |
| PA30      | 8     | h  | Source - Number of hours of pump operation to carry out a rotation |
| PA31      | 5     | s  | Source - Period of pumps ON simultaneously after rotation of pumps |



Even if the unit is configured with double pump, parameter PA24 is always complied with.

The value of parameter PA28 determines the type of rotation of the pumps that can be:

- 0 = not managed;
- 1 = manual rotation; activation of the pump takes place in accordance with parameter PA29;
- 2 = rotation by number of starts; the pump with the lowest number of starts is activated;
- 3 = rotation by number of hours of operation; the pump with the lowest number of hours of operation is activated, and rotation between the pumps is forced when the active one reaches the number of hours set in parameter PA30.
- 4 = rotation by number of hours and starts; the pump with the lowest number of hours and starts is activated.

When parameter PA28 = 1, the pumps are activated in accordance with parameter PA29:

- PA29 = 0; the control always activates pump 1;
- PA29 = 1; the control always activates pump 2.



If the value of parameter PA28 is different from "0" or "1", forced pump shifting takes place automatically in the event of a breakdown.

If the value of parameter PA28 is "1", pump shifting does not take place and the unit will stop due to flow switch alarm in the event of a breakdown of the pump selected by parameter PA29.

The diagram below graphically shows the automatic rotation and the status of the thermoregulation request with the alarm of one of the pumps and of both of them.

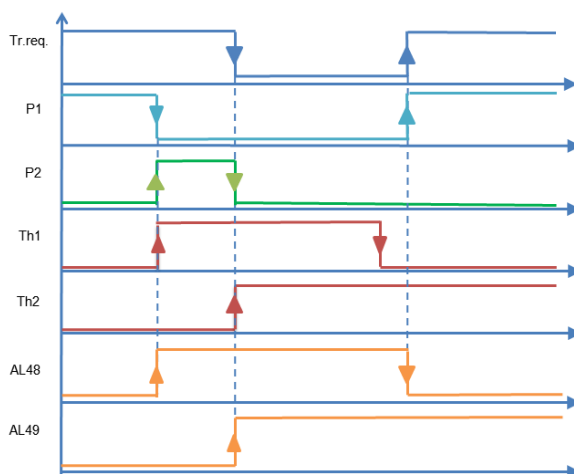


Fig. 19 Graphical representation of the alarms of the pumps

The graph shows:

1. the unit running with thermoregulation request (Tr.req = on) and pump 1 active (P1 = on);
2. operation of the thermal overload protection of pump 1 (Th1 = on) with activation of the relevant alarm (AL48 = on), deactivation of pump 1 (P1 = off) and activation of pump 2 (P2 = on);
3. operation of the thermal overload protection of pump 2 (Th2 = on) with activation of the relevant alarm (AL49 = on), deactivation of pump 2 (P2 = off) and of thermoregulation (Tr.req = off);
4. reset of the overload protection of pump 1 (Th1 = off);
5. reset of the alarm of pump 1 (AL48 = off), activation of thermoregulation (Tr.req = on), activation of pump 1 (P1 = on).

### 2.13.3 Management of the pumps in antifreeze function

With the controller, there is the possibility of using system water circulation to prevent freezing of the heat exchanger during periods when the machine is stopped.



So that water circulation can impede freezing of the exchanger, the unit must be electrically powered and circulation must not be prevented by the status of valves and taps.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM | Description                                                                    |
|-----------|--------|----|--------------------------------------------------------------------------------|
| PA24      | 1 or 2 | -  | Source - Pump management                                                       |
| PA32      | 1      | -  | Source - Antifreeze - Action of pumps in case of antifreeze alarm and unit off |
| PA33      | 5      | -  | Source - Antifreeze. Selection of antifreeze probe                             |
| PA34      | 4.0    | °C | Source - Antifreeze. Activation threshold of pumps on antifreeze probe         |
| PA35      | 4.0    | °C | Source - Antifreeze. Activation differential of pumps on antifreeze probe      |

The value of parameter PA32 determines water circulation in unit OFF conditions or in any case with pumps deactivated:

- 0 = always deactivated
- 1 = activated at the same time as the antifreeze heaters
- 2 = activated with reference to the values of parameters PA11 and PA12

The value of parameter PA33 identifies the reference for activating the antifreeze protection and alarm that can be:

- PA33 = 1; the value read by the probe placed at the outlet of evaporator 1;
- PA33 = 2; the lowest value read out of the probes placed at the outlets of evaporator 1 and evaporator 2;
- PA33 = 3; the lowest value read out of the probes placed at the outlets of evaporator 3 and evaporator 4;
- PA33 = 4; the lowest value read out of the probes placed at the outlets of evaporator 1, evaporator 2, evaporator 3 and evaporator 4;
- PA33 = 5; the lowest value read out of the probes placed at the outlets of evaporator 1, evaporator 2, evaporator 3 and evaporator 4 and at the outlet in the common section;
- PA33 = 6; the value read by the external air probe;



If one of the set probes has an error, it is excluded. If only one probe is set, then the pump will stay switched off.

### 2.13.4 Source-side pump alarms

The alarms that regard the source-side pumps are shown below.

#### Maintenance of source-side pumps

|                       |                                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL146 / AL446 maintenance of pump 1; AL147 / AL447 maintenance of pump 2</b> |
| Reason for activation | This is detected when the work hours exceed the value of parameter PA36         |
| Reset                 | Upon deletion of the hours in the Service or Maintenance menu                   |
| Alarm icon            | Flashing                                                                        |
| AlarmLog              | Yes                                                                             |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                       |
| Pump in alarm         | Follows its control                                                             |
| The other devices     | They follow their control                                                       |

#### Thermal overload protection of source-side pumps

|                   |                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b> | <b>AL48 / AL348 Thermal overload protection of pump 1; AL49 / AL349 Thermal overload protection of pump 2</b> |
| Reset             | With digital input closed                                                                                     |
| Reset mode        | Always manual                                                                                                 |
| Alarm icon        | Flashing                                                                                                      |
| AlarmLog          | Yes                                                                                                           |
| <b>Devices</b>    | <b>Behaviour in the event of an alarm</b>                                                                     |
| Pump              | Operation of the pump in alarm is prevented                                                                   |
| The other devices | They follow their control                                                                                     |

## 2.14 Heat recovery pumps

Management of the heat recovery pumps of the unit takes place based on the number of pumps configured.

The heat recovery pumps are managed by the controller through the setting of the PA parameters. The parameters involved are shown in the table.

Activation of the pump is linked to the setting of parameter "PA43" to "1".

The number of pumps present is factory set whereas the type of rotation depends on parameter "PA45"

| Parameter | Min | Max | UM   | Description                                                  |
|-----------|-----|-----|------|--------------------------------------------------------------|
| PA36      | 0   | 999 | 10 h | Source/Recovery - Pump hour counter threshold                |
| PA43      | 0   | 1   | -    | Recovery - Recovery Pump Management                          |
| PA44      | 0   | 999 | s    | Recovery - Disactivation pump delay                          |
| PA45      | 2   | 3   | -    | Recovery - Type of rotation and activation pumps             |
| PA46      | 0   | 999 | hr   | Recovery - Number of pump operating hours to make a rotation |
| PA47      | 0   | 999 | s    | Recovery - Contemporary time ON pump after pump rotation     |

### 2.14.1 Management of one or two heat recovery pumps

Irrespective of the number of pumps managed by the controller, parameter "PA43" must be set to "1".

The controller manages water circulation in the heat recovery exchanger when it activates the heat recovery valve.

If just one pump is factory configured, the controller manages heat recovery only if the pump is not in alarm condition.

If two pumps are configured, at the time the heat recovery valve is activated, the pump is activated according to the setting of parameter "PA45".

With parameter "PA45" (rotation of operation due to reaching the number of hours of operation) set to "3", when the number of hours of operation reaches the value set in parameter "PA46", if both pumps are available, the controller rotates them.

During rotation of operation, the controller keeps both pumps operating for the time set in parameter "PA47".

At the end of heat recovery, the controller keeps the pump that is running operating for the time set in parameter "PA44".

### 2.14.2 Heat recovery pump alarms

The alarms regarding the heat recovery pumps are shown below.

#### Maintenance of recovery pumps/desuperheater

| Alarm code            | AL241 maintenance of pump 1; AL242 maintenance of pump 2                |
|-----------------------|-------------------------------------------------------------------------|
| Reason for activation | This is detected when the work hours exceed the value of parameter PA36 |
| Reset                 | Upon deletion of the hours in the Service or Maintenance menu           |
| Alarm icon            | Flashing                                                                |
| AlarmLog              | Yes                                                                     |
| Devices               | Behaviour in the event of an alarm                                      |
| Pump in alarm         | Follows its control                                                     |
| The other devices     | They follow their control                                               |

---

#### Thermal overload protection in recovery pumps/desuperheater

|                   |                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------|
| <b>Alarm code</b> | <b>AL243 Thermal overload protection of pump 1; AL244 Thermal overload protection of pump 2</b> |
| Reset             | With digital input closed                                                                       |
| Reset mode        | Always manual                                                                                   |
| Alarm icon        | Flashing                                                                                        |
| AlarmLog          | Yes                                                                                             |
| <b>Devices</b>    | <b>Behaviour in the event of an alarm</b>                                                       |
| Pump              | Operation of the pump in alarm is prevented                                                     |
| Recovery          | Prevented if a back-up pump is not available                                                    |
| The other devices | They follow their control                                                                       |

## 2.15 Liquid injection valve

To activate this function, the PTC discharge probe must be configured for each circuit present in the unit.

All the parameters involved with this function are shown in the table.

| Parameter | Value | UM | Description                                                                                   |
|-----------|-------|----|-----------------------------------------------------------------------------------------------|
| CO51      | 110   | °C | Control of discharge temperature - Activation Setpoint of the liquid injection solenoid valve |
| CO52      | 10.0  | °C | Screw - Differential activation of the liquid injection solenoid valve (discharge temp.)      |

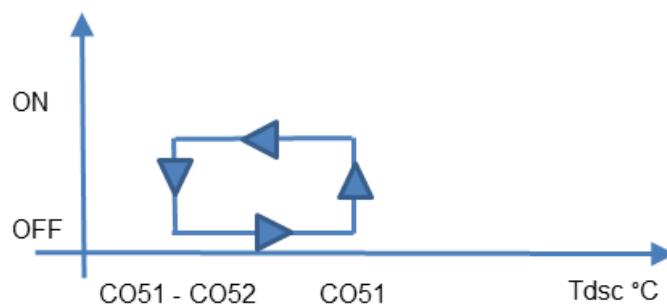


Fig. 20 Graphical representation of injection valve operation

When the temperature of the discharge gas (Tdsc) reaches the value of parameter CO51, injection of liquid is activated and remains active until the temperature falls to the value given by the difference CO51 - CO52.

## 2.16 Oil return

The oil return function consists of the increase in cooling capacity of the circuit when it remains at reduced capacity for a long time.

The increase in cooling capacity causes an increase in the speed of the refrigerant in the exchangers and facilitates oil return to the compressor.

The parameters involved are shown in the table.

| Parameter | Min | Max | UM  | Description                                                                                            |
|-----------|-----|-----|-----|--------------------------------------------------------------------------------------------------------|
| CO16      | 0   | 1   | -   | Criteria for selection of compressors in the selection of circuits                                     |
| CO45      | 0   | 999 | sec | Oil return - Scroll ON/OFF: Compressor override time to ON with oil return function enabled (0=disab.) |
| CO47      | 0   | 180 | min | Oil return - Scroll ON/OFF: delay in procedure activation - Inverter: compressor override duration     |



The function is present on all units.

The capacity reduction value that activates the function is factory set.

### 2.16.1 Oil return for on-off compressors connected in parallel

In the case of on-off compressors connected in parallel, there can be two conditions that require an increase in cooling capacity to facilitate oil return:

- prolonged operation of the same compressor;
- activation and deactivation for short periods, one at a time, of all the compressors.

All the parameters involved with this function are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                                            |
|-----------|-------|-----|--------------------------------------------------------------------------------------------------------|
| CO16      | 0     | -   | Criteria for selection of compressors in the selection of circuits                                     |
| CO45      | 60    | sec | Oil return - Scroll ON/OFF: Compressor override time to ON with oil return function enabled (0=disab.) |
| CO47      | 50    | min | Oil return - Scroll ON/OFF: delay in procedure activation - Inverter: compressor override duration     |

### Prolonged operation of the same compressor

When just one compressor remains in operation in a circuit for a time longer than parameter CO47, the controller forces the activation of another compressor.

Irrespective of the thermoregulation request, the forcing stays active for the time set in parameter CO45.

After time CO45 has elapsed, forcing stops and, if not required by thermoregulation, the compressor that was in operation first is stopped.

In the case of circuits with 3 compressors, the controller chooses the one that is activated for forcing with the criteria set in parameter CO16.

A graphical representation of the function is shown in the illustration.

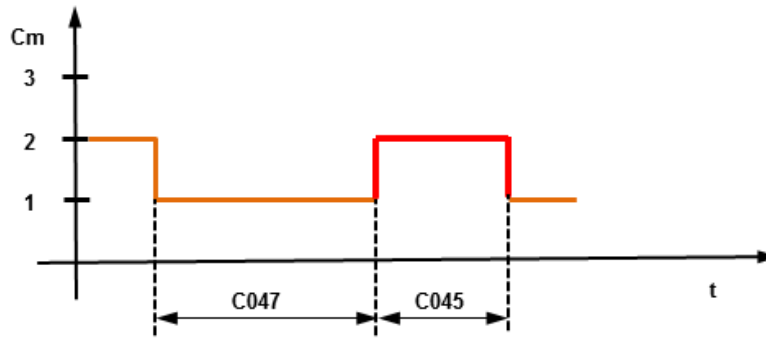


Fig. 21 Forcing of compressor starting for oil recovery

The abbreviation "Cm" refers to the number of compressors that are running.

### Activation and deactivation for short periods, one at a time, of all the compressors

When the compressors remain running, one at a time, for short periods in "low load conditions" in a circuit, if the sum of the operating times is greater than parameter CO47, the controller activates another compressor.

Irrespective of the thermoregulation request, the forcing stays active for the time set in parameter CO45.

After time CO45 has elapsed, forcing stops and, if not required by thermoregulation, the compressor that was in operation first is stopped.

In the case of circuits with 3 compressors, the controller chooses the one that is activated for forcing with the criteria set in parameter CO16.

A graphical representation of the function is shown in the illustration.

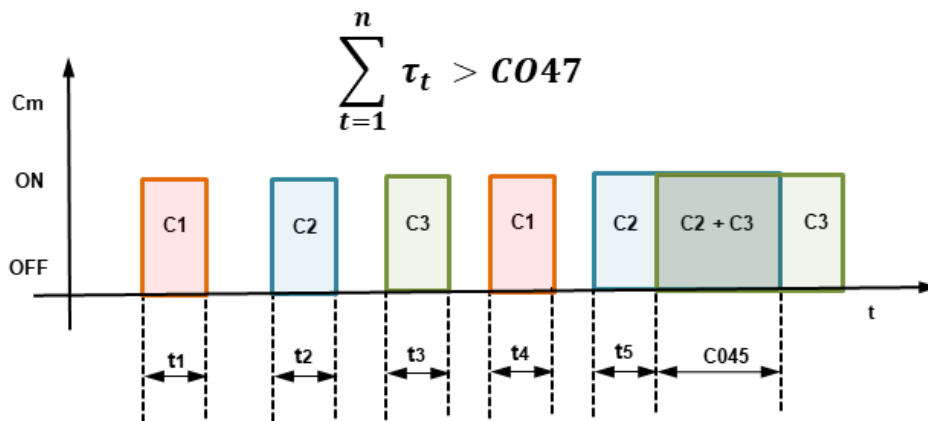


Fig. 22 Forcing of compressor starting for oil recovery

"Cm" refers to the status of the compressors.

C1, C2 and C3 refer to the compressors that are running.

## 2.17 Heat recovery

During operation of the unit in chiller mode, this function allows the heat normally rejected in the source-side heat exchanger to be recovered. Heat recovery takes place by heating water.

When the function is active, condensation takes place in the heat recovery heat exchanger, and source-side water does not flow through the condensing heat exchanger.

The parameters involved are shown in the table.

| Parameter | Min    | Max     | UM  | Description                                                                              |
|-----------|--------|---------|-----|------------------------------------------------------------------------------------------|
| RC3       | 0      | 999     | s   | DC - Forced unloading time before entering in recovery                                   |
| RC4       | 0      | 999     | s   | DC - Forced unloading time after entering in recovery                                    |
| RC5       | 0      | 999     | m   | DC/DS - Minimum On time                                                                  |
| RC6       | 0      | 999     | m   | DC - Minimum waiting time between two recoveries / DS - Waiting time before VDO enabling |
| RC7       | 0.0    | 99.9    | bar | DC - High pressure threshold to exit from recovery                                       |
| RC8       | 0.1    | 25.5    | bar | DC - High pressure differential to exit from recovery                                    |
| RC9       | 0      | 999     | s   | DC - Fans deactivation delay after entering in recovery                                  |
| RC11      | -50.0  | 45.0    | °C  | DC/DS - Minimum setpoint                                                                 |
| RC12      | 28.0   | 110.0   | °C  | DC/DS - Maximum setpoint                                                                 |
| RC13      | 28.0   | 45.0    | °C  | DC/DS - Setpoint                                                                         |
| RC14      | 0.1    | 25.5    | °C  | DC/DS - Differential                                                                     |
| RC15      | 0      | 9       | -   | Probe selection entry/exit DC/DS                                                         |
| RC16      | 0 = NO | 1 = YES | -   | Enable DC/DS circuit 1                                                                   |
| RC17      | 0 = NO | 1 = YES | -   | Enable DC/DS circuit 2                                                                   |
| RC18      | 0 = NO | 1 = YES | -   | Enable DC/DS circuit 3                                                                   |
| RC19      | 0 = NO | 1 = YES | -   | Enable DC/DS circuit 4                                                                   |
| RC20      | 0.0    | 99.9    | bar | Setpoint activation air coil drain valve                                                 |
| RC21      | 0.1    | 25.5    | bar | Differential deactivation air coil drain valve                                           |

### 2.17.1 Enabling and activation of recovery

With the relevant digital input closed, activation of recovery depends on the temperature value read by the probe that controls it (RC15) compared to the recovery setpoint (RC13) and relevant differential (RC14).

The recovery differential is divided into the same number of steps as refrigerant circuits present in the unit.

A graphical representation is shown below.

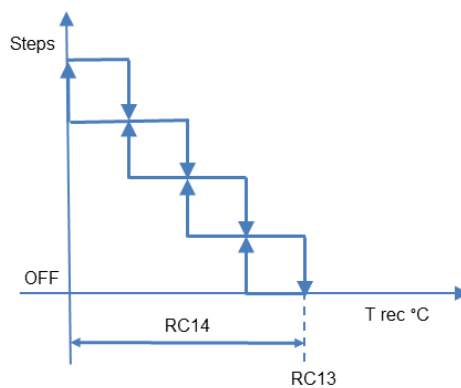


Fig. 23 Graph of recovery activation

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- $T_{rec}$  = recovery water temperature.

## 2.17.2 Recovery management

In addition to activation, the controller manages heat recovery and checks the suction and delivery pressures, and with delays.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                              |
|-----------|-------|-----|------------------------------------------------------------------------------------------|
| RC3       | 60    | s   | DC - Forced unloading time before entering in recovery                                   |
| RC4       | 60    | s   | DC - Forced unloading time after entering in recovery                                    |
| RC5       | 2     | m   | DC/DS - Minimum On time                                                                  |
| RC6       | 5     | m   | DC - Minimum waiting time between two recoveries / DS - Waiting time before VDO enabling |
| RC7       | 16.0  | bar | DC - High pressure threshold to exit from recovery                                       |
| RC8       | 4.0   | bar | DC - High pressure differential to exit from recovery                                    |
| RC9       | 5     | s   | DC - Fans deactivation delay after entering in recovery                                  |
| RC11      | 28.0  | °C  | DC/DS - Minimum setpoint                                                                 |
| RC12      | 45.0  | °C  | DC/DS - Maximum setpoint                                                                 |
| RC13      | 42.0  | °C  | DC/DS - Setpoint                                                                         |
| RC14      | 3.0   | °C  | DC/DS - Differential                                                                     |
| RC20      | 1.0   | bar | Setpoint activation air coil drain valve                                                 |
| RC21      | 0.3   | bar | Differential deactivation air coil drain valve                                           |

In addition to the request by thermoregulation for recovery and possible closing of the external OK signal, before activating the recovery exchanger, the controller checks that:

- the minimum delay between two activations has elapsed (RC6);
- the forced capacity reduction time before activation has elapsed (RC3).

Once heat recovery is activated, water circulation in the source-side heat exchanger is maintained for the switch-off delay of the pumps (RC9).

Once activation is completed, recovery is maintained at least for the minimum activation time (RC5).

With recovery active, the delivery and suction pressures are checked. In particular:

1. if the delivery pressure exceeds the value of the high pressure threshold for deactivation (RC7), the controller deactivates recovery in the refrigerant circuit involved;
2. if the suction pressure falls below the value of the discharge pressure (RC20), the discharge valve of the refrigerant circuit of the relevant source-side heat exchanger is activated.

When recovery is deactivated, whether this takes place normally with thermoregulation, from external OK signal, from the keypad, or due to reaching the high pressure threshold for deactivation (RC7), the stages are as follows:

- the circuit is necessarily kept with reduced capacity for time (RC4);
- the heat recovery valve is deactivated and the source-side pump is started up.
- if one heat recovery pump is operating, it stays running with the source-side pump for the time set in parameter "PA44".



If the thermoregulation request is met in chiller operating mode while a circuit is in recovery mode, switching off always takes place with recovery deactivated.

---

### 2.17.3 Recovery alarms

The alarms that regard recovery are shown below.

|                                |                                                                       |
|--------------------------------|-----------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL207.. AL210 circuit 1 .. 4 recovery disabled</b>                 |
| Reason for activation          | This is detected if the delivery pressure exceeds threshold RC7       |
| Reset                          | When the delivery pressure is lower than value RC7 - RC8 for time RC9 |
| Reset mode                     | Manual                                                                |
| Alarm icon                     | Flashing                                                              |
| AlarmLog                       | Yes                                                                   |
| Buzzer                         | Yes                                                                   |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                             |
| Circuit in alarm               | Recovery deactivated                                                  |
| The other circuits and devices | They follow their control                                             |

## 2.18 Desuperheater

The function of the desuperheater is to recover a portion of the heat generated by the superheated gas at the compressor exhaust and to use it to heat water.

For correct refrigerant circuit operation, the superheated gas must not, however, be cooled to such extent that it condenses. This is why the desuperheater can only be supplementary to the main source used for the production of hot water in the system in which it is incorporated.

As the controller is intended to provide for safe management of the refrigerant unit, it uses the desuperheater at best by controlling the following:

- a digital output which the installer can use to manage a pump or a valve;
- one or two pumps, including their safety devices and the pump rotation logics in connection with the hours of operation and alarms, if any.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM | Description                                                                                 |
|-----------|--------|----|---------------------------------------------------------------------------------------------|
| RC5       | 0      | m  | DC/DS - Minimum On time                                                                     |
| RC6       | 0      | m  | DC - Minimum waiting time between two recoveries / DS - Waiting time before VDO enabling    |
| RC11      | -50.0  | °C | DC/DS - Minimum setpoint                                                                    |
| RC12      | 28.0   | °C | DC/DS - Maximum setpoint                                                                    |
| RC13      | 28.0   | °C | DC/DS - Setpoint                                                                            |
| RC14      | 0.1    | °C | DC/DS - Differential                                                                        |
| RC15      | 0      | -  | Probe selection entry/exit DC/DS                                                            |
| RC16      | 0 = NO | -  | Enable DC/DS circuit 1                                                                      |
| RC17      | 0 = NO | -  | Enable DC/DS circuit 2                                                                      |
| RC18      | 0 = NO | -  | Enable DC/DS circuit 3                                                                      |
| RC19      | 0 = NO | -  | Enable DC/DS circuit 4                                                                      |
| RC22      | -99.9  | °C | DS - Minimum difference between condensation converted temperature and DS temperature       |
| RC23      | -99.9  | °C | DS - Differential: difference between condensation converted temperature and DS temperature |

### 2.18.1 Desuperheater activation

If the relevant icon is tapped on screen and the relevant digital input is closed, the desuperheater is enabled based on the water reference temperature setpoint and the condensing temperature.

A graphical representation is shown below.

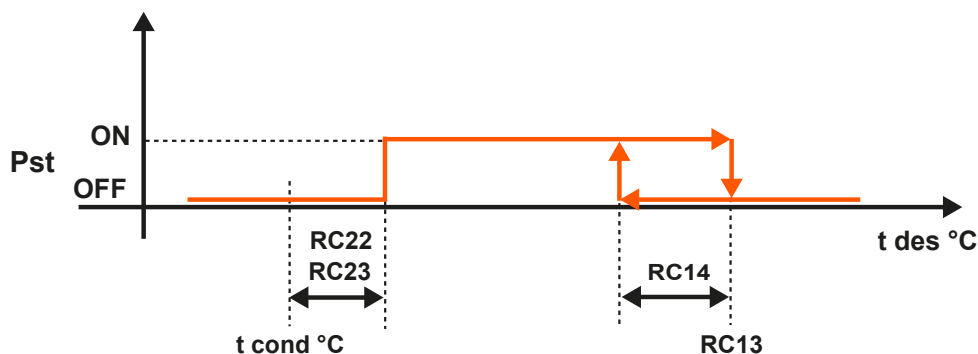


Fig. 24 Desuperheater activation graph

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- Pst = desuperheater OK signal status;
- t cond = condensing temperature;
- t des = water reference temperature.

---

### 2.18.2 Desuperheater management

When the water reference temperature exceeds the setpoint value stored in parameter “RC13”, the controller stops the OK signal that enables desuperheater operation. The signal is output again when the water reference temperature is smaller than the value resulting by subtracting the setpoint in “RC13” and the “RC14” differential value.

When the reference value of the water temperature is lower than the condensing temperature (“t cond”) plus the differential value “RC22” (operation in cooling mode) or the differential value “RC23” (operation in heating mode), the controller stops outputting the OK signal to enable desuperheater operation in order to prevent the refrigerant from condensing inside the desuperheater.



Parameters “RC22” and “RC23” may take both positive and negative values. The graph shows the “RC22” and “RC23” parameters having equal and positive values.

The controller starts outputting the OK signal to the desuperheater again as soon as the conditions for re-activation are met for at least as long as the time set in parameter “RC6”.



If desuperheater pumps are fitted, their management is described in the chapter titled “Recovery pumps”.

## 2.19 Antifreeze control in recovery system/desuperheater

During operation of the units, or while they are in stand-by conditions and the ambient temperature is below zero, the water inside the exchangers can freeze.

Ice formation inside the exchangers can irreparably damage them.

The controller runs dedicated processes to prevent the formation of ice in the heat exchangers.

The parameters involved are shown in the table.

| Parameter | Min   | Max   | UM | Description                                |
|-----------|-------|-------|----|--------------------------------------------|
| AR12      | -50.0 | 110.0 | °C | Activation setpoint of DC/DS heaters       |
| AR13      | 0.1   | 25.5  | °C | Deactivation differential of DC/DS heaters |
| AR14      | 0     | 3     | -  | DC/DS antifreeze type                      |

### 2.19.1 Antifreeze control in recovery system/desuperheater

The output used to enable the antifreeze function gets activated when the temperature value read by the reference probe reaches the setpoint value. Deactivation takes place when the activation temperature plus the differential is reached.

The reference probe installed to control the antifreeze function reads the temperature of water at the heat exchanger inlet. If multiple heat exchangers are fitted, they must be connected to a manifold.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                |
|-----------|-------|----|--------------------------------------------|
| AR12      | 3.0   | °C | Activation setpoint of DC/DS heaters       |
| AR13      | 1.0   | °C | Deactivation differential of DC/DS heaters |
| AR14      | 1     | -  | DC/DS antifreeze type                      |

A graphical representation is shown below.

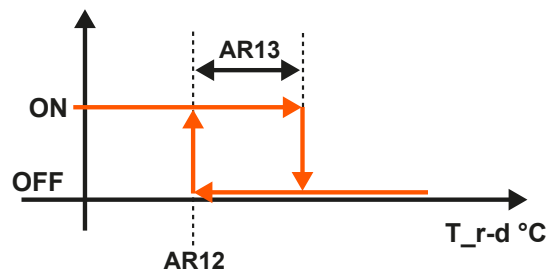


Fig. 25 Antifreeze control

In addition to the parameters in the table, the following abbreviations are present in the graph:

- ON = antifreeze function enabled;
- OFF = antifreeze function disabled;
- $T_{r-d}$  = temperature read by the reference probe.

The value stored in parameter “AR14” defines the function that is used to prevent the formation of ice in the heat exchanger:

- 0 = no function;
- 1 = enable antifreeze heater;
- 2 = enable OK signal output to external pump;
- 3 = enable unit pumps in antifreeze function.

---

### 2.19.2 Management of the pumps in antifreeze function

The controller features an option by which water is circulated to prevent freezing of the heat exchanger provided that the conditions to enable the antifreeze function are in place (parameter "AR14" = 3).



So that water circulation can impede freezing of the exchanger, the unit must be electrically powered and circulation must not be prevented by the status of valves and taps.



If an error is experienced with the reference probe that controls the antifreeze function, the antifreeze function does not get enabled.

## 2.20 Pump down

This function causes the refrigerant circuit to stop following the closing of the expansion valve and the reaching of the suction pressure at the switch-off threshold in pump down.

The parameters involved are shown in the table.

| Parameter | Min | Max  | UM  | Description                                                            |
|-----------|-----|------|-----|------------------------------------------------------------------------|
| PD1       | 0   | 6    | -   | Enables pump down function                                             |
| PD2       | 0.0 | 99.9 | bar | Deactivation threshold                                                 |
| PD4       | 0   | 999  | s   | Maximum time in pump down at start-up and switch-off                   |
| PD7       | 0   | 60   | -   | Maximum number of pump down activations per hour during procedure stop |

### 2.20.1 Pump down during switch-off

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                            |
|-----------|-------|-----|------------------------------------------------------------------------|
| PD1       | 1     | -   | Enables pump down function                                             |
| PD2       | 2.0   | bar | Deactivation threshold                                                 |
| PD4       | 30    | s   | Maximum time in pump down at start-up and switch-off                   |
| PD7       | 3     | -   | Maximum number of pump down activations per hour during procedure stop |

A graphical representation is shown below.

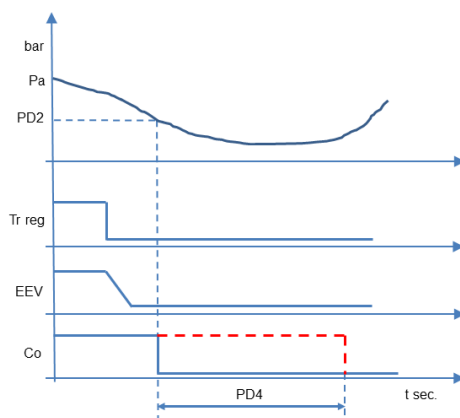


Fig. 26 Pump down

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- Pa = suction pressure
- Tr reg = thermoregulation request
- EEV = electronic expansion valve
- Co = OK signal to the refrigerant circuit.

The stages of the graph are as follows:

- the request for refrigerant circuit operation by thermoregulation ends;
- the controller forces the closing of the electronic expansion valve;
- the suction pressure decreases;
- on reaching the value set in parameter PD2, the controller stops the refrigerant circuit;
- in any case, when delay PD4 has elapsed, irrespective of the suction pressure value, the controller stops the refrigerant circuit with alarm message.

---

## 2.20.2 Pump down alarms

The alarms regarding pump down are shown below.

|                                |                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL122.. AL125 pump down alarm for circuits 1 .. 4</b>                                  |
| Reason for activation          | When PD1 is different from "0" and the switching off of a refrigerant circuit is required |
| Reset                          | Automatic, and becomes manual after PD7 occurrences/hour                                  |
| Reset mode                     | Only the service personnel may reset the manual alarm.                                    |
| Alarm icon                     | Flashing                                                                                  |
| AlarmLog                       | Yes                                                                                       |
| Buzzer                         | Yes                                                                                       |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                                 |
| Circuit in alarm               | Deactivated                                                                               |
| The other circuits and devices | They follow their control                                                                 |

## 2.21 Refrigerant leak detector management

The refrigerant leak detector is a system component that must always be in efficient conditions. In order for the detector to be efficient, it must be inspected/calibrated as instructed by the manufacturer.

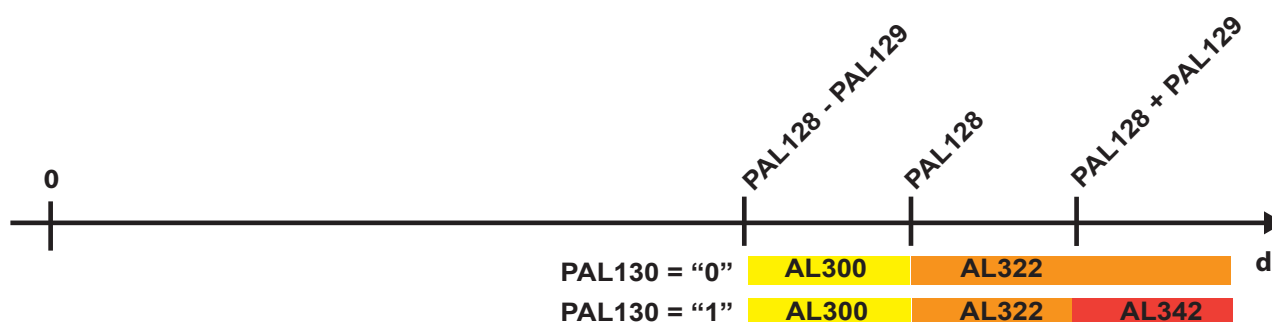
Based on the time of the last inspection/calibration, the controller generates messages/alarms to warn about maintenance being needed.

### 2.21.1 Function management

The parameters involved in the management of the function are shown in the table.

| Parameter | Min | Max | UM | Description                                                                     |
|-----------|-----|-----|----|---------------------------------------------------------------------------------|
| PAL128    | 0   | 999 | dd | Nominal interval between leak detector calibrations/replacements (0 = disabled) |
| PAL129    | 0   | 50  | dd | No. days for final warning message/alarm                                        |
| PAL130    | 0   | 1   | -  | Leak detector calibration/replacement time ended                                |

A graphical representation is shown below.



Parameter "PAL128" is used in the factory to set the number of days within which the sensor in the leak detector needs to be maintained.

An alarm appears on the main screen as the end of the period of time specified in parameter "PAL128" approaches. The alarm actually warns about the coming of the date in which the sensor calibration needs to be checked. The relevant day is calculated as follows: " $PAL128 - PAL129$ ".

The Alarms screen will include message code "AL300" which warns about calibration expiry.

A click on the sensor symbol in the Alarms screen gives access to the full description of the alarm.

A service level password is needed to clear the alarm from the main screen and the alarm message from the alarms list.

The value set in parameter "PAL130" determines how the function is managed when the number of days stored in parameter "PAL128" is achieved.

If parameter "PAL130" is set to "0", an alarm appears in the main screen as soon as the number of days set in parameter "PAL128" is exceeded. In this case too, this is a message.

In the Alarms page, message code "AL322" explains that the calibration time has expired.

A click on the sensor symbol in the Alarms screen gives access to the full description of the alarm.

A service level password is needed to clear the alarm from the main screen and the alarm message from the alarms list.

If parameter "PAL130" is set to "1", an alarm appears in the main screen as soon as the number of days set in parameter "PAL128" is exceeded. In this case too, message code "AL322" is always active in the Alarms screen.

The Alarms screen shows the message used to warn that the calibration time is over and a message specifying the number of days after which the unit is blocked.

The unit will continue to operate for the number of days specified in parameter "PAL129".

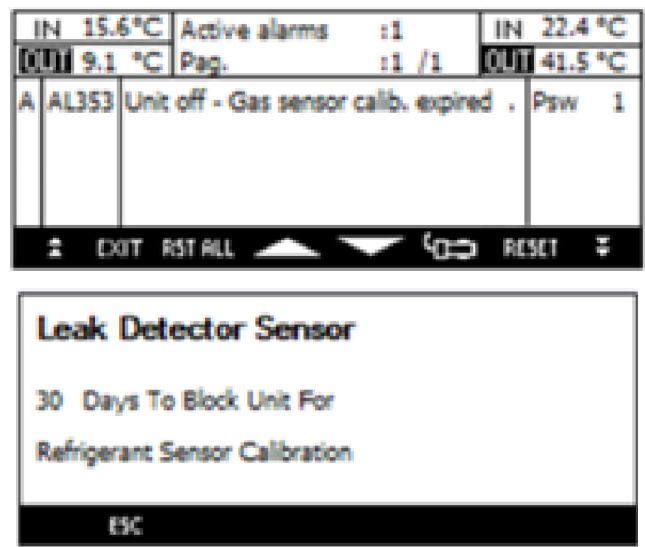
As was the case in the examples above, a service level password is needed to clear the message from the main screen and to unblock the unit.

The controller blocks the unit after the days specified in the alert have elapsed.

When the unit is blocked, a message appears on the main screen to inform that the unit has been blocked because the calibration time has expired.

Alarm message “AL342” becomes active in the alarms list.

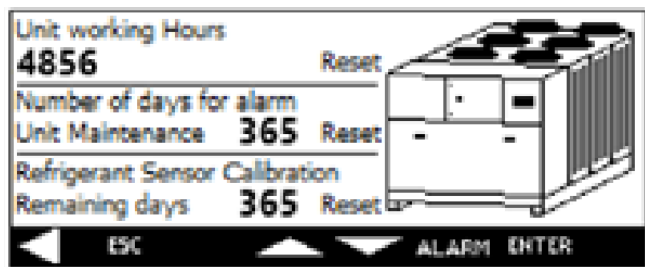
By way of exemplification, please find below the pictures of an alarm screen and of a screen with the alarm description.



2.21.2 Password-protected counter reset

After the refrigerant sensor has been calibrated, the counter needs to be reset in order to clear a message or to stop unit operation.

Leak detector sensor inspection and calibration are maintenance operations that only qualified staff are authorised to perform. This is why the alarm message must be cleared and the unit must be unblocked using the password that is entered to access the service branch.



## 2.22 Refrigerant leak detection management



The controller manages refrigerant leaks that do not affect safety.

The procedure to manage safety matters in connection with flammable refrigerant leaks in units filled with “R290” and indoor units filled with refrigerant “A2L” is illustrated in the “Instruction Manual for installation, operation and maintenance”.

This function manages refrigerant leaks.

Leaks are controlled through a refrigerant detector whose sensor is installed in the compressor compartment of the unit.

On the controller, for each refrigerant circuit of the unit, there are digital inputs to which the refrigerant detectors are connected.

If the amount of refrigerant measured by the sensor exceeds the alarm threshold, the detector opens a digital input of the controller of the unit.

Depending on the settings, in case of refrigerant leaks, the controller stops the relevant circuit in pump down or just gives a warning.

### 2.22.1 Stop due to refrigerant leak

A graphical representation is shown below.

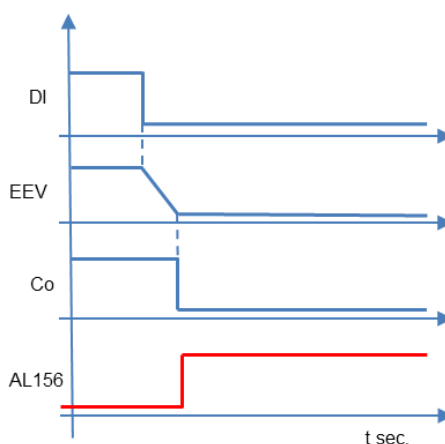


Fig. 27 Leak detector

The abbreviations of the graph indicate:

- DI = digital input regarding the refrigerant detector
- EEV = electronic expansion valve
- Co = OK signal to the refrigerant circuit
- ALL = activation of the alarm.

The stages of the graph are as follows:

- opening of the digital input of the controller by the refrigerant detector;
- the controller forces the closing of the electronic expansion valve;
- when the electronic expansion valve closes, the controller stops the refrigerant circuit involved;
- with the stopping of the circuit, the alarm is signalled.

### 2.22.2 Refrigerant leak warning

With management of just the refrigerant leak warning, when the digital input of the controller is opened by the leak detector, the alarm is activated while the refrigerant circuit continues with normal operation.

---

### 2.22.3 Refrigerant leak alarms

The refrigerant leak alarms are shown below.

|                                |                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL156.. AL159 refrigerant leak alarm of circuits 1 .. 4</b>                                |
| Reason for activation          | When PD1 = "5" and digital input of the controller regarding the refrigerant detector is open |
| Reset                          | Automatic, and becomes manual after PD7 occurrences/hour                                      |
| Reset mode                     | Only the service personnel may reset the manual alarm.                                        |
| Alarm icon                     | Flashing                                                                                      |
| AlarmLog                       | Yes                                                                                           |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                                     |
| Circuit in alarm               | Depending on the setting, it is stopped or follows the control                                |
| The other circuits and devices | They follow their control                                                                     |

## 2.23 Anti-freeze heaters

During operation of the units, or while they are in stand-by conditions and the ambient temperature is below zero, the water inside the exchangers can freeze.

Ice formation inside the exchangers can irreparably damage them.

To prevent ice formation inside the exchangers, the controller can manage auxiliary heaters.

The parameters involved are shown in the table.

| Parameter | Min   | Max   | UM | Description                                          |
|-----------|-------|-------|----|------------------------------------------------------|
| AR1       | -50.0 | 110.0 | °C | Users - Anti-freeze heaters activation setpoint      |
| AR2       | 0.1   | 25.5  | °C | Users - Anti-freeze heaters activation differential  |
| AR3       | -50.0 | 110.0 | °C | Source - Anti-freeze heaters activation setpoint     |
| AR4       | 0.1   | 25.5  | °C | Source - Anti-freeze heaters activation differential |

### 2.23.1 Heater set point and differential

Activation of the output of the heaters takes place when the temperature value read by the reference probe reaches the set point value. Deactivation takes place when the activation temperature plus the differential is reached.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                          |
|-----------|-------|----|------------------------------------------------------|
| AR1       | 4.0   | °C | Users - Anti-freeze heaters activation setpoint      |
| AR2       | 2.0   | °C | Users - Anti-freeze heaters activation differential  |
| AR3       | 4.0   | °C | Source - Anti-freeze heaters activation setpoint     |
| AR4       | 2.0   | °C | Source - Anti-freeze heaters activation differential |

A graphical representation is shown below.

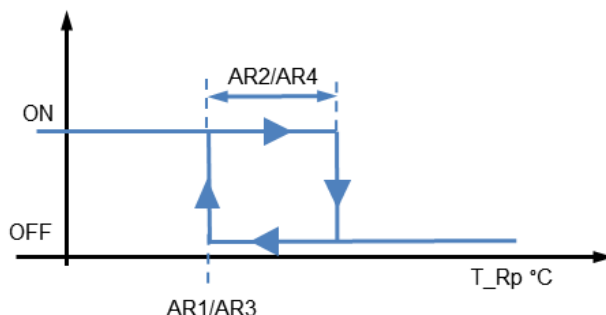


Fig. 28 Management of heater outputs

In addition to the parameters in the table, the following abbreviations are present in the graph:

- ON = heater output active
- OFF = heater output not active
- T\_Rp = temperature read by the reference probe.

---

### 2.23.2 Reference probe

Depending on the unit, there can be one or more reference probes for activation of the heater output.

The number of probes present is linked to the type of unit and to the number of water exchangers.

For water/water units, the hydraulic user side heaters and the source-side heaters are managed separately.

For each hydraulic side, the cases can be:

- in the case of one exchanger, the reference probe is the one installed on the water outlet;
- in the case of more than one exchanger, the reference probes are those installed on the outlet of each exchanger and the one installed in the common section at the outlet of the unit.

If there is more than one reference probe on the hydraulic side for management of the antifreeze heaters, only one of them needs to read the activation temperature in order for the heaters to be activated.

## 2.24 Auxiliary heating

This function allows management of a heating device to supplement operation in heat pump mode or as an alternative to it. The controller can manage up to 4 digital outputs to obtain 4 steps and a 0/10 V analogue output.

Activation of this function is possible only for units that can operate in heat pump mode.

According to the settings, the ways the function is managed are:

- auxiliary heating with the same set point as operation in heat pump mode;
- auxiliary heating with set point linked to operation in heat pump mode;
- auxiliary heating with set point independent of operation in heat pump mode;

With these ways of management, there are the conditions for activation of heating and deactivation of compressor operation, linked to the outside air temperature and delays.

Also, with parameter AH15, activation of auxiliary heating can be forced during a defrost.

The parameters that manage the function are shown in the table.

| Parameter | Min   | Max   | UM  | Description                                                            |
|-----------|-------|-------|-----|------------------------------------------------------------------------|
| AH2       | -50.0 | 110.0 | °C  | Outside air setpoint for activation                                    |
| AH3       | 0.1   | 25.5  | °C  | Outside air differential for de-activation                             |
| AH4       | 0     | 999   | min | Auxiliary heating activation delay                                     |
| AH5       | -50.0 | 110.0 | °C  | Integration - Outside air setpoint required to disable compressors     |
| AH6       | 0.1   | 25.5  | °C  | Integration - Outside air differential required to enable compressors  |
| AH7       | 0     | 999   | min | Integration - Delay in compressor switch-off                           |
| AH8       | 0     | 2     | -   | Type of temperature control                                            |
| AH9       | -50.0 | 110.0 | °C  | Heating ON/OFF - Main probe setpoint on hot side                       |
| AH10      | 0.1   | 25.5  | °C  | Heating ON/OFF - Proportional band                                     |
| AH11      | -50.0 | 110.0 | °C  | Heating 0-10V - Main probe setpoint on hot side                        |
| AH12      | 0.1   | 25.5  | °C  | Heating 0-10V - Proportional band                                      |
| AH13      | 0     | 0     | %   | Heating 0-10V - Minimum value                                          |
| AH14      | 0     | 100   | %   | Heating 0-10V - Maximum value                                          |
| AH15      | 0     | 1     | -   | Heating 0-10V - Enable minimum opening if temperature exceeds setpoint |
| AH16      | 0     | 1     | -   | Enables auxiliary heating during defrost                               |

### 2.24.1 Conditions as the air temperature changes

The air temperature intervenes in the activation of auxiliary heating and in the deactivation of the compressors in heat pump operating mode.

For activation of auxiliary heating, the air temperature must be lower than parameter AH2 for time AH4.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                |
|-----------|-------|-----|--------------------------------------------|
| AH2       | 5.0   | °C  | Outside air setpoint for activation        |
| AH3       | 1.0   | °C  | Outside air differential for de-activation |
| AH4       | 5     | min | Auxiliary heating activation delay         |

As regards air temperature, with the setting of parameter AH5, it is possible to decide on deactivation of the operation of the compressors after delay AH7.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                           |
|-----------|-------|-----|-----------------------------------------------------------------------|
| AH5       | 0.0   | °C  | Integration - Outside air setpoint required to disable compressors    |
| AH6       | 1.0   | °C  | Integration - Outside air differential required to enable compressors |
| AH7       | 5     | min | Integration - Delay in compressor switch-off                          |

A graphical representation is shown below.

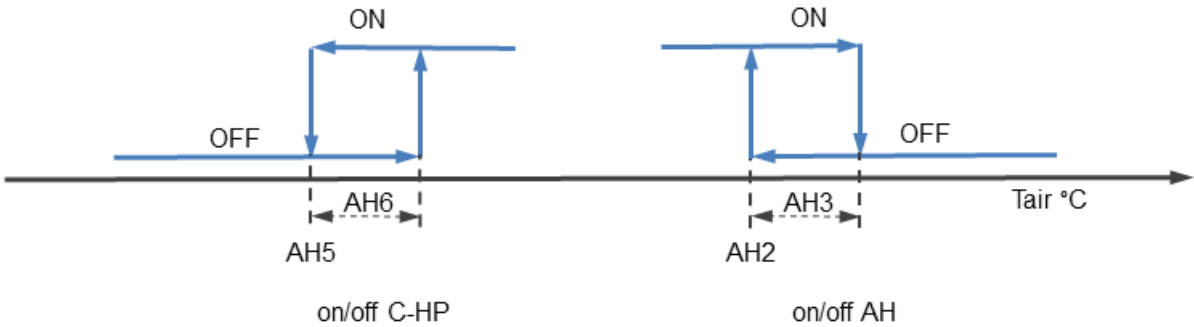


Fig. 29 Air conditions for management of auxiliary heating and compressors

- In addition to the references present in the table, the abbreviations in the graph are:
- Tair = air temperature;
  - on/off C-HP = air temperature condition for deactivation of the compressors in heat pump operating mode;
  - on/off AH = air temperature condition for activation of auxiliary heating.



In the case of alarms regarding the probes involved in control, the outputs relevant to the function will always be deactivated.

### 2.24.2 Auxiliary heating with the same set point as operation in heat pump mode

This control function is used to activate auxiliary heating, through both the digital outputs and the analogue output, with the same operating set point and differential in heat pump mode of the compressors; auxiliary heating will be substitutive to operation in heat pump mode of the unit.



With activation of the first step of auxiliary heating, the switching off of the compressors will be forced.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value       | UM | Description                                      |
|-----------|-------------|----|--------------------------------------------------|
| AH8       | 0           | -  | Type of temperature control                      |
| AH9       | ST4         | °C | Heating ON/OFF - Main probe setpoint on hot side |
| AH10      | ST8 or ST10 | °C | Heating ON/OFF - Proportional band               |
| AH11      | ST4         | °C | Heating 0-10V - Main probe setpoint on hot side  |
| AH12      | ST8 or ST10 | °C | Heating 0-10V - Proportional band                |
| AH13      | 0           | %  | Heating 0-10V - Minimum value                    |
| AH14      | 100         | %  | Heating 0-10V - Maximum value                    |

A graphical representation is shown below.

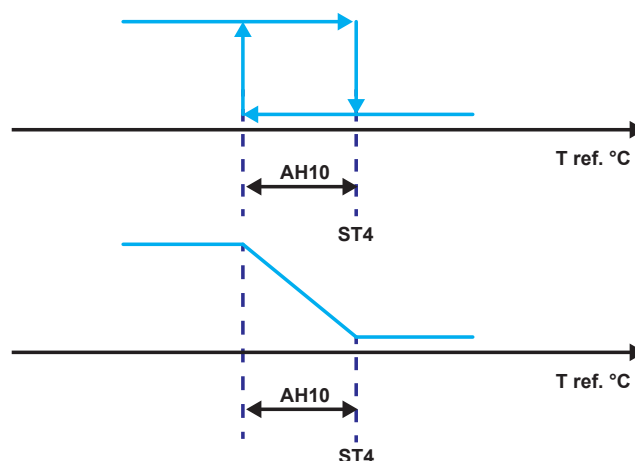


Fig. 30 Digital and analogue output of auxiliary heating with the same set point as operation in heat pump mode

In addition to the references present in the table, T ref = reference water temperature.

### 2.24.3 Auxiliary heating with set point linked to operation in heat pump mode

This control function is used to activate auxiliary heating with off-sets from the set point of the compressors in operation in heat pump mode; in this way, changing the set point of the compressors automatically changes the activation of auxiliary heating.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                      |
|-----------|-------|----|--------------------------------------------------|
| AH8       | 2     | -  | Type of temperature control                      |
| AH9       | 4.0   | °C | Heating ON/OFF - Main probe setpoint on hot side |
| AH10      | 2.0   | °C | Heating ON/OFF - Proportional band               |
| AH11      | 5.0   | °C | Heating 0-10V - Main probe setpoint on hot side  |
| AH12      | 2.0   | °C | Heating 0-10V - Proportional band                |
| AH13      | 0     | %  | Heating 0-10V - Minimum value                    |
| AH14      | 100   | %  | Heating 0-10V - Maximum value                    |

A graphical representation is shown below.

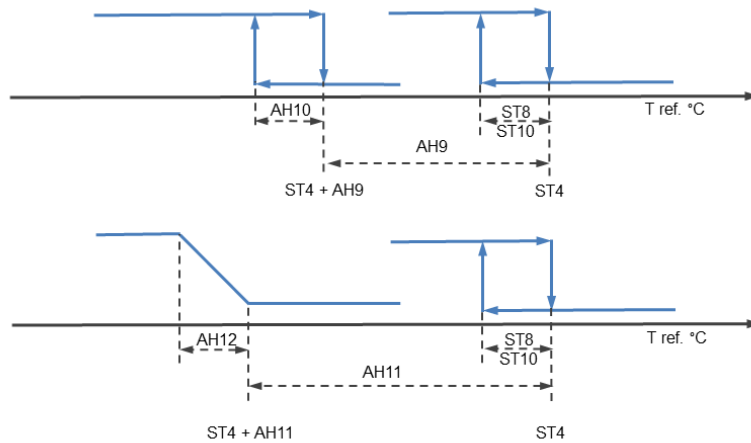


Fig. 31 Digital and analogue output of auxiliary heating with off-set

In addition to the references present in the table, T ref = reference water temperature.

#### 2.24.4 Auxiliary heating with independent set point

This control function is used to activate auxiliary heating with its own set points and differentials; in this way, its management is not linked to the set point of the compressors in operation in heat pump mode.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                      |
|-----------|-------|----|--------------------------------------------------|
| AH8       | 1     | -  | Type of temperature control                      |
| AH9       | 37.0  | °C | Heating ON/OFF - Main probe setpoint on hot side |
| AH10      | 2.0   | °C | Heating ON/OFF - Proportional band               |
| AH11      | 36.0  | °C | Heating 0-10V - Main probe setpoint on hot side  |
| AH12      | 2.0   | °C | Heating 0-10V - Proportional band                |
| AH13      | 0     | %  | Heating 0-10V - Minimum value                    |
| AH14      | 100   | %  | Heating 0-10V - Maximum value                    |

A graphical representation is shown below.

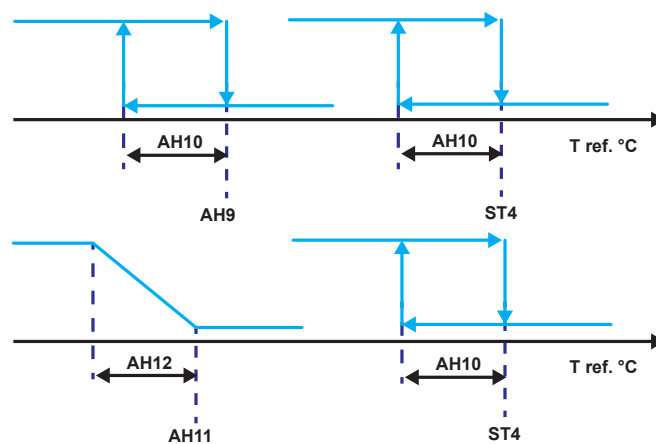


Fig. 32 Digital and analogue output of auxiliary heating with independent set point

In addition to the references present in the table, T ref = reference water temperature.

## 2.25 “ACS” function

The “ACS” function is designed for the production of hot water for sanitary use, which prioritises the system demand.

### 2.25.1 General

This function enables the controller to manage a 3-way valve to divert the water flow, which goes through the heat exchanger in the unit, towards the hydraulic circuit of the enabled function.

A temperature sensor and a dedicated temperature regulation function are featured in the controller to sense the demand from the sanitary circuit.

The demand from the sanitary circuit is always prioritised regardless of the active function in the air conditioning circuit (cooling or heating).

Any operating switch to/from the sanitary circuit causes the pump to stop, the water flow to be diverted by the 3-way valve, the pump to be re-started and the compressors to be enabled depending on the demand from the enabled temperature regulation function.

If no demand is received from the sanitary circuit, the 3-way valve enables direct flow of water into the system circuit.

The 3-way valve keeps its position and lets the water flow directly to the sanitary circuit if sanitary circuit mode only is enabled.

If this is the case, once the demand from the temperature regulation function is met, the controller stops the pump.

The figure shows an outline hydraulic diagram with the main components.

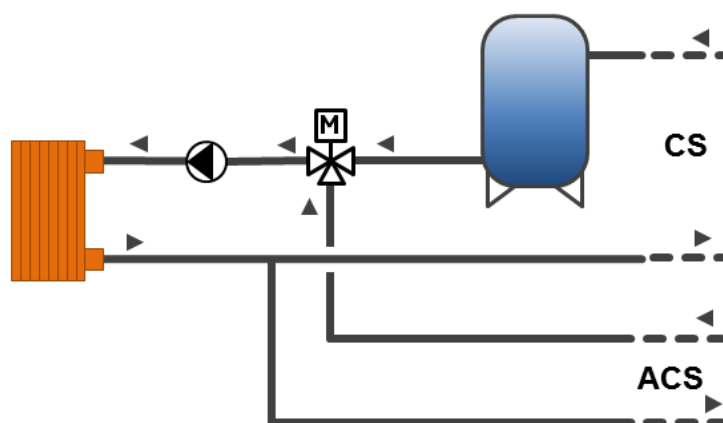


Fig. 33 Outline hydraulic diagram

In addition to controlling the activation of the compressors used to heat the water for the sanitary system, the controller can manage up to 4 additional power steps thanks to digital outputs.

These digital outputs can be connected to heaters or any other external source of heating from the unit.

The external heating sources may be used to either support or replace the compressors for specific functions.

In units where this function is featured the controller offers the opportunity to manage the two systems separately.

In addition to a general signal to operate the unit, signals are featured for each individual function.

The table shows the parameters that manage this function.

| Parameter | Min   | Max   | UM    | Description                                                                     |
|-----------|-------|-------|-------|---------------------------------------------------------------------------------|
| ACS1      | 0     | 1     | -     | Enabling of domestic hot water                                                  |
| ACS2      | 0     | 1     | -     | Enables setpoint from BMS                                                       |
| ACS3      | ACS5  | ACS6  | °C    | Setpoint                                                                        |
| ACS4      | 0     | 25.0  | °C    | Control diff.                                                                   |
| ACS5      | -50.0 | ACS6  | °C    | Minimum Setpoint                                                                |
| ACS6      | ACS5  | 110   | °C    | Maximum Setpoint                                                                |
| ACS7      | -50.0 | 110   | °C    | Forced output set point                                                         |
| ACS8      | 0.1   | 25.0  | °C    | Re-enabling diff. from forced output                                            |
| ACS9      | 0     | 250   | min   | Minimum cut-off from forced output                                              |
| ACS10     | 0     | 999   | min   | Activation delay                                                                |
| ACS11     | 0     | 999   | s     | Deactivation delay                                                              |
| ACS12     | 0     | 240   | min   | Compressor forcing activation delay                                             |
| ACS13     | 0     | 240   | min   | Time of subsequent activations of compressors after ACS12                       |
| ACS14     | ACS15 | ACS16 | °C    | Anti-legionella - Set point                                                     |
| ACS15     | -50.0 | ACS16 | °C    | Anti legionella - Minimum Setpoint                                              |
| ACS16     | ACS5  | 110.0 | °C    | Anti legionella - Maximum Setpoint                                              |
| ACS17     | 0     | 24    | h     | Anti-legionella - Time of activation                                            |
| ACS18     | 0     | 7     | -     | Anti-legionella - Day of activation                                             |
| ACS19     | 0.1   | 25.0  | °C    | Anti-legionella - Control differential                                          |
| ACS20     | 0     | 999   | °C    | Anti-legionella - Override                                                      |
| ACS21     | 1     | 250   | min   | Anti-legionella - Minimum duration                                              |
| ACS22     | 1     | 250   | min   | Anti legionella - Maximum duration                                              |
| ACS23     | 0     | 1     | -     | Anti-legionella - Enabling                                                      |
| ACS25     | -30.0 | 65.0  | °C    | Outside Air - DHW setpoint decrease triggering point                            |
| ACS26     | -30.0 | 65.0  | °C    | Outside Air - Minimum limit for DHW setpoint decrease                           |
| ACS27     | 0.0   | 65.0  | °C    | Outside Air - Maximum setpoint at low temperature                               |
| ACS28     | 0     | 999   | min   | Maximum DHW production duration time                                            |
| ACS29     | 0     | 60    | -     | DHW forced output alarm due to temperature, maximum number of attempts per hour |
| ACS31     | 0     | 999   | min   | Three-way valve movement time                                                   |
| ACS32     | 0     | 999   | min   | Delay time for disappearance of the VAI49 probe alarm                           |
| ACS35     | 0     | 1     | -     | Enables DHW integration heaters                                                 |
| ACS36     | 0     | 1     | -     | Enables heaters as an integration to compressors in defrost mode                |
| ACS37     | 0     | 3600  | s     | Switching on time between steps of heaters in defrost mode                      |
| ACS38     | 0     | 180   | min   | Switching on time between steps of heaters in DHW mode                          |
| ACS38     | 0     | 1     | -     | DHW heater alarm management                                                     |
| ACS41     | 0     | 24    | h/min | Start of time band 1 for DHW production                                         |
| ACS42     | 0     | 24    | h/min | End of time band 1 for DHW production                                           |
| ACS43     | 0     | 24    | h/min | Start of time band 2 for DHW production                                         |
| ACS44     | 0     | 24    | h/min | End of time band 2 for DHW production                                           |
| ACS45     | 0     | 24    | h/min | Start of time band 3 for DHW production                                         |
| ACS46     | 0     | 24    | h/min | End of time band 3 for DHW production                                           |
| ACS47     | 0     | 7     | -     | Sunday - operation with time band                                               |
| ACS48     | 0     | 7     | -     | Monday - operation with time band                                               |
| ACS49     | 0     | 7     | -     | Tuesday - operation with time band                                              |
| ACS50     | 0     | 7     | -     | Wednesday - operation with time band                                            |
| ACS51     | 0     | 7     | -     | Thursday - operation with time band                                             |
| ACS52     | 0     | 7     | -     | Friday - operation with time band                                               |
| ACS53     | 0     | 7     | -     | Saturday - operation with time band                                             |
| ACS54     | -30.0 | 30.0  | °C    | Setpoint variation during time band                                             |
| ACS55     | 0     | 2     | -     | Action upon ACS demand                                                          |
| ACS57     | 0     | 50.0  | °C    | Regulation differential for delivery or return line monitoring                  |
| ACS58     | 0     | 50.0  | °C    | Increase of regulation setpoint for delivery line monitoring                    |

The following parameters listed in the table are also controlled for the production of hot water for the air conditioning system.

| Parameter | Min   | Max  | UM | Description                                                                   |
|-----------|-------|------|----|-------------------------------------------------------------------------------|
| ST6       | 28.0  | 65.0 | -  | Heat Pump - Maximum Setpoint                                                  |
| SD15      | -30.0 | 65.0 | °C | Operating limit - HP setpoint reduction start point                           |
| SD16      | -30.0 | 65.0 | °C | Operating limit - Minimum outside temperature limit for HP setpoint reduction |
| SD17      | 0.0   | 65.0 | °C | Operating limit - Maximum setpoint with low outside air temperature           |

### 2.25.2 Enable/Disable buttons and view pages

In addition to the screens of the “Service” branch for parameter setting and the “Menu” branch for time band setting, the controller display features some pages that are used to control the unit and to view the main parameters of the hydraulic circuit.

All the units can be enabled using either the controller or the relevant digital input.

In addition to general signals, units featuring the “ACS” function also have function-specific signals. This is why a digital input for system operation and a digital input for the sanitary circuit are provided, which are connected to the corresponding enable/disable buttons on the controller.

To enable the “ACS” function using the controller, the operator has to go to the Home page and press button  which gives access to the screen for function management.

Once in the “ACS” function screen, press button  which will switch to  as soon as the function is enabled.

If the “ACS” function is enabled, the procedure to switch to the new operating mode starts as soon as the reference probe senses the need for this change, based on the fact that sanitary system operation is prioritised.

To enable the system using the controller, the operator has to go to the Home page and press button  which gives access to the screen relating to function management.

Once in the “ACS” function screen, press button  which will switch to  as soon as the function is enabled.

This screen also allows the operator to edit the setpoint by pressing button **ENTER** followed by buttons  and .

The change must be confirmed with button **ENTER**.

Additionally, a click on  displays the main parameters of the hydraulic circuit.

If the anti legionella function is featured on this screen, a click on button  causes the cycle to be overridden.

### 2.25.3 Changes in operation

Any time the system switches to a new operating mode the pump stops for the time required for the 3-way valve to divert the flow of water.

If the demand from the sanitary circuit is received while the compressors are in operation, the controller stops the compressors before stopping the pump.

The production of hot water for the sanitary circuit may be concluded as soon as the setpoint is achieved or the max. time has elapsed.

Regardless of the reason why the production of hot water for the sanitary circuit is stopped, the time set in parameter “ACS10” has to elapse before the next demand can be fulfilled.

While switching to a new operating mode, the unit is in standby and in the main screen - operating mode field - the following icon appears .

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                           |
|-----------|-------|------|-------------------------------------------------------|
| ACS10     | 45.0  | min  | Activation delay                                      |
| ACS11     | 45.0  | s    | Deactivation delay                                    |
| ACS31     | 2.0   | min  | Three-way valve movement time                         |
| CO2       | 180   | s    | Minimum OFF time                                      |
| PA2       | 6     | 10 s | User - Compressor activation delay from pump start-up |
| PA3       | 3     | 10 s | Users - Pump Off delay from switch-off of compressors |

Below is a graphical representation of the operating steps required to switch from air conditioning to sanitary mode, and vice versa.

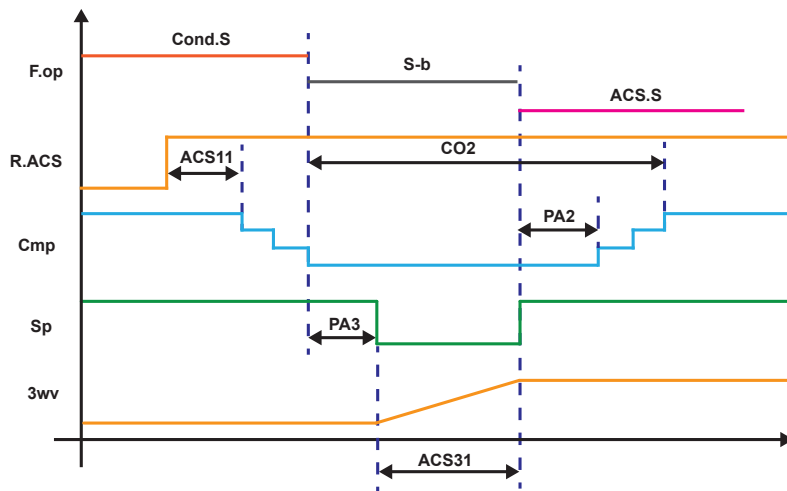


Fig. 34 Switch from air conditioning to sanitary mode

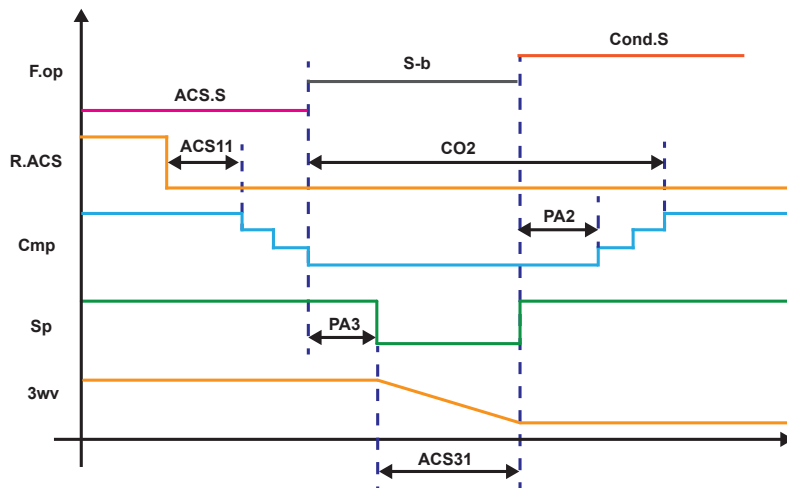


Fig. 35 Switch from sanitary to air conditioning mode

---

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- F.op = enabled function;
- Cond.S = unit operating in air conditioning mode;
- ACS.S = unit operating in sanitary mode;
- R.ACS = status of demand from sanitary system;
- Cmp = compressor status;
- Sp = status of pumps featured in the system;
- 3WV = 3-way valve status;
- S-B = unit in standby during operating mode switching.

If the demand for hot sanitary water is received when there is no demand from the air conditioning system, the delays due to the compressor switch-off are ignored. Similarly, if the pump is not in operation (pulse function enabled), the relating delay is ignored.

## 2.25.4 “ACS” temperature regulation

A sensor is provided in the controller that must be installed in the relevant tank to activate generation of hot domestic water. The controller activates generation of hot domestic water when the domestic water temperature value is lower than the relevant setpoint minus its differential.

Thermoregulation and, as a result, compressor activation take place with reference to the output temperature from the heat exchanger fitted in the unit.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                    |
|-----------|-------|-----|----------------------------------------------------------------|
| ACS3      | 45.0  | °C  | Setpoint                                                       |
| ACS4      | 2.0   | °C  | Control diff.                                                  |
| ACS5      | 40.0  | °C  | Minimum Setpoint                                               |
| ACS6      | 50.0  | °C  | Maximum Setpoint                                               |
| ACS7      | 60    | °C  | Forced output set point                                        |
| ACS10     | 8     | min | Activation delay                                               |
| ACS11     | 10    | s   | Deactivation delay                                             |
| ACS12     | 15    | min | Compressor forcing activation delay                            |
| ACS13     | 5     | min | Time of subsequent activations of compressors after ACS12      |
| ACS28     | 240   | min | Maximum DHW production duration time                           |
| ACS57     | 2.0   | °C  | Regulation differential for delivery or return line monitoring |
| ACS58     | 7.0   | °C  | Increase of regulation setpoint for delivery line monitoring   |
| ST19      | 5.0   | °C  | With NZ or PID, Heat Pump - Activation zone offset             |
| ST21      | 2.0   | °C  | With NZ or PID, Heat Pump - De-activation zone offset          |
| ST26      | 120   | Sec | With ZN or PID, Heat pump - Maximum activation time            |
| ST27      | 90    | Sec | With NZ or PID, Heat Pump - Minimum activation time            |
| ST28      | 30    | Sec | With ZN or PID, Heat Pump - Maximum de-activation time         |
| ST29      | 10    | Sec | With ZN or PID, Heat pump - Minimum de-activation time         |

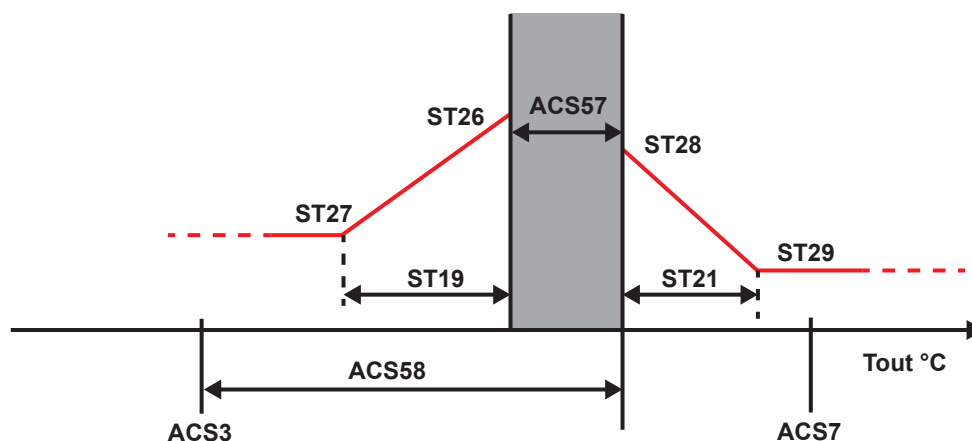


Fig. 36 Activation of unit resources

The setpoint used by the controller to manage either the compressors or the inverter, when the compressor is controlled by an inverter, is the sum of the values stored in parameters “ACS3” and “ACS58”, and the neutral zone is identified by the value in parameter “ACS57”.

The activation and deactivation times and differentials correspond to the values in the “ST” parameters that are used to manage heating.



In order to prevent the output temperature from reaching the value in parameter “ACS7” while operating in “ACS” mode, as this causes a forced stop of the function, the controller checks that the sum of the values in parameters “ACS3”, “ACS58” and “ST21” is lower than the value in parameter “ACS7”.

Where this is not the case, the controller forces the value in parameter “ACS3” to be reduced in order for the required condition to be met.

In addition to regulating the water temperature measured at the heat exchanger outlet, the controller also includes some override functions to manage the demand of hot domestic water.

If the demand is not fulfilled and all the available power steps are not enabled within the time setpoint in parameter "ACS12", the controller overrides to the next step.

After the time set in "ACS12" has elapsed, override to the next available steps occurs as soon as the time set in parameter "ACS13" has elapsed.

The override remains active until the temperature setpoint is achieved in the sanitary system.

As soon as the time set in parameter "ACS28" has elapsed, the production of hot water for the sanitary system is stopped, and the unit switches to operation in air conditioning mode.

If the demand persists, the production of hot water for the sanitary system resumes after the time set in parameter "ACS10" has elapsed.

With reference to temperature regulation, the controller manages an alarm and a warning that are described below.

|                           |                                                                    |
|---------------------------|--------------------------------------------------------------------|
| <b>Alarm code</b>         | <b>AL109 - "ACS" reference probe alarm</b>                         |
| Reason for activation     | The "ACS" reference probe is malfunctioning or it is not connected |
| Reset                     | As soon as correct probe operation is resumed                      |
| Reset mode                | Automatic                                                          |
| Alarm icon                | Flashing                                                           |
| AlarmLog                  | Yes                                                                |
| <b>Devices</b>            | <b>Behaviour in the event of an alarm</b>                          |
| "ACS" function            | Deactivated                                                        |
| Air conditioning function | After temperature regulation                                       |

|                       |                                                                                                                       |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL254 Warning: exiting "ACS" due to max. time</b>                                                                  |
| Reason for activation | It is detected when the "ACS" function does not achieve the corresponding setpoint within the time stored in "ACS28". |
| Reset                 | If the demand persists, after the time set in "ACS10" has elapsed                                                     |
| Reset mode            | Automatic                                                                                                             |
| Alarm icon            | No                                                                                                                    |
| AlarmLog              | No                                                                                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                             |
| "ACS" function        | Stopped                                                                                                               |
| System demands        | They follow their control                                                                                             |

### 2.25.5 Forced exit from “ACS”

The controller may stop the “ACS” function before a demand is met due to many other conditions than merely exceeding the max. time to fulfil the hot sanitary water demand.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                     |
|-----------|-------|-----|---------------------------------------------------------------------------------|
| ACS7      | 58.0  | °C  | Forced output set point                                                         |
| ACS8      | 2.0   | °C  | Re-enabling diff. from forced output                                            |
| ACS9      | 20    | min | Minimum cut-off from forced output                                              |
| ACS29     | 2     | -   | DHW forced output alarm due to temperature, maximum number of attempts per hour |

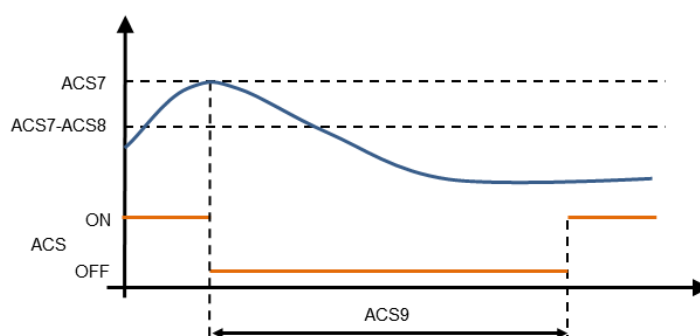


Fig. 37 Management of forced exit from “ACS”

The controller always checks that the output water temperature to the heat exchanger featured in the unit is inferior to the value set in parameter “ACS7”.

If the output water temperature from the heat exchanger in the unit exceeds the value set in parameter “ACS7”, the controller stops the production of hot water for the sanitary circuit in order to prevent the safety devices from tripping, which may even cause the unit to stop.

This stop causes the flow of water to be diverted to the air conditioning system and, where necessary, the compressors to be started in order to fulfil the demand for temperature regulation.

An alarm triggers to warn about the forced stop of water production.

As soon as the water temperature drops by the differential value set in parameter “ACS8”, the alarm is cleared automatically.

The alarm is cleared automatically until the value set in parameter “ACS29” is achieved.

If the alarm triggers again, then it has to be cleared manually.

In any case, water production for the sanitary circuit is resumed after the interval of time set in parameter “ACS9” has elapsed.

If the demand persists, the production of hot water for the sanitary system resumes after the time set in parameter “ACS10” has elapsed.

| Alarm code                | AL257 Warning: forced exit from “ACS”                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------|
| Reason for activation     | As soon as “ACS7” value relating to output water temperature from unit is achieved                            |
| Reset                     | Drop of the output water temperature in the unit by the value set in “ACS8” as opposed to the “ACS7” setpoint |
| Reset mode                | Automatic until the number of times set in “ACS29” is achieved, and then manual                               |
| Alarm icon                | No                                                                                                            |
| AlarmLog                  | Yes                                                                                                           |
| Devices                   | Behaviour in the event of an alarm                                                                            |
| “ACS” function            | Deactivated                                                                                                   |
| Air conditioning function | After temperature regulation                                                                                  |

---

### 2.25.6 Time bands for “ACS” function

The controller can manage the hot water production setpoint for the sanitary system according to time bands.

An offset is added to the setpoint that represents the period defined within each time band. If the offset is positive, then the setpoint is increased; if it is negative, the setpoint is reduced.

The setpoint value can in no case exceed its max. value.

The system enables setting 3 time bands and selecting one of the 7 possible combinations for each day in the week.

Similarly to the setpoints relating to the air conditioning system, to set and manage the time bands in the "ACS" function, the operator has to open the "ENERGY SAVING" branch in the "Menu" screen where two sections are featured: "Sanitary System" and "Air Conditioning System".

## 2.25.7 Max. setpoint compensation in heating mode

These units are manufactured to produce hot water to be used both for air conditioning and sanitary purposes at very high temperatures.

To prevent damage to the compressors in the event of operation outside their working ranges, the software features a compensation function that is linked to the air temperature and limits the max. setpoint value.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                                   |
|-----------|-------|----|-------------------------------------------------------------------------------|
| ACS6      | 65.0  | °C | Maximum Setpoint                                                              |
| ACS25     | -10.0 | °C | Outside Air - DHW setpoint decrease triggering point                          |
| ACS26     | -20.0 | °C | Outside Air - Minimum limit for DHW setpoint decrease                         |
| ACS27     | 55.0  | °C | Outside Air - Maximum setpoint at low temperature                             |
| ST6       | 65.0  | °C | Heat Pump - Maximum Setpoint                                                  |
| SD15      | -10.0 | °C | Operating limit - HP setpoint reduction start point                           |
| SD16      | -20.0 | °C | Operating limit - Minimum outside temperature limit for HP setpoint reduction |
| SD17      | 55.0  | °C | Operating limit - Maximum setpoint with low outside air temperature           |



When setting parameters "ACS26" and "SD16", the value of parameter "PAL118", which stops operation of the unit for hot water production, must be taken into consideration.

The values listed in the table are reflected in the graphical representation that shows the change in the max. setpoint relating to both sanitary water "ACS6" and hot water for the air conditioning system "ST6", as shown in the figure.

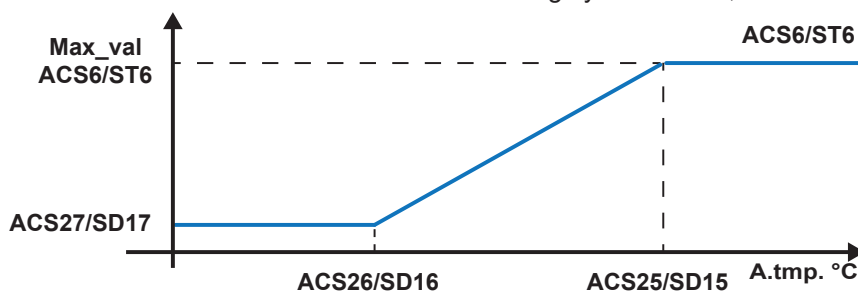


Fig. 38 Change in max. "ACS6" and "ST6" setpoints linked to air temperature change

In the graph, beside the parameters of the function, there are the abbreviations that refer to:

- Max\_val ACS6/ST6 = max. value of parameters "ACS6" and "ST6";
- A.tmp = air temperature.

## 2.25.8 Heater management

The controller can manage up to 4 supplementary power steps, which may be either heaters or any other external source to the unit.

Depending on the setting, they may be used to supplement the compressor heating power during the production of hot sanitary water or to replace the compressors when they are being defrosted and during the anti legionella cycle.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                      |
|-----------|-------|-----|------------------------------------------------------------------|
| ACS35     | 1     | -   | Enables DHW integration heaters                                  |
| ACS36     | 1     | -   | Enables heaters as an integration to compressors in defrost mode |
| ACS37     | 60    | s   | Switching on time between steps of heaters in defrost mode       |
| ACS38     | 5     | min | Switching on time between steps of heaters in DHW mode           |
| ACS38     | 0     | -   | DHW heater alarm management                                      |

If the power steps are used as a supplement during the production of hot water for sanitary use "ACS35 = 1", they are enabled as soon as the time set in parameter "ACS38" has elapsed, after the activation of all compressors.

If the power steps are used for the production of hot water for sanitary use in replacement of the compressors during the defrost cycles "ACS36 = 1", they are enabled proportionally within the "ACS4" differential as soon as the temperature read by the reference hot sanitary water probe drops with respect to the setpoint stored in parameter "ACS3".

In any case, the controller enables the next step after the current step has been activated and the time set in parameter "ACS37" has elapsed.

The override remains active until the temperature setpoint is achieved in the sanitary system.

The controller features a number of digital inputs, which is equal to the number of outputs, that are used to display the alarms linked to the power steps.

If the setpoint of parameter "ACS39" is "0" and the input is open, the unit will only display the alarm message; if the setpoint is "1", the unit displays the alarm message and stops the corresponding output.

| Alarm code                     | AL250, AL251, AL252 and AL253 Thermal cutout alarm - heaters supplementing heating power in "ACS" |
|--------------------------------|---------------------------------------------------------------------------------------------------|
| Reason for activation          | Upon opening of the digital input configured for the corresponding alarms                         |
| Reset                          | Only after closing of the digital input                                                           |
| Reset mode                     | Manual                                                                                            |
| Alarm icon                     | Flashing                                                                                          |
| AlarmLog                       | Yes                                                                                               |
| Devices                        | Behaviour in the event of an alarm                                                                |
| Output in alarm                | Output regulated if "ACS39" = 0; no regulation if "ACS39" = 1                                     |
| The other circuits and devices | They follow their control                                                                         |

## 2.25.9 Anti legionella cycle

The controller can manage an anti legionella cycle while producing hot sanitary water.

The anti legionella cycle requires that hot water be produced in the sanitary circuit at a different setpoint value, i.e. a higher value than the normal working value. The cycle is run one day a week, starting from a preset time, lasting for a min. time and with a max. time given to achieve the required temperature.



The anti legionella cycle is only performed with supplementary power steps.

During the anti legionella cycle the unit continues to work in air conditioning mode, i.e. the 3-way valve diverts the flow of water to the air conditioning system, and fulfils the thermostatic demand, where necessary.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                            |
|-----------|-------|-----|----------------------------------------|
| ACS14     | 70    | °C  | Anti-legionella - Set point            |
| ACS15     | 60    | °C  | Anti legionella - Minimum Setpoint     |
| ACS16     | 75    | °C  | Anti legionella - Maximum Setpoint     |
| ACS17     | 2     | h   | Anti-legionella - Time of activation   |
| ACS18     | 2     | -   | Anti-legionella - Day of activation    |
| ACS19     | 3.0   | °C  | Anti-legionella - Control differential |
| ACS20     | 4.0   | °C  | Anti-legionella - Override             |
| ACS21     | 5     | min | Anti-legionella - Minimum duration     |
| ACS22     | 15    | min | Anti legionella - Maximum duration     |
| ACS23     | 1     | -   | Anti-legionella - Enabling             |



Parameter "ACS18" defines the day in the week when the anti legionella cycle is performed. Value "0" is Sunday, value "6" is Saturday, and value "7" disables the cycle.

If hot sanitary water is being produced when the anti legionella cycle is supposed to start, the anti legionella cycle is postponed by one week.

To achieve the anti legionella setpoint stored in "ACS14", the controller enables the available resources in a proportional manner within the corresponding differential "ACS19".

As soon as the anti legionella cycle is started, the controller heats the water to a temperature exceeding the value stored in parameter "ACS14", based on the "override" value set in parameter "ACS20".

For correct performance of an anti legionella cycle, the setpoint must be achieved within the time set in parameter "ACS22" and it must be preserved for the time set in parameter "ACS21".

If the anti legionella cycle is not performed due to a demand from the sanitary system, or if it is not completed correctly, the controller outputs the corresponding warning message.

| Alarm code            | AL255 Warning: exiting Anti legionella cycle due to max. time                         |
|-----------------------|---------------------------------------------------------------------------------------|
| Reason for activation | If the anti legionella cycle does not finish within the time set in parameter "ACS22" |
| Reset                 | Automatic                                                                             |
| Reset mode            | Automatic                                                                             |
| Alarm icon            | No                                                                                    |
| AlarmLog              | Yes                                                                                   |
| Devices               | Behaviour in the event of an alarm                                                    |
| Unit functions        | After regulations                                                                     |

---

|                           |                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>         | <b>AL258 Warning: failure to perform anti legionella cycle</b>                                              |
| Reason for activation     | The production of hot sanitary water has not achieved the setpoint within the time set in parameter "ACS7". |
| Reset                     | Automatic                                                                                                   |
| Reset mode                | Automatic                                                                                                   |
| Alarm icon                | No                                                                                                          |
| AlarmLog                  | Yes                                                                                                         |
| <b>Devices</b>            | <b>Behaviour in the event of an alarm</b>                                                                   |
| Air conditioning function | After temperature regulation                                                                                |

## 2.26 Flowzer

The “Flowzer” function is designed to define the speed setpoints for the pump fitted in the unit that help meet the demand received from different system types.

Specific logics have been developed according to which the controller manages the hydraulic systems connected to the unit.

The management logics are intended to increase system efficiency and save energy for water circulation at the same time.

With the help of these logics, the circulating water fulfils the demands of the system, without exceeding the design flow rate limits and without jeopardising correct operation of the cooling unit.

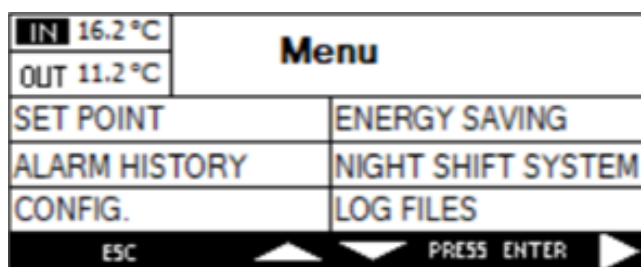
Each management logic refers to a specific system type and it requires some arrangements both at the time of installation and at start-up.

The parameters involved with this function are shown below.

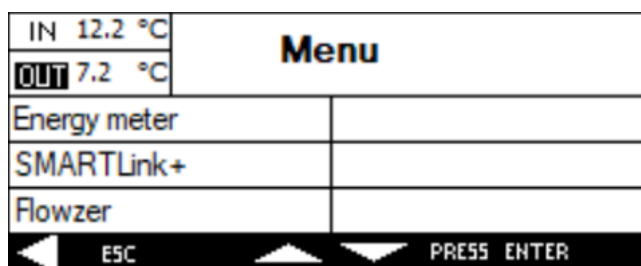
| Parameter | Min  | Max   | UM  | Description                                                                               |
|-----------|------|-------|-----|-------------------------------------------------------------------------------------------|
| FMG1      | 0.0  | 100.0 | %   | Common - Min. pump speed                                                                  |
| FMG2      | 0.0  | 100.0 | %   | Common - Max. pump speed                                                                  |
| FMG4      | 0.0  | 100.0 | %   | Common - Pump speed at start-up                                                           |
| FMG5      | 10   | 999   | s   | Common - Pump start-up time                                                               |
| FMG6      | 0.0  | 15.0  | °C  | DT/VPS - Setpoint                                                                         |
| FMG7      | 0.0  | 15.0  | °C  | DT/VPS - Neutral zone                                                                     |
| FMG9      | 0.0  | 100.0 | %   | Common - Setup parameter - Pump speed increase %                                          |
| FMG10     | 1    | 999   | s   | Common - Setup parameter - Time between pump speed increases                              |
| FMG11     | 0.0  | 100.0 | %   | Common - Setup parameter - Pump speed decrease %                                          |
| FMG12     | 1    | 999   | s   | Common - Setup parameter - Time between pump speed decreases                              |
| FMG13     | 0.0  | 100.0 | %   | Common - Emergency - $\Delta p$ / $H\Delta p$ - % increase/decrease                       |
| FMG14     | 0    | 999   | s   | Common - Emergency - $\Delta p$ / $H\Delta p$ - Time between increase/decrease            |
| FMG15     | 6.0  | 100.0 | °C  | VPS - Setup parameter - Setpoint of second pump speed increase threshold                  |
| FMG16     | 1    | 999   | s   | VPS - Setup parameter - Second threshold - Increase time                                  |
| FMG18     | 0    | 10000 | -   | PID - Coefficient - Kp                                                                    |
| FMG19     | 0    | 10000 | -   | PID - Coefficient - Ki                                                                    |
| FMG20     | 0    | 10000 | -   | PID - Coefficient - Kd                                                                    |
| FMG42     | 0    | 1     | -   | Common - Pump in manual mode                                                              |
| FMG43     | 0.0  | 999.0 | kPa | VD/VDE/VFPP - Cooling - System - Pressure difference threshold                            |
| FMG44     | 0.0  | 999.0 | kPa | VD/VDE/VFPP - Cooling - System - Differential                                             |
| FMG45     | 0.0  | 999.0 | kPa | VD/VDE/VFPP - Heating - System - Pressure difference threshold                            |
| FMG46     | 0.0  | 999.0 | kPa | VD/VDE/VFPP - Heating - System - Differential                                             |
| FMG47     | 10   | 9999  | l   | VFPP - Cooling - Volume in litres                                                         |
| FMG48     | 10   | 9999  | l   | VFPP - Heating - Volume in litres                                                         |
| FMG52     | 0    | 1     | -   | VFPP - Through time                                                                       |
| FMG53     | 1    | 999   | s   | VFPP - Through time in manual mode                                                        |
| FMG54     | 50.0 | 100.0 | %   | Common - Pump - Speed in manual mode                                                      |
| FMG55     | 0.0  | 100.0 | %   | VFPP/DT - Valve - Min. opening                                                            |
| FMG56     | 0.0  | 100.0 | %   | VFPP/DT - Valve - Max. opening                                                            |
| FMG57     | 0.0  | 100.0 | %   | VFPP/DT - Valve - Open in manual mode                                                     |
| FMG58     | 0    | 100   | %   | VFPP/DT - Valve - Min. opening with temp. diff. in heat exchanger smaller than min. value |
| FMG59     | 0.0  | 100.0 | %   | VFPP/DT - Valve - Setup parameter - % increase                                            |
| FMG60     | 1    | 999   | s   | VFPP/DT - Valve - Setup parameter - Time between increases                                |
| FMG61     | 0.0  | 100.0 | %   | VFPP/DT - Valve - Setup parameter - % decrease                                            |
| FMG62     | 1    | 999   | s   | VFPP/DT - Valve - Setup parameter - Time between decreases                                |
| FMG63     | 0    | 1     | -   | VFPP/DT - Valve - Open in manual mode                                                     |
| FMG64     | 0.0  | 100.0 | %   | VP - Cooling - Inverter pump %                                                            |
| FMG65     | 0.0  | 100.0 | %   | VP - Free Cooling - Inverter pump %                                                       |
| FMG66     | 0.0  | 100.0 | %   | VP - Heating - Inverter pump %                                                            |
| PA22      | 0    | 999   | kPa | User - Flowzer - Low pressure difference setpoint in heat exchanger                       |
| PA55      | 0    | 999   | kPa | User - Flowzer - Pressure difference high in heat exchanger                               |

Provision has been made for screens in units featuring this function which show the operating status. The function screens give access to the main setup parameters, which are also accessible from the overall list in the “Service” branch.

The button on the right-hand side in the “Menu” screen gives access to the screen where the “Flowzer” function is featured. Sub-menus may also be present depending on the functions set in the controller.



The arrow buttons are tapped to select the “Flowzer” function, after which the “ENTER” button must be pressed to confirm the selection.



Below are some screens associated to one of the “Flowzer” functions: they show the operating status with the main parameters.

The screens and the parameters vary according to the enabled function.

The top central part of all function screens shows the operating status. When the status is “OFF”, the pump is switched off. If the symbol “ML” appears on the top central part of the screen(s), the unit is a “Master” unit in a “Multilogic” or “Multifree” installation.

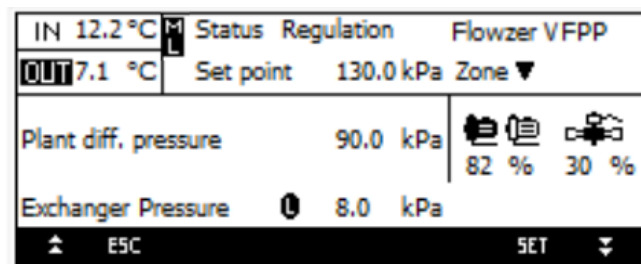


Fig. 39 Screen showing “VFPP” function loop

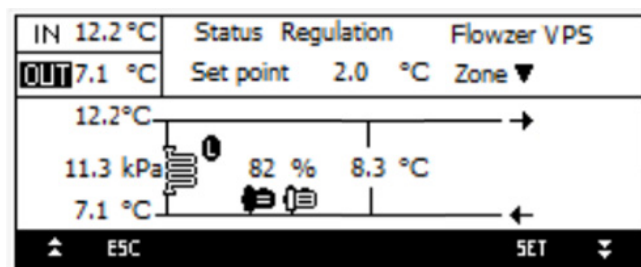


Fig. 40 Screen showing “VPS” function loop

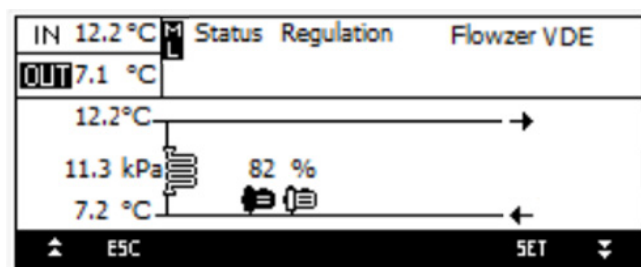


Fig. 41 Screen showing “VDE” function loop

The various setup parameters are illustrated in the next sections.

## 2.26.1 General

All functions have some parameters in common which are used to control the pump fitted in the unit.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                          |
|-----------|-------|----|--------------------------------------|
| FMG1      | 50.0  | %  | Common - Min. pump speed             |
| FMG2      | 100.0 | %  | Common - Max. pump speed             |
| FMG4      | 75.0  | %  | Common - Pump speed at start-up      |
| FMG5      | 45    | s  | Common - Pump start-up time          |
| FMG42     | 0     | -  | Common - Pump in manual mode         |
| FMG54     | 72.0  | %  | Common - Pump - Speed in manual mode |

As regards all Flowzer-related functions, the pump in the unit always gets started at the percentage setpoint stored in parameter "FMG4" in order to detect the operating values and determine what the system needs. The start-up speed is maintained for as long as the time set in parameter "FMG5".

After the start-up time has elapsed, the controller manages the pump speed according to the enabled function.

Irrespective of the enabled function, the pump can be overridden to manual operation at any time by setting the value in parameter "FMG42" to "1" ("0" = automatic operation).

When operation is overridden to manual mode, the pump runs at the speed percentage set in parameter "FMG54".

Some of the many featured functions require the installation of pressure probes in both the delivery and return lines to/from the system, a differential pressure probe on the heat exchanger side fitted in the unit and a temperature probe on the bypass pipe.

If one of the above-mentioned probes is alarmed, which causes the setup references to be lost, the controller overrides the pump to manual mode at the speed setpoint stored in parameter "FMG54".

If a bypass valve is fitted, this one too is overridden to the opening required in manual mode, as set in parameter "FMG57".



For operational continuity, it is important that the values set in parameters "FMG54" and "FMG57" are consistent so that the system is also operational when one of the probes used by the "Flowzer" function is alarmed.

## 2.26.2 "VP" function

The "VP" function requires that the pump operates at constant speed, which is made possible by the inverter fitted to control it.

The pump speed must be set up to achieve the system rated flow.

This function is useful when the flow rate of the pump aboard the unit is higher than the rated flow. The result of flow rate reduction is energy consumption saving.

The reduction of the pump speed is set as a percentage value of the nominal speed.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                         |
|-----------|-------|----|-------------------------------------|
| FMG64     | 75.0  | %  | VP - Cooling - Inverter pump %      |
| FMG65     | 85.0  | %  | VP - Free Cooling - Inverter pump % |
| FMG66     | 72.0  | %  | VP - Heating - Inverter pump %      |

The controller is designed to set different speeds according to the type of unit and the active function.

The speed values can be viewed and edited in the screens of the Flowzer menu, as well as in the parameters listed in the table.

### 2.26.3 “DT” function

The “DT” function is designed to change the pump speed in order to have a constant temperature difference between the unit inlet and outlet.

The resulting effect is that the temperature of water supplied to the system is constant. When the load is reduced, the water flow rate is reduced accordingly, which results in consumption saving.

The controller keeps the flow rate through the unit within a range of safety values in order to preserve it in good operating condition.

This function may be applied to different types of system, their main difference consisting in a bypass valve or a pump being fitted in the secondary circuit. The parameters in the controller depend in any case on the factory-enabled functions.

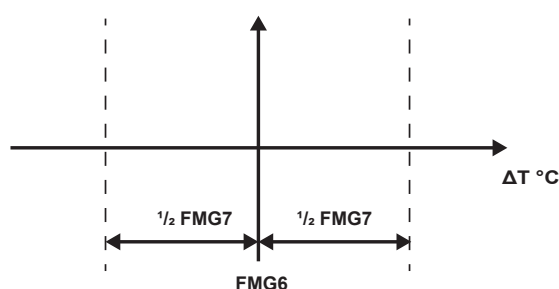
The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                               |
|-----------|-------|-----|-------------------------------------------------------------------------------------------|
| FMG6      | 6.0   | °C  | DT/VPS - Setpoint                                                                         |
| FMG7      | 0.5   | °C  | DT/VPS - Neutral zone                                                                     |
| FMG13     | 5.0   | %   | Common - Emergency - $L\Delta p$ / $H\Delta p$ - % increase/decrease                      |
| FMG14     | 10    | s   | Common - Emergency - $L\Delta p$ / $H\Delta p$ - Time between increase/decrease           |
| FMG18     | 300   | -   | PID - Coefficient - Kp                                                                    |
| FMG19     | 150   | -   | PID - Coefficient - Ki                                                                    |
| FMG20     | 5     | -   | PID - Coefficient - Kd                                                                    |
| FMG55     | 0.0   | %   | VFPP/DT - Valve - Min. opening                                                            |
| FMG56     | 100.0 | %   | VFPP/DT - Valve - Max. opening                                                            |
| FMG57     | 30.0  | %   | VFPP/DT - Valve - Open in manual mode                                                     |
| FMG58     | 50    | %   | VFPP/DT - Valve - Min. opening with temp. diff. in heat exchanger smaller than min. value |
| FMG59     | 1.0   | %   | VFPP/DT - Valve - Setup parameter - % increase                                            |
| FMG60     | 35    | s   | VFPP/DT - Valve - Setup parameter - Time between increases                                |
| FMG61     | 2.0   | %   | VFPP/DT - Valve - Setup parameter - % decrease                                            |
| FMG62     | 10    | s   | VFPP/DT - Valve - Setup parameter - Time between decreases                                |
| FMG63     | 0     | -   | VFPP/DT - Valve - Open in manual mode                                                     |
| PA22      | 8     | kPa | User - Flowzer - Low pressure difference setpoint in heat exchanger                       |
| PA55      | 70    | kPa | User - Flowzer - Pressure difference high in heat exchanger                               |

Below is a graphical representation of the parameters set based on the setpoint difference.



The controller adjusts the pump speed to keep constant the temperature difference, which is the setpoint value in parameter “FMG6”.

The setpoint is associated to a neutral zone that is set in parameter “FMG7”.

Outside the neutral zone the controller modulates the pump speed according to the setpoints stored in the PID parameters.

If the function is not designed to manage other features than temperature difference control on the heat exchanger side fitted in the unit, the hydraulic diagram of the installation is approximately as follows.

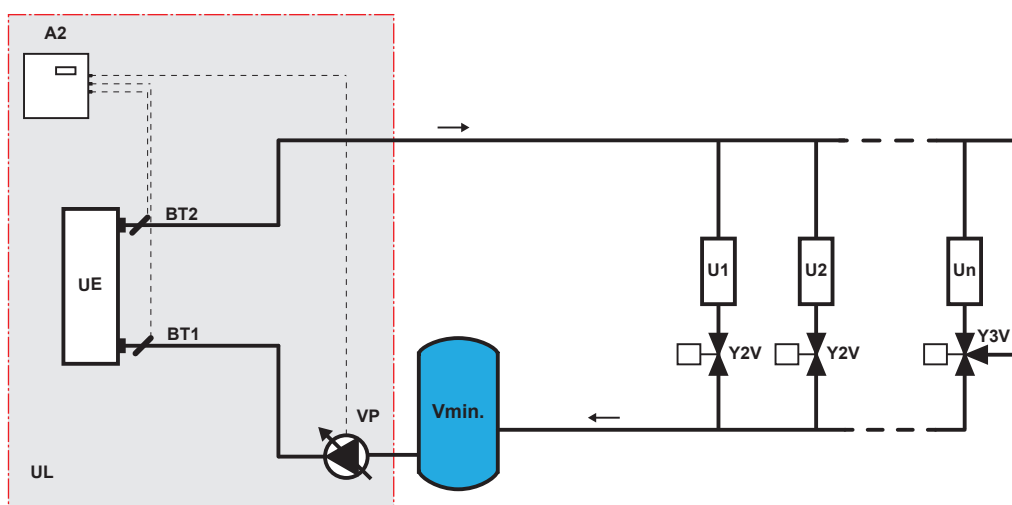


Fig. 42 Pump in unit used for water circulation in the system

If the function is designed for flow rate control on the heat exchanger side fitted in the unit, the hydraulic diagram of the installation is approximately as follows.

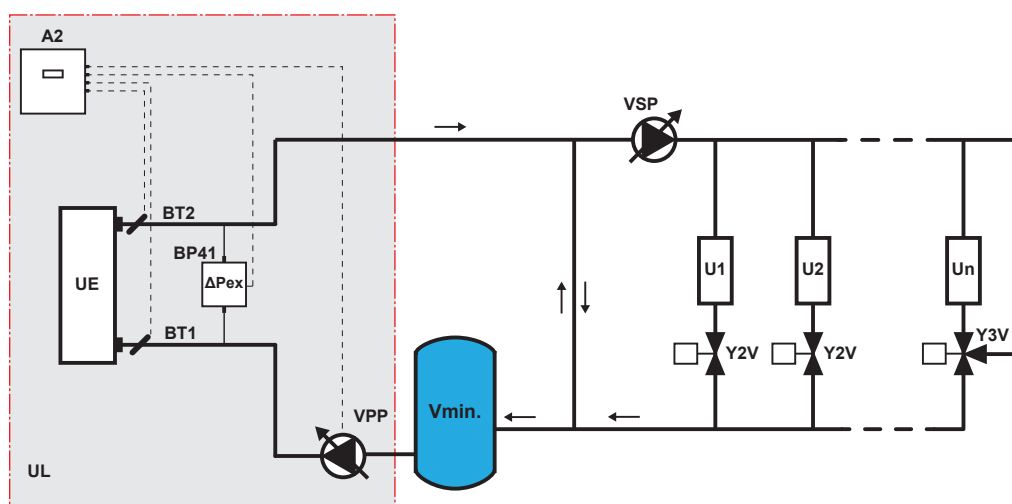


Fig. 43 System featuring one pump in primary circuit and one in secondary circuit

In this case, irrespective of the temperature difference value measured on the heat exchanger side, the controller provides for the pump speed required to keep the pressure difference between the values set in parameters "PA22" and "PA55".

If the pressure difference on the heat exchanger side is outside the range of values set in parameters "PA22" and "PA55", the controller changes the pump speed as needed using the setpoints in parameters "FMG13" and "FMG14".

If the function requires management of a bypass valve to control the pressure difference on the heat exchanger side, the hydraulic diagram of the installation is approximately as follows.

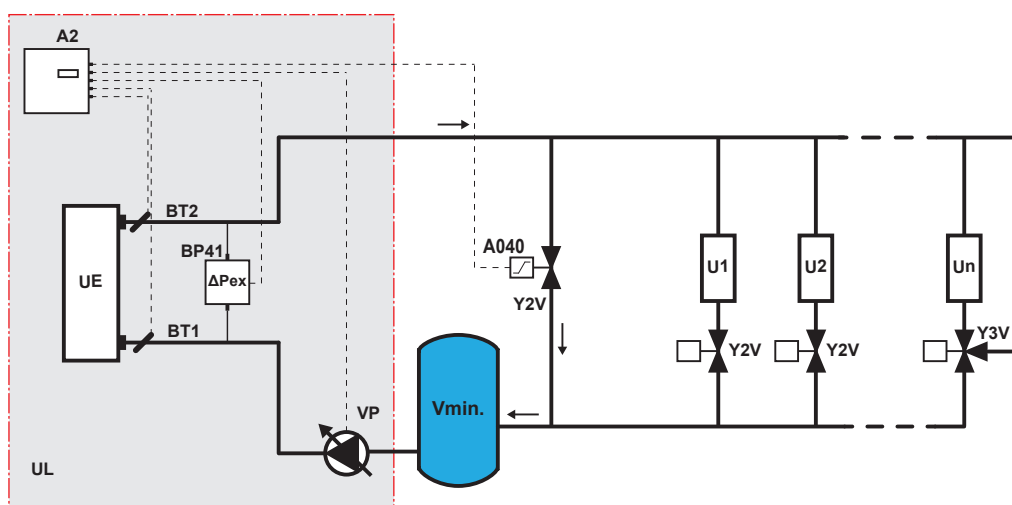


Fig. 44 Pump in unit used for water circulation in the system with bypass valve

If the pressure difference on the heat exchanger side is lower than the value in parameter “PA22”, the controller opens the bypass valve at the percentage setpoint (pre-positioning) stored in parameter “FMG58”.

When in start position or during setup operations, the controller uses the setpoints in parameters “FMG59” and “FMG60” if it senses the need to open the bypass valve.

If the pressure difference on the heat exchanger side is higher than the setpoint in parameter “PA55”, the controller uses the values set in parameters “FMG61” and “FMG62” to reduce it.

The bypass valve may be overridden to open at any time by setting the value of parameter “FMG63” to “1” in order to enable manual mode (“0” = automatic mode).

When operation is overridden to manual mode, the valve opens at the percentage set in parameter “FMG57”.

Irrespective of the setpoint, the controller manages opening of the bypass valve between the min. value set in parameter “FMG55” and the max. value set in parameter “FMG56”.

## 2.26.4 “VDE” function

The “VDE” function is designed to set the pump speed in order to have a constant pressure difference between the unit inlet and outlet.

The speed of the pump is set automatically to preserve the desired flow through the heat exchanger in the unit.

This function is useful when the head of the pump aboard the unit is greater than the system requires, which would result in a higher water flow circulating.

The value corresponding to the difference between the input and the output pressure needs to be monitored to ensure the correct water flow.

In heat pump units the controller is designed to offer the opportunity to set two pressure difference values: one for cooling and one for heating.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                    |
|-----------|-------|-----|----------------------------------------------------------------|
| FMG43     | 130.0 | kPa | VD/VDE/VFPP - Cooling - System - Pressure difference threshold |
| FMG44     | 2.0   | kPa | VD/VDE/VFPP - Cooling - System - Differential                  |
| FMG45     | 130.0 | kPa | VD/VDE/VFPP - Heating - System - Pressure difference threshold |
| FMG46     | 2.0   | kPa | VD/VDE/VFPP - Heating - System - Differential                  |

The controller adjusts the pump speed so as to keep constant the pressure difference, which is the setpoint value in parameter “FMG43”, for operation in cooling mode.

The value is adjusted taking as reference the differential set in parameter “FMG44”.

If the unit is a heat pump unit, the controller adjusts the pump speed in heating mode so as to keep constant the pressure difference, which is the setpoint value in parameter “FMG45”.

In heating mode the value is adjusted taking as reference the differential set in parameter “FMG46”.

Differentials work underneath and above the setpoint. The PID parameters are used to keep the setpoint.

The hydraulic diagram below shows a system featuring this function.

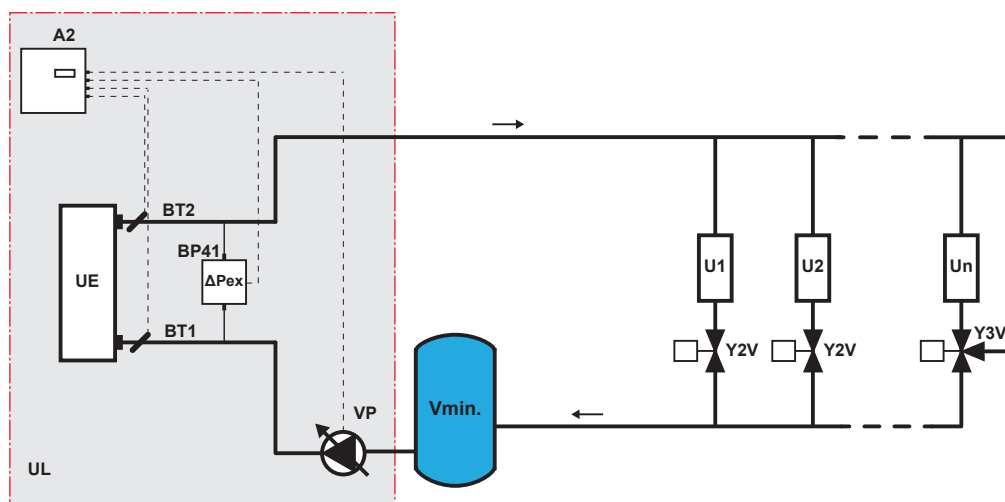


Fig. 45 System diagram with constant pressure control in unit

### 2.26.5 “VD” function

The “VD” function is designed to set the pump speed in order to have a constant pressure difference between the delivery and the return lines in the system.

If the pressure difference at the ends of the system is kept constant, the pump speed is set automatically in order to have the desired flow as the load changes.

A reduction in the load demand results in an increase in the pressure difference that the controller offsets by reducing the pump speed, which has an impact in terms of energy consumption saving.

In heat pump units the controller is designed to offer the opportunity to set two pressure difference values: one for cooling and one for heating.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                    |
|-----------|-------|-----|----------------------------------------------------------------|
| FMG18     | 300   | -   | PID - Coefficient - Kp                                         |
| FMG19     | 150   | -   | PID - Coefficient - Ki                                         |
| FMG20     | 5     | -   | PID - Coefficient - Kd                                         |
| FMG43     | 130.0 | kPa | VD/VDE/VFPP - Cooling - System - Pressure difference threshold |
| FMG44     | 2.0   | kPa | VD/VDE/VFPP - Cooling - System - Differential                  |
| FMG45     | 130.0 | kPa | VD/VDE/VFPP - Heating - System - Pressure difference threshold |
| FMG46     | 2.0   | kPa | VD/VDE/VFPP - Heating - System - Differential                  |

The controller adjusts the pump speed so as to keep constant the pressure difference, which is the setpoint value in parameter “FMG43”, for operation in cooling mode.

The value is adjusted taking as reference the differential set in parameter “FMG44”.

If the unit is a heat pump unit, the controller adjusts the pump speed in heating mode so as to keep constant the pressure difference, which is the setpoint value in parameter “FMG45”.

In heating mode the value is adjusted taking as reference the differential set in parameter “FMG46”.

Differentials work underneath and above the setpoint. The PID parameters are used to keep the setpoint.

The hydraulic diagram below shows a system featuring this function.

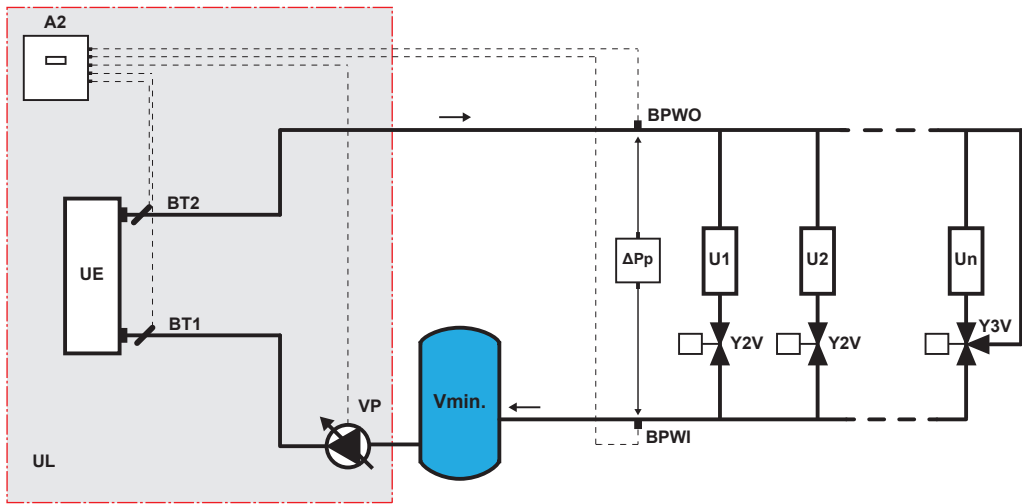


Fig. 46 System diagram with constant pressure control in system

## 2.26.6 “VFPP” function

The “VFPP” function is designed to control variable flow systems to the primary circuit.

As demand changes, the system keeps stable the difference in water pressure and temperature in the system delivery line.

The water flow rate and temperature are independent variables and they are not directly connected.

Pump control (only one pump in the system) provides for the necessary flow rate, while cooling capacity control ensures the correct temperature.

A reduction in the demand from the system results in an increase in the pressure difference that the controller offsets by reducing the pump speed, which has an impact in terms of energy consumption saving.

The water flow rate in the primary circuit is always adjusted within the set limits for correct operation of the refrigerant unit.

In heat pump units the controller is designed to offer the opportunity to set two pressure difference values: one for cooling and one for heating.

The parameters involved are shown below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                               |
|-----------|-------|-----|-------------------------------------------------------------------------------------------|
| FMG9      | 2.0   | %   | Common - Setup parameter - Pump speed increase %                                          |
| FMG10     | 40    | s   | Common - Setup parameter - Time between pump speed increases                              |
| FMG11     | 1.0   | %   | Common - Setup parameter - Pump speed decrease %                                          |
| FMG12     | 35    | s   | Common - Setup parameter - Time between pump speed decreases                              |
| FMG13     | 5.0   | %   | Common - Emergency - $L\Delta p$ / $H\Delta p$ - % increase/decrease                      |
| FMG14     | 10    | s   | Common - Emergency - $L\Delta p$ / $H\Delta p$ - Time between increase/decrease           |
| FMG43     | 130.0 | kPa | VD/VDE/VFPP - Cooling - System - Pressure difference threshold                            |
| FMG44     | 2.0   | kPa | VD/VDE/VFPP - Cooling - System - Differential                                             |
| FMG45     | 130.0 | kPa | VD/VDE/VFPP - Heating - System - Pressure difference threshold                            |
| FMG46     | 2.0   | kPa | VD/VDE/VFPP - Heating - System - Differential                                             |
| FMG47     | 700   | l   | VFPP - Cooling - Volume in litres                                                         |
| FMG48     | 700   | l   | VFPP - Heating - Volume in litres                                                         |
| FMG52     | 0     | -   | VFPP - Through time                                                                       |
| FMG53     | 30    | s   | VFPP - Through time in manual mode                                                        |
| FMG55     | 0.0   | %   | VFPP/DT - Valve - Min. opening                                                            |
| FMG56     | 100.0 | %   | VFPP/DT - Valve - Max. opening                                                            |
| FMG57     | 30.0  | %   | VFPP/DT - Valve - Open in manual mode                                                     |
| FMG58     | 50    | %   | VFPP/DT - Valve - Min. opening with temp. diff. in heat exchanger smaller than min. value |
| FMG59     | 1.0   | %   | VFPP/DT - Valve - Setup parameter - % increase                                            |
| FMG60     | 35    | s   | VFPP/DT - Valve - Setup parameter - Time between increases                                |
| FMG61     | 2.0   | %   | VFPP/DT - Valve - Setup parameter - % decrease                                            |
| FMG62     | 10    | s   | VFPP/DT - Valve - Setup parameter - Time between decreases                                |
| FMG63     | 0     | -   | VFPP/DT - Valve - Open in manual mode                                                     |
| PA22      | 8     | kPa | User - Flowzer - Low pressure difference setpoint in heat exchanger                       |
| PA55      | 70    | kPa | User - Flowzer - Pressure difference high in heat exchanger                               |

The controller adjusts the pump speed so as to keep constant the pressure difference in the system, which is the setpoint value in parameter “FMG43”, for operation in cooling mode.

The value is adjusted taking as reference the differential set in parameter “FMG44”.

If the unit is a heat pump unit, the controller adjusts the pump speed in heating mode so as to keep constant the pressure difference in the system, which is the setpoint value in parameter “FMG45”.

In heating mode the value is adjusted taking as reference the differential set in parameter “FMG46”.

Differentials work underneath the setpoint.

The speed is increased by small percentage variations at preset intervals of time using the values stored in parameters “FMG9” and “FMG10”. Speed reduction takes place in the same way, but referencing the setpoints in parameters “FMG11” and “FMG12”.

If the pressure difference on the heat exchanger side in the unit during the process to keep the pressure difference in the system constant is lower than the value in parameter "PA22", the controller opens the bypass valve at the percentage setpoint (pre-positioning) stored in parameter "FMG58".

When in start position or during setup operations, the controller uses the setpoints in parameters "FMG59" and "FMG60" if it senses the need to open the bypass valve any further.

Opening of the bypass valve makes it possible to circulate the necessary flow to keep the pressure difference constant on the heat exchanger side fitted in the unit.

The bypass valve starts closing again when the pressure difference on the heat exchanger side is higher than the value stored in parameter "PA22" plus the differential value. The differential value is written in the programming code.

If the pressure difference on the heat exchanger side during the process to keep the pressure difference constant in the system is higher than the setpoint in parameter "PA55", the controller uses the values set in parameters "FMG61" and "FMG62" to reduce it.

The bypass valve may be overridden to open at any time by setting the value of parameter "FMG63" to "1" in order to enable manual mode ("0" = automatic mode).

When operation is overridden to manual mode, the valve opens at the percentage set in parameter "FMG57".

Irrespective of the setpoint, the controller manages opening of the bypass valve between the min. value set in parameter "FMG55" and the max. value set in parameter "FMG56".

Special conditions may exist where automatic setup of the pump speed needs to be bypassed.

If the value of parameter "FMG52" is set to "1", the time elapsing between two pump speed changes is activated according to the value in parameter "FMG53".

The hydraulic diagram below shows a system featuring this function.

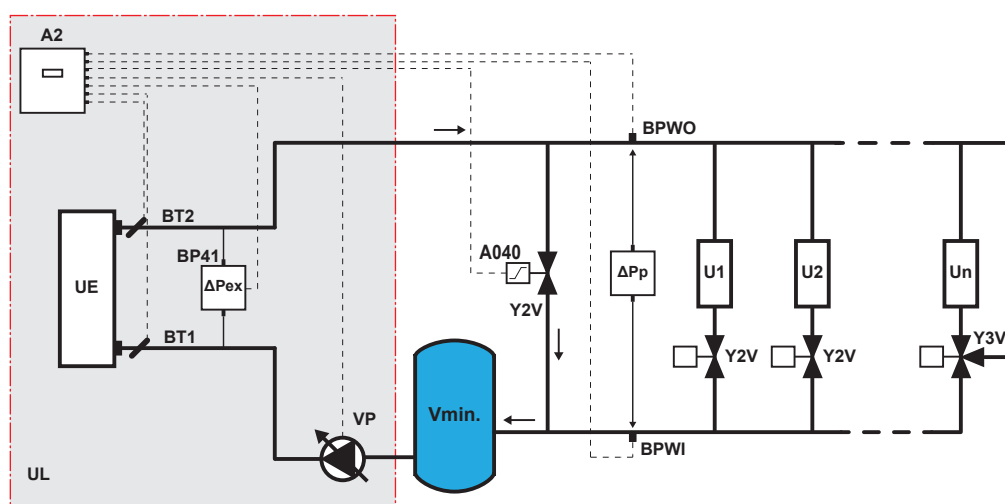


Fig. 47 System diagram with "VFPP" control

## 2.26.7 “VPS” function

The “VPS” function is designed for flow rate modulation to the primary circuit following that of the secondary circuit, having as reference the water temperature difference measured between the outlet of the primary circuit and the bypass pipe.

The water flow rate in the primary circuit is always set up within the limits set for correct operation of the refrigerant unit.

The parameters involved are shown below.

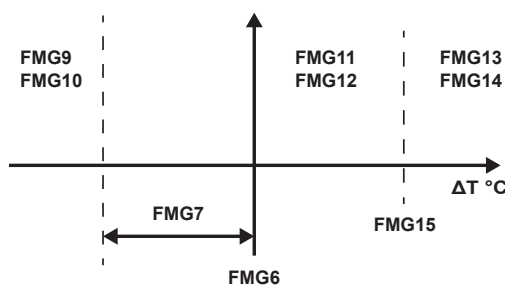


The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                                     |
|-----------|-------|----|---------------------------------------------------------------------------------|
| FMG6      | 5.0   | °C | DT/VPS - Setpoint                                                               |
| FMG7      | 0.5   | °C | DT/VPS - Neutral zone                                                           |
| FMG9      | 2.0   | %  | Common - Setup parameter - Pump speed increase %                                |
| FMG10     | 40    | s  | Common - Setup parameter - Time between pump speed increases                    |
| FMG11     | 1.0   | %  | Common - Setup parameter - Pump speed decrease %                                |
| FMG12     | 35    | s  | Common - Setup parameter - Time between pump speed decreases                    |
| FMG13     | 5.0   | %  | Common - Emergency - $L\Delta p$ / $H\Delta p$ - % increase/decrease            |
| FMG14     | 10    | s  | Common - Emergency - $L\Delta p$ / $H\Delta p$ - Time between increase/decrease |
| FMG15     | 15.0  | °C | VPS - Setup parameter - Setpoint of second pump speed increase threshold        |
| FMG16     | 5     | s  | VPS - Setup parameter - Second threshold - Increase time                        |

The controller adjusts the pump speed to keep the difference in the water temperature at the outlets of the primary circuit and the bypass pipe at the setpoint stored in parameter “FMG6”.

A graphical representation is shown below.



As the graph shows, the neutral zone is underneath the setpoint in parameter “FMG7”.

Underneath the neutral zone the pump speed is reduced taking small percentage variations - this value is set in parameter “FMG11” - which take place with the delay time set in parameter “FMG12”.

Above the neutral zone the pump speed is increased taking small percentage variations - this value is set in parameter “FMG11” - which take place with the delay time set in parameter “FMG12”.

If the temperature difference reaches the value set in parameter “FMG15”, the pump speed is increased with the percentage variations set in parameter “FMG13”, which takes place with the delay time set in parameter “FMG14”.

The hydraulic diagram below shows a system featuring this function.

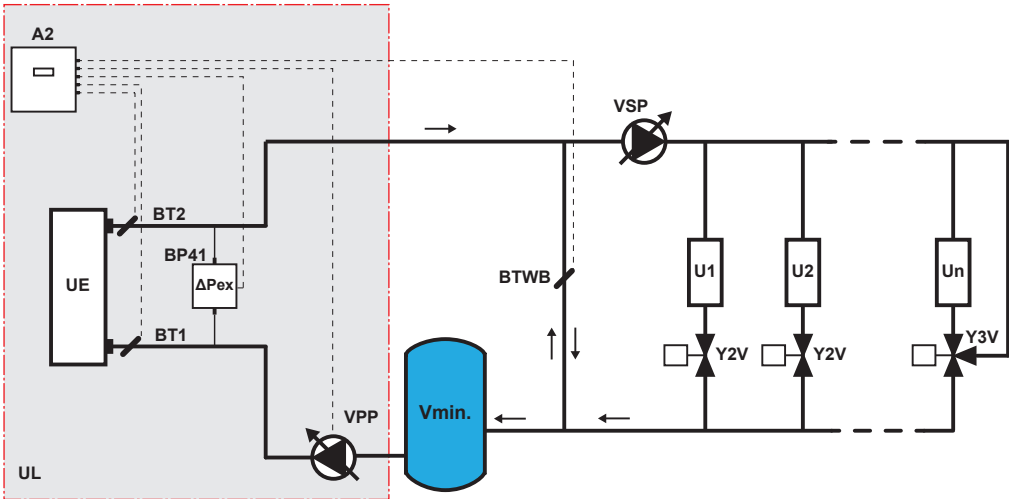


Fig. 48 System diagram with “VPS” control

## 2.27 SMART Link

The "SMART Link" function prepares the refrigerant units for serial connection with "GOLD" ventilated units.

Through the serial connection, the "GOLD" unit intervenes in the water temperature value of the refrigerant unit to optimize system operation and reduce energy consumption.

This function is available for both chiller units and heat pump units.

The parameters involved are shown in the table.

| Parameter | Min | Max | UM | Description                     |
|-----------|-----|-----|----|---------------------------------|
| SP6       | 0   | 1   | -  | Enable BMS supervision writings |
| SP11      | 0   | 1   | -  | Enabling of SmartLink BMS       |
| SP12      | 1   | 247 | -  | BMS serial address              |
| SP14      | 0   | 3   | -  | Modbus speed                    |



For serial connection and networked operation of the two units, also consult the documentation for the GOLD unit.

### 2.27.1 Parametrization of the controller

Normally, in units that have the "SMART Link" function, the parameters for serial communication in the controller are factory set.

If a check is necessary, the correct values are shown in the table.

| Parameter | Value | UM | Description                     |
|-----------|-------|----|---------------------------------|
| SP6       | 1     | -  | Enable BMS supervision writings |
| SP11      | 1     | -  | Enabling of SmartLink BMS       |
| SP12      | 64    | -  | BMS serial address              |
| SP14      | 3     | -  | Modbus speed                    |

When these parameters are correctly set, the following symbol appears in the controller display near the setpoint value:



When these parameters are correctly set, the "SmartLink" symbol appears in the controller display.



If, for any reason, it is necessary to start the refrigerant unit without the command from the "GOLD" unit, parameters SP6 and SP11 must be set to "0".

### 2.27.2 Serial connection

Serial connection between the refrigerant unit and the "GOLD" unit is to be carried out by the installer and must be done on the serial port RS485 of the controller at terminals 97, 98 and 99, respectively corresponding to (-), (+) and (GND).

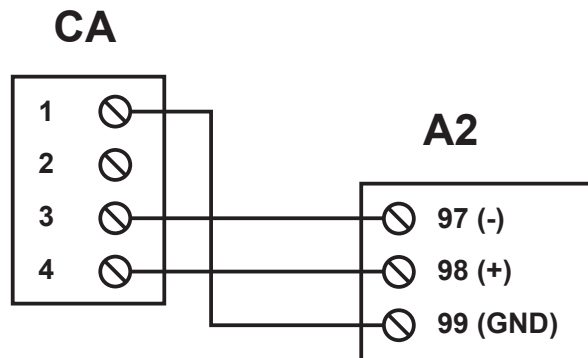


Fig. 49 Serial connection

The abbreviations shown in the illustration refer to:

- CA = cable adapter, present in the GOLD unit;
- A2 = terminal board of the serial port RS485 present in the board of the controller.



The serial connection must be made with AWG20 twisted cable (cross-section of at least 0.5 mm<sup>2</sup>), for a maximum length of 100 metres.



Adopt suitable precautions to prevent the creation of electromagnetic interference to the connection. In particular, to avoid creating line interference that would compromise the signal, avoid running the serial cable alongside the power cables.

## 2.28 SMARTLink +

The “SMARTLink+” function is designed to set up the refrigerant units for connection to as many as ten ventilating units of any version whatsoever (“GOLD” units and chilled beam systems) using an Ethernet port.

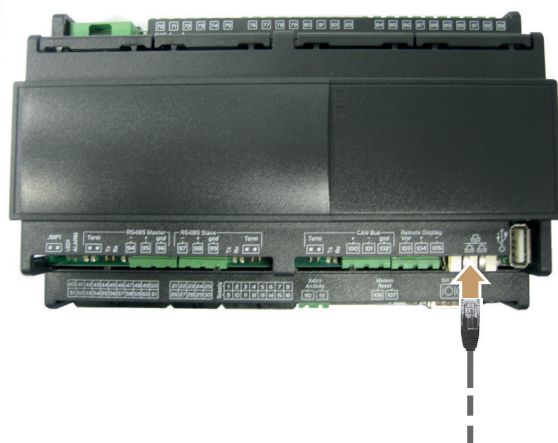
The Ethernet connection enables multiple ventilating units to be involved in the definition of the water temperature value of the refrigerant unit with a view to optimizing system operation and reducing energy consumption.

This function offers refrigerant units the possibility to be fitted in systems with either one or two hydraulic circuits (defined as “circuit A” and “circuit B” in the controller parameters).

### 2.28.1 Serial connection

The connection of the refrigerant unit and the ventilating units is via Modbus on a TCP/IP network.

A twisted pair network cable, CAT5, with RJ45 connector must be used for unit connection to the network. The cable may be shielded or not.



There are three possible connection options:

- direct, between a refrigerant unit and a ventilating unit;
- using a specific network for the system where only refrigerant and ventilating units are fitted;
- using the network of the installation where other devices are connected in addition to the system units.

The first case requires that the connection to the connectors is criss-crossed; the other two cases require a direct connection (also see the reference Smart Link+ guide for “GOLD” units.)

### 2.28.2 Function activation

Normally, units featuring the SMART Link+ function are shipped from the factory with one ventilating unit configured.

When it is started up, the refrigerant unit looks for a ventilating unit in the network whose address is IP 10.2.3.51. If the ventilating unit is not connected or its IP address is different, alarm AL386 appears.

The correct parameters for the type of system in which the unit is connected hydraulically must be set up in the controller of the refrigerant unit.

These parameters include, in sequence:

- the number of ventilating units to be controlled;
- the operating mode switch type (for heat pump units only);
- their IP address;
- the hydraulic circuit to which the ventilating units are connected (“A” is the default factory setpoint);
- activation of serial communication with the ventilating unit.

These values may be set in the “SML” parameters stored in the “Service” branch or in the function-specific screens.

Please find below a list of values set in the “SML” parameters:

- parameter “SML1” is used to set the number of ventilating units featured;
- the hydraulic circuit to which each ventilating unit is connected is set in parameter SML2: 0 = None; 1 = Circuit A; 2 = Circuit B
- the type of user connected is set from parameter “SML13” to “SML22”: 0 = "Gold"; 1 = "SuperWise"

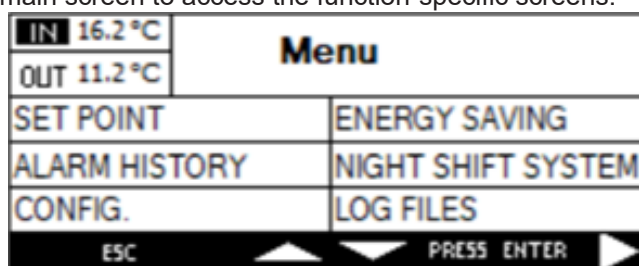
| Parameter | Min   | Max  | UM | Description                           |
|-----------|-------|------|----|---------------------------------------|
| SML1      | 0     | 10   | -  | Number of users to be controlled      |
| SML2      | 0     | 2    | -  | Circuit configured                    |
| SML3      | 1     | 254  | -  | User 1 - IP address                   |
| SML4      | 1     | 254  | -  | User 2 - IP address                   |
| SML5      | 1     | 254  | -  | User 3 - IP address                   |
| SML6      | 1     | 254  | -  | User 4 - IP address                   |
| SML7      | 1     | 254  | -  | User 5 - IP address                   |
| SML8      | 1     | 254  | -  | User 6 - IP address                   |
| SML9      | 1     | 254  | -  | User 7 - IP address                   |
| SML10     | 1     | 254  | -  | User 8 - IP address                   |
| SML11     | 1     | 254  | -  | User 9 - IP address                   |
| SML12     | 1     | 254  | -  | User 10 - IP address                  |
| SML13     | 0     | 1    | -  | Consumer 1 - Type                     |
| SML14     | 0     | 1    | -  | Consumer 2 - Type                     |
| SML15     | 0     | 1    | -  | Consumer 3 - Type                     |
| SML16     | 0     | 1    | -  | Consumer 4 - Type                     |
| SML17     | 0     | 1    | -  | Consumer 5 - Type                     |
| SML18     | 0     | 1    | -  | Consumer 6 - Type                     |
| SML19     | 0     | 1    | -  | Consumer 7 - Type                     |
| SML20     | 0     | 2    | -  | Consumer 8 - Type                     |
| SML21     | 0     | 1    | -  | Consumer 9 - Type                     |
| SML22     | 0     | 1    | -  | Consumer 10 - Type                    |
| SML26     | -50.0 | 99.9 | °C | Producer - Toa - Threshold            |
| SML27     | 0.0   | 25.0 | °C | Producer - Toa - Cooling differential |
| SML28     | 0.0   | 25.0 | °C | Producer - Toa - Heating differential |

If communication between the refrigerant unit and the ventilating units is not successful with the parameters set, an alarm appears on the controller of the refrigerant unit.

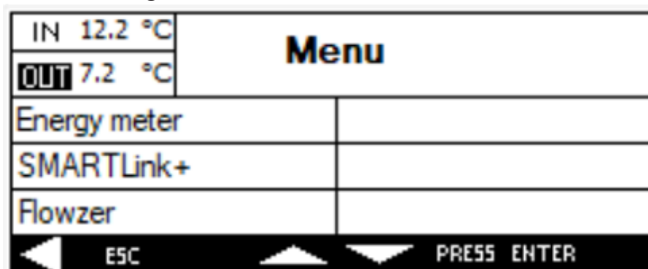


The alarm only pops up if the ventilating unit is enabled.

Press the button “MENU” on the main screen to access the function-specific screens.



Scroll the “MENU” screens using the arrow right until the screen with the SMART Link+ function appears.



Tap the arrow down to select the “SMART Link+” function and press “ENTER” to confirm: the first screen appears where the function parameters are set up.

|                   |            |             |                     |
|-------------------|------------|-------------|---------------------|
| <b>SMARTLink+</b> |            | Type change | 1- by digital input |
| Num.Consumer      | 1          | Config.Circ | 0- None             |
| Consumer          | IP address | Type        | Enable              |
| 1                 | 51         | Gold        | 1- YES              |

ESC    ▲    ▼    PRESS    ENTER

Move in the various fields using the arrow buttons and press “ENTER” to confirm after entering the necessary parameters, according to the system in which the refrigerant unit is fitted.

As soon as the number of ventilating units is set up, the value entry fields are enabled.



The value to be entered in the field “IP address” is the last digit in the address (e.g. 10.2.3.xx).

The first three values of the IP address for network identification are the same numbers as in the controller.

The controller IP address set at the factory is 10.2.3.20. If it needs changing, refer to the section “IP addressing” in the controller hardware manual.

The addresses for units in the network can take values between 1 and 254.



All communications with the ventilating units are disabled by default to avoid unnecessary alarms.

### 2.28.3 Determination of operating mode (only for heat pump units)

The operating mode of heat pump units is connected to the value set in parameter “SP9”, which may be:

- 0 = from user interface;
- 1 = from digital input;
- 2 = from SMART Link+.



When the unit is fitted with the SMART Link+ option, the value of parameter “SP9” is set to “2” at the factory. Parameter “SP9” must be edited at start-up or when an override is required.

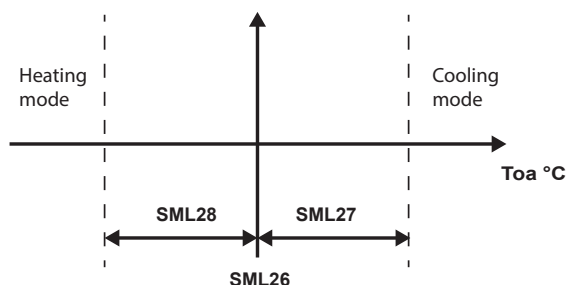
When parameter “SP9” is set to “2”, the controller establishes the operating mode type based on the demand received from the highest number of ventilating units connected.

If the number of demands for cooling is equal to the number of demands for heating, the controller establishes the operating mode to be enabled by comparing the value in parameter “SML26” with the outside air temperature.

If the outside air temperature is higher than the setpoint in parameter “SML26”, the controller sets the unit for operation in cooling mode; if it is lower, it sets the unit for operation in heating mode.

Other parameters are provided in addition to the threshold for operating mode switching (“SML26”). These include the differential for switching to cooling mode (“SML27”) and the differential for switching to heating mode (“SML28”).

A graphical representation is shown below.



When the refrigerant unit is set up for operation in heating mode, it only switches to cooling mode if the air temperature value is higher than threshold “SML26”, plus the relevant differential (“SML27”).

When the refrigerant unit is set up for operation in cooling mode, it only switches to heating mode if the air temperature value is lower than threshold “SML26”, minus the relevant differential (“SML28”).

### 2.28.4 Setpoint calculation

The refrigerant unit uses an algorithm to calculate the setpoint that best suits the requirements of the ventilating units. When the function is enabled, the parameter that the user uses to edit the unit setpoint is no longer effective for thermoregulation.

The setpoint calculated based on the demands of the ventilating units is in any case included between the min. and max. values of each operating mode (“ST2” and “ST3” for cooling mode; “ST5” and “ST6” for heating mode).



All serial variables in units with the “SMART Link+” function enabled are available in read only mode.



For serial connection and unit operation in the network, also consult the documentation relating to the “GOLD” unit.

## 2.29 Energy meter

The option “Energy meter” is designed to control the main electrical parameters of the unit.  
This measuring instrument is installed in the electrical cabinet of the unit and it is configured at the factory. It communicates with the controller serially.

### 2.29.1 Viewing of measured parameters

Specific screens are provided to show the measured parameters.  
Press the button “MENU” on the main screen to access the measured parameter screens.

|               |                    |  |
|---------------|--------------------|--|
| IN 16.2 °C    | Menu               |  |
| OUT 11.2 °C   |                    |  |
| SET POINT     | ENERGY SAVING      |  |
| ALARM HISTORY | NIGHT SHIFT SYSTEM |  |
| CONFIG.       | LOG FILES          |  |
| ESC           | PRESS ENTER        |  |

Scroll the “MENU” screens using the arrow right until the screen with the “Energy meter” function appears.

|              |             |  |
|--------------|-------------|--|
| IN 12.2 °C   | Menu        |  |
| OUT 7.2 °C   |             |  |
| Energy meter |             |  |
| SMARTLink+   |             |  |
| Flowzer      |             |  |
| ESC          | PRESS ENTER |  |

Tap the arrow down to select the “Energy meter” function and press “ENTER” to confirm: the first screen appears where the parameters measured in each phase are shown.

| Energy meter |         |  |         |  |             |
|--------------|---------|--|---------|--|-------------|
|              | L1      |  | L2      |  | L3          |
| Voltage      | 399 V   |  | 398 V   |  | 400 V       |
| Current      | 50.2 A  |  | 45.8 A  |  | 46.1 A      |
| Power        | 19.1 kW |  | 17.7 kW |  | 17.9 kW     |
| cos fi       | 0.983   |  | 0.972   |  | 0.975       |
| ESC          |         |  |         |  | PRESS ENTER |

The total values are displayed in the screen appearing when the arrow down is tapped.

| Energy meter  |             |     |
|---------------|-------------|-----|
| Total voltage | 399         | V   |
| Frequency     | 50          | Hz  |
| Total power   | 54.7        | kW  |
| Total energy  | 479.2       | MWh |
| ESC           | PRESS ENTER |     |



The energy value is an aggregate value over time. The reset procedure is explained in the meter manual.

Where communication with the measuring instrument fails, the controller warns about this condition causing an alarm window to appear.

## 2.29.2 Limitation of absorbed current using “Energy meter”

The option “Energy meter” may be integrated with an additional option that is designed to limit the electric current absorbed by the unit.

The current limitation option is not available for sizes where the number of compressors is not enough for correct operation.

The controller uses as reference the greatest value of absorbed current on the three phases.

The current is limited by overriding cooling capacity reduction.

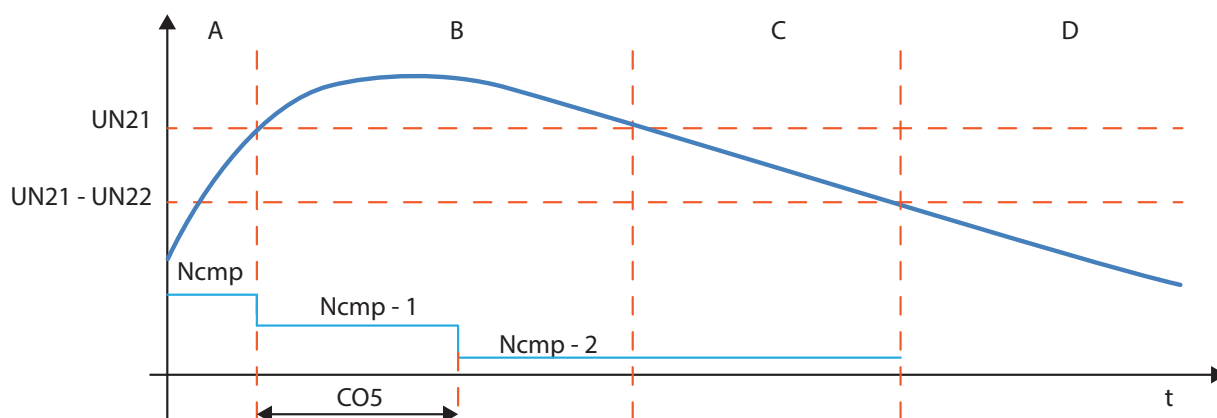
The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                       |
|-----------|-------|-----|-----------------------------------------------------------------------------------|
| UN4       | 2     | -   | Unloading from Amperometric Transformer                                           |
| UN17      | 15    | min | Capacity reduction activation time limit                                          |
| UN18      | 5     | min | Time between two capacity reductions of the same circuit                          |
| UN21      | 250   | A   | Current capacity reduction threshold                                              |
| UN22      | 50    | A   | Current capacity reduction differential                                           |
| CO5       | 10    | s   | Min. time between de-activation of 2 compressors/Min. Time between step decrement |

A graphical representation is shown below.



The override of unit capacity reduction is enabled when the greatest current value measured on the three phases is higher than the setpoint in parameter “UN21” (phase B). In this phase, the controller disables the compressors according to the delay time set in parameter “CO5” until the absorbed current drops back to a lower value than the setpoint in parameter “UN21”.

If the value of current is between the value in parameter “UN21” and the difference between the values in parameters “UN21” – “UN22”(phase C), the controller does not change the capacity.

When the current absorbed by the unit is lower than the difference between the values in parameters “UN21” – “UN22” (phase D), the controller exits capacity reduction override mode and the demand for cooling capacity is managed again based on thermoregulation.

The time of the capacity reduction process may be as long as the time setpoint in parameter “UN17”. When this setpoint is exceeded, capacity is managed again based on thermoregulation, irrespective of the absorbed current.

Before a new capacity reduction cycle is started, the time set in parameter “UN18” must elapse.

## 2.30 Reversal of operation on the water

Normally, in units that have this feature, reversal of operation takes place in the refrigerant circuit.

In water/water units, reversal of operation can be done on the hydraulic circuits.

The type of reversal is linked to parameter "CF2".

The values used for parameter "CF2" are:

- 0 = operation only in cooling mode;
- 1 = operation only in heating mode;
- 2 = operation in cooling and heating modes with reversal on the refrigerant circuit;
- 3 = operation in cooling and heating modes with reversal on the hydraulic circuits.

Operation with reversal on the hydraulic circuits involves changing the references of the relevant temperature probes that, as described, become "cold" and "hot" from "user" and "source".

Also, reversal of operation on the hydraulic circuits differs according to the position of the pumps compared to the valves.

The controller manages units with reversal of operation on the water in systems with valves between the pumps and the heat exchangers and also in systems with pumps between the valves and the heat exchangers.

The setting of parameter PA41 selects the type of system:

- 0 = pumps between the reversing valves and the heat exchangers.
- 1 = reversing valves between the pumps and the heat exchangers;

In the first case "PA41 = 0", the references to the pumps become "cold" and "hot" whereas, in the second case "PA41 = 1", the references remain "user" and "source".

In addition to the signal that controls the change of operation, the controller consistently manages the water circulation pumps and the reference probes for thermoregulation.

All the alarms and warnings are shown in the "Alarms" chapter.

### 2.30.1 Pumps between the valves and the heat exchangers

In this type of system, the pumps are linked to the heat exchangers.

#### 2.30.1.1 Cold water production

With the production of cold water for the system, the "cold" circuit pump is the evaporator pump and the starting of it is linked to the starting of the unit, whereas the "hot" circuit pump is the condenser pump and the starting of it is linked to the starting of the compressors.

The reference probe is the one installed in the evaporator.

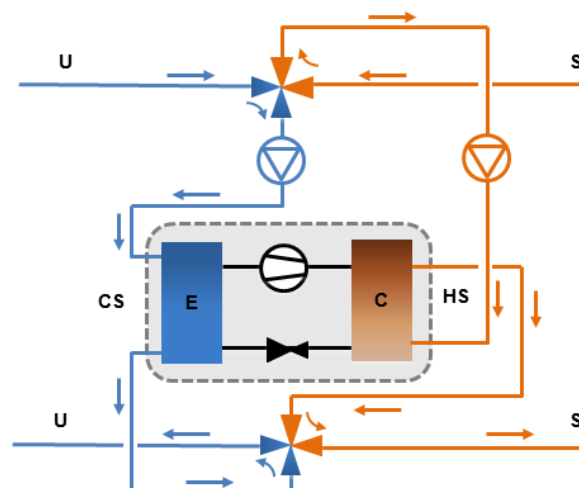


Fig. 50 Cold water production

### 2.30.1.2 Hot water production

With the production of hot water for the system, the "hot" circuit pump is the condenser pump and the starting of it is linked to the starting of the unit, whereas the "cold" circuit pump is the evaporator pump and the starting of it is linked to the starting of the compressors.

The reference probe is the one installed in the condenser.

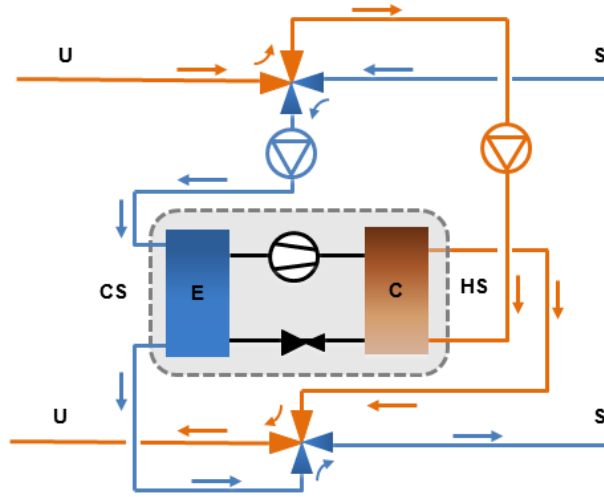


Fig. 51 Hot water production

The abbreviations present in the illustrations indicate:

- U = user circuit;
- S = source circuit;
- C = condenser;
- E = evaporator;
- HS = hot water side;
- CS = cold water side.

### 2.30.2 Valves between the pumps and the heat exchangers

In this type of system, the pumps are linked to the hydraulic circuit.

With the production of cold water for the system, the "user-side" circuit pump makes the water go into the evaporator and the starting of it is linked to the starting of the unit, whereas the "source-side" circuit pump makes the water go into the condenser and the starting of it is linked to the starting of the compressors.

The reference probe is the one installed in the evaporator.

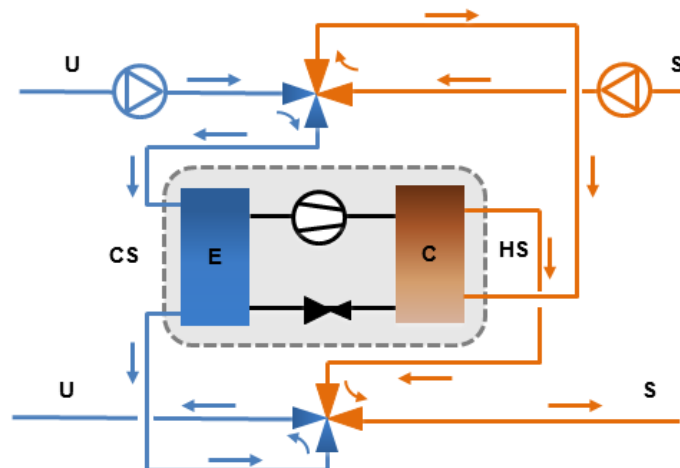


Fig. 52 Cold water production

### 2.30.2.3 Hot water production

With the production of hot water for the system, the "user-side" circuit pump makes the water go into the condenser and the starting of it is linked to the starting of the unit, whereas the "source-side" circuit pump makes the water go into the evaporator and the starting of it is linked to the starting of the compressors.

The reference probe is the one installed in the condenser.

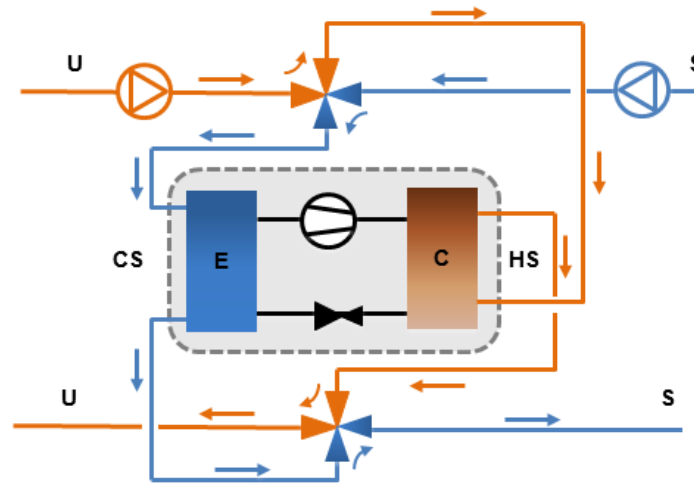


Fig. 53 Hot water production

The abbreviations present in the illustrations indicate:

- U = user circuit;
- S = source circuit;
- C = condenser;
- E = evaporator;
- HS = hot water side;
- CS = cold water side.

## 2.31 Electronic expansion valve

The use of the electronic expansion valve allows very precise, stable and reliable control of refrigerant flow with consequent increase in efficiency.

The controller manages the electronic expansion valve and controls its opening based on the performance required by the system in all working conditions, to ensure low superheating over time that optimizes the performance of the unit and increases the benefits of floating condensation.

Also, the controller can act on the control of the electronic expansion valve to prevent the occurrence of operating conditions that can damage the compressor.

The parameters involved are shown in the table.

| Parameter | Min   | Max   | UM    | Description                                                     |
|-----------|-------|-------|-------|-----------------------------------------------------------------|
| Et24      | 45    | 2400  | steps | Chiller - Pre-positioning of valve before the compressors start |
| Et25      | 0     | 999   | s     | Delay on starting before enabling the PID control               |
| Et27      | 0     | 999   | s     | LOP function activation delay (low evaporating pressure)        |
| Et28      | 0     | 999   | s     | MOP function activation delay (high evaporating pressure)       |
| Et29      | 0     | 999   | 10 s  | High superheating function activation delay                     |
| Et30      | 0     | 999   | 10 s  | Low superheating function activation delay                      |
| Et31      | 0.0   | 25.5  | °C    | Chiller - PID, proportional coefficient                         |
| Et32      | 0     | 999   | s     | Chiller - PID, integral time                                    |
| Et33      | 0     | 999   | -     | Chiller - PID, derivative time                                  |
| Et34      | 0.0   | 110.0 | °C    | Chiller - Superheating setpoint                                 |
| Et35      | 0.0   | 25.5  | °C    | Chiller - Neutral control zone                                  |
| Et36      | 5.0   | 110.0 | °C    | Chiller - High superheating protection threshold                |
| Et37      | 0.0   | 5.0   | °C    | Chiller - Low superheating protection threshold                 |
| Et39      | -50.0 | 110.0 | °C    | Chiller - MOP protection threshold                              |
| Et41      | -50.0 | 110.0 | °C    | Chiller - LOP protection threshold                              |
| Et48      | 0.0   | 25.5  | °C    | Heat pump - PID, proportional coefficient                       |
| Et49      | 0     | 999   | s     | Heat pump - PID, integral coefficient                           |
| Et50      | 0     | 999   | -     | Heat pump - PID, derivative coefficient                         |
| Et51      | 0.0   | 110.0 | °C    | Heat pump - Superheating setpoint                               |
| Et53      | 5.0   | 110.0 | °C    | Heat pump - High superheating protection threshold              |
| Et54      | 0.0   | 5.0   | °C    | Heat pump - Low superheating protection threshold               |
| Et56      | -50.0 | 110.0 | °C    | Heat pump - MOP protection threshold                            |
| Et58      | -50.0 | 110.0 | °C    | Heat pump - LOP protection threshold                            |
| Et61      | 1     | 999   | s     | Heat pump - Filter on the evaporating pressure                  |
| Et62      | 1     | 999   | s     | Heat pump - Valve position update filter                        |
| Et65      | 0.1   | 25.5  | °C    | Defrost - PID, proportional coefficient                         |
| Et66      | 0     | 999   | s     | Defrost - PID, integral coefficient                             |
| Et67      | 0.1   | 25.5  | °C    | Defrost - Superheating setpoint                                 |
| Et68      | -50.0 | 110.0 | °C    | Defrost - MOP protection threshold                              |
| Et69      | -50.0 | 110.0 | °C    | Defrost - LOP protection threshold                              |
| Et70      | 0     | 999   | s     | Defrost - PID control delay after start of defrost              |
| Et71      | 0     | 999   | -     | Defrost - Minimum valve opening percentage during defrost       |
| Et73      | 0     | 999   | -     | Valve pre-positioning during capacity change of compressors     |
| Et76      | 0     | 999   | s     | Low superheating alarm delay                                    |

### 2.31.1 Superheating management

The main parameter controlled by the electronic expansion valve is the superheating value of the gas at the outlet of the evaporator.

The PID control algorithm allows the superheating value, at the various operating conditions, to be kept close to the value of the set setpoint.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                               |
|-----------|-------|----|-------------------------------------------|
| Et31      | 10.0  | °C | Chiller - PID, proportional coefficient   |
| Et32      | 100   | s  | Chiller - PID, integral time              |
| Et33      | 1     | -  | Chiller - PID, derivative time            |
| Et34      | 5.0   | °C | Chiller - Superheating setpoint           |
| Et48      | 10.0  | °C | Heat pump - PID, proportional coefficient |
| Et49      | 100   | s  | Heat pump - PID, integral coefficient     |
| Et50      | 1     | -  | Heat pump - PID, derivative coefficient   |
| Et51      | 5.0   | °C | Heat pump - Superheating setpoint         |
| Et65      | 10.0  | °C | Defrost - PID, proportional coefficient   |
| Et66      | 100   | s  | Defrost - PID, integral coefficient       |
| Et67      | 5.0   | °C | Defrost - Superheating setpoint           |



The values set in the controller are the result of tests and the manufacturer's experience.  
Any change to these values must be approved by the manufacturer.



It might take a few minutes to reach the optimal set point.

### 2.31.2 Control in high superheating conditions

Prolonged continuation of the condition in which the superheating value exceeds the threshold set by the manufacturer will cause damage to the compressors.

When this condition occurs, the controller changes the opening of the expansion valve.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                        |
|-----------|-------|------|----------------------------------------------------|
| Et29      | 2     | 10 s | High superheating function activation delay        |
| Et36      | 15.0  | °C   | Chiller - High superheating protection threshold   |
| Et53      | 15.0  | °C   | Heat pump - High superheating protection threshold |



The values set in the controller are the result of tests and the manufacturer's experience.  
Any change to these values must be approved by the manufacturer.

The high superheating condition ends when the superheating value falls by 1°C below the protection threshold.

### 2.31.3 Control in low superheating conditions

Prolonged continuation of the condition in which the superheating value is lower than the threshold set by the manufacturer will cause damage to the compressors.

When this condition occurs, the controller changes the opening of the expansion valve.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                       |
|-----------|-------|------|---------------------------------------------------|
| Et30      | 30    | 10 s | Low superheating function activation delay        |
| Et37      | 2.0   | °C   | Chiller - Low superheating protection threshold   |
| Et54      | 2.0   | °C   | Heat pump - Low superheating protection threshold |
| Et76      | 60    | s    | Low superheating alarm delay                      |



The values set in the controller are the result of tests and the manufacturer's experience.

Any change to these values must be approved by the manufacturer.

The low superheating condition ends when the superheating value exceeds the protection threshold by 1°C.

In the event of an alarm, the reset is automatic for the number of occurrences in one hour set in parameter PAL4.

In the event of automatic reset, the minimum stop time is always complied with.



In the event of a low superheating alarm, make sure the valve is working correctly using the manual controls.

If the alarm persists, contact the manufacturer.



Control of the MOP ends if the low superheating condition occurs.

### 2.31.4 Control in MOP conditions

Prolonged continuation of the condition in which the suction pressure value exceeds the MOP (Maximum Operating Pressure) threshold set by the manufacturer will cause damage to the compressors.

When this condition occurs, the controller stops the PID superheating control and, with suitable algorithm, closes the expansion valve.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                               |
|-----------|-------|----|-----------------------------------------------------------|
| Et28      | 10    | s  | MOP function activation delay (high evaporating pressure) |
| Et39      | 15.0  | °C | Chiller - MOP protection threshold                        |
| Et56      | 15.0  | °C | Heat pump - MOP protection threshold                      |
| Et68      | 50.0  | °C | Defrost - MOP protection threshold                        |



The values set in the controller are the result of tests and the manufacturer's experience.

Any change to these values must be approved by the manufacturer.

The MOP condition ends when the suction pressure value falls by 1°C below the protection threshold value.

### 2.31.5 Control in LOP conditions

The LOP (Low Operating Pressure) threshold set by the manufacturer is the suction pressure value below which the low pressure alarm intervenes with stopping of the refrigerant circuit.

When this condition occurs, the controller stops the PID superheating control and, with suitable algorithm, opens the expansion valve.

The relevant parameters are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                              |
|-----------|-------|----|----------------------------------------------------------|
| Et27      | 1     | s  | LOP function activation delay (low evaporating pressure) |
| Et41      | -30.0 | °C | Chiller - LOP protection threshold                       |
| Et58      | -30.0 | °C | Heat pump - LOP protection threshold                     |
| Et69      | -25.0 | °C | Defrost - LOP protection threshold                       |



The values set in the controller are the result of tests and the manufacturer's experience.  
Any change to these values must be approved by the manufacturer.

The LOP condition ends when the suction pressure value exceeds the protection threshold by 0,1°C.

# 3 ALARMS

## 3.1 Introduction

The active alarms generated by the application software can activate a relay, if suitably configured.

The relay is switched on if:

- there is an active alarm;
- there is an alarm that has not been reset;

**The display is supplied with a buzzer.**

The buzzer will be switched on if:

- at least one alarm is active;

The relay will be switched off if:

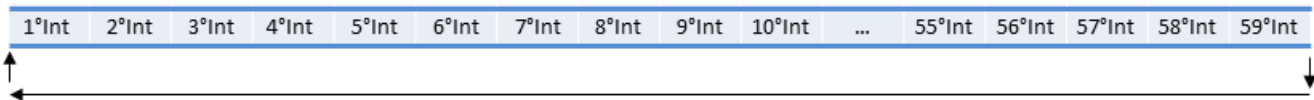
- there are no active alarms.

The buzzer will be switched off if:

- any button is pressed during an active alarm.

### 3.1.1 Automatic/Manual procedure and alarm reset

The holding of the alarms takes place considering a time window of 1 hour. The hour is divided into 60 intervals of 1 minute each.

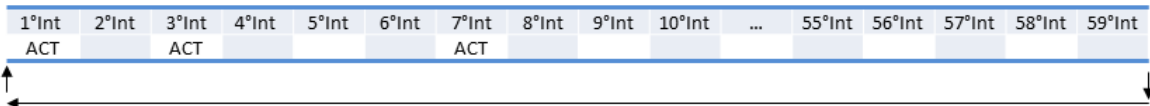


The window is sliding as regards the alarm event and always covers the last hour. During the interval of one minute, if an occurrence is detected, this time interval is considered active.

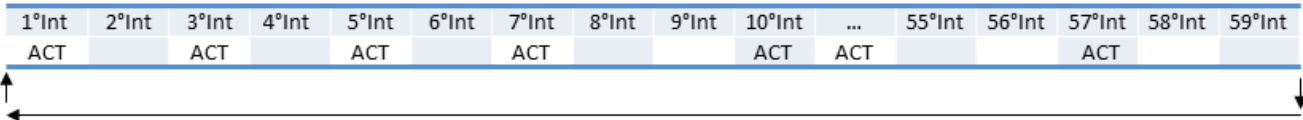
"ACT" is assigned to the active interval to record the event. The sum of the active intervals in the last hour allows the number of events/alarms per hour to be calculated.

If the sum of the active intervals does not exceed the respective threshold value of occurrences/hour, they are deleted.

Two examples are given below with threshold of occurrences/hour = 5



In the first example, since the number of active intervals is 3, which is lower than the threshold of occurrences/hour set to 5, the events are deleted.



In the second example, the number of active intervals is 7, and therefore exceeds the threshold of occurrences/hour set to 5. In this case, the alarm becomes a manual reset alarm and therefore the work of technical personnel will be necessary.

Even if the alarm is no longer active, only a manual reset will cause the deletion of the alarm from the display and from the list of active alarms.

Alarms that merely notify, that is, no output is energized/de-energized are also managed in the application. These are called WARNINGS.

## 3.2 Unit alarms

The unit alarms immediately cause all the compressors and relevant additional functions to be switched off.

### 3.2.1 Flow switch alarm

Management of the flow switch alarm depends on whether or not pumps are present in the unit.

If it is the controller that manages the pumps of the unit, the parameters involved are shown in the table below.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM | Description                                                 |
|-----------|--------|----|-------------------------------------------------------------|
| PA1       | 1 or 2 | -  | User-side pump management                                   |
| PAL103    | 15     | s  | User-side flow switch; alarm delay when the pump is started |
| PAL105    | 5      | s  | User-side flow switch; alarm delay at steady state          |

|                       |                                                                                                                                                             |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL3 \ AL303</b>                                                                                                                                          |
| Reason for activation | When the relevant digital input is open for a time longer than PAL103 when the unit is started or<br>for a time longer than PAL105 after PAL103 has elapsed |
| Reset mode            | Manual                                                                                                                                                      |
| Alarm icon            | Flashing                                                                                                                                                    |
| AlarmLog              | Yes                                                                                                                                                         |
| Alarm relay           | Yes                                                                                                                                                         |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                   |
| Anti-freeze heaters   | Follows the control                                                                                                                                         |
| The other devices     | Switched off                                                                                                                                                |

A graphical example is shown below of flow switch alarm management with parameter PA1 = 1 or 2.

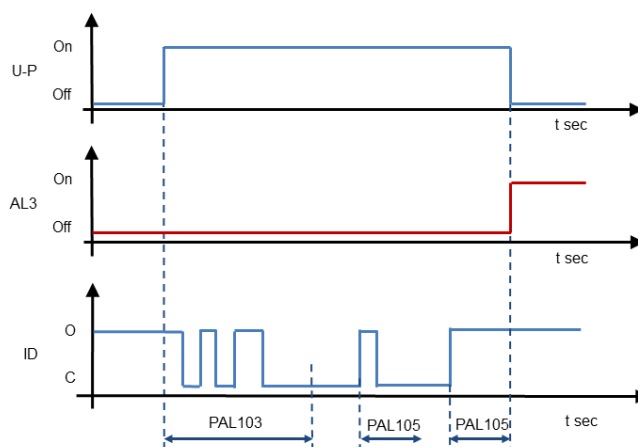


Fig. 54 Activation of flow switch alarm AL3 / AL303

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- U/P = relating to the "unit" or "pump" device
- On = state of the device
- Off = state of the device
- ID = digital input to which the flow switch is connected
- O = open
- C = closed
- t = time.

If it is not the controller that manages the pumps of the unit, the parameters involved are shown in the table below.

| Parameter | Value | UM   | Description               |
|-----------|-------|------|---------------------------|
| PA1       | 0     | -    | User-side pump management |
| PAL58     | 5     | s    | Alarm activation delay    |
| PAL59     | 2     | 10 s | Alarm over delay          |

|                       |                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL2 \ AL302</b>                                                                                               |
| Reason for activation | When the relevant digital input is open for a time longer than PAL58                                             |
| Reset mode            | Manual after closing of the digital input and after time PAL59<br>With the reset of the alarm, the unit restarts |
| Alarm icon            | Flashing                                                                                                         |
| AlarmLog              | Yes                                                                                                              |
| Alarm relay           | Yes                                                                                                              |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                        |
| Anti-freeze heaters   | Follows the control                                                                                              |
| The other devices     | Switched off                                                                                                     |

A graphical example is shown below of flow switch alarm management with parameter PA1 = 0.

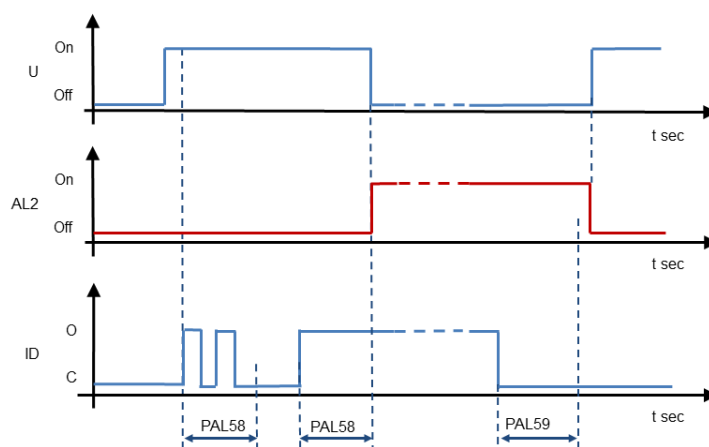


Fig. 55 Activation of flow switch alarm AL2 / AL302

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- U = relating to the status of the unit
- On = state of the device
- Off = state of the device
- ID = digital input to which the flow switch is connected
- O = open
- C = closed
- t = time.

### 3.2.2 Source-side flow switch alarm

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                         |
|-----------|-------|----|---------------------------------------------------------------------|
| PAL110    | 15    | s  | Source-side flow switch; alarm delay upon starting of the unit/pump |
| PAL112    | 15    | s  | Source-side flow switch; alarm delay at steady state                |
| PAL113    | 5     | s  | Source-side flow switch; delay on when alarm ends                   |

|                       |                                                                                                                                                                                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL4 \ AL304</b>                                                                                                                                                                |
| Reason for activation | When the relevant digital input is open for a time longer than PAL110 upon starting of the unit or the source-side pump<br>for a time longer than PAL112 after PAL110 has elapsed |
| Reset mode            | Manual after closing of the digital input and after time PAL113<br>With the reset of the alarm, the unit restarts                                                                 |
| Alarm icon            | Flashing                                                                                                                                                                          |
| AlarmLog              | Yes                                                                                                                                                                               |
| Alarm relay           | Yes                                                                                                                                                                               |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                                         |
| Anti-freeze heaters   | Follows the control                                                                                                                                                               |
| The other devices     | Switched off                                                                                                                                                                      |

A graphical example is shown below of source-side flow switch alarm management.

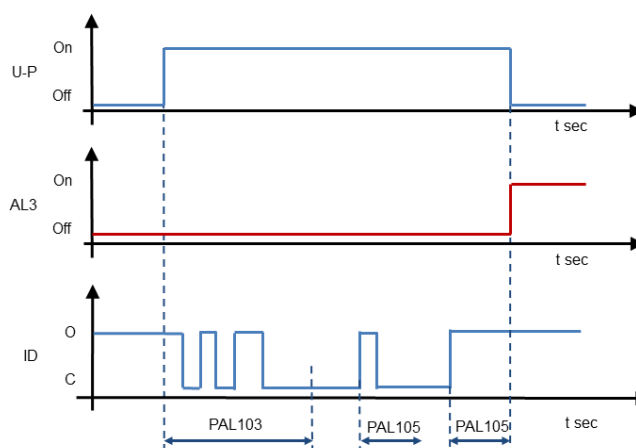


Fig. 56 Activation of flow switch alarm AL4 / AL304

In addition to the parameters present in the table, the other abbreviations in the graph indicate:

- U/P = relating to the "unit" or "pump" device
- On = state of the device
- Off = state of the device
- ID = digital input to which the flow switch is connected
- O = open
- C = closed
- t = time.

### 3.2.3 Antifreeze alarms

The antifreeze alarms depend on the number of exchangers present in the unit.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                                      |
|-----------|-------|----|----------------------------------------------------------------------------------|
| PAL36     | 3.0   | °C | User-side water antifreeze - alarm threshold                                     |
| PAL37     | 4.0   | °C | User-side water antifreeze - alarm differential                                  |
| PAL47     | 5 o 6 | -  | User-side water antifreeze - Selection of probe on which to check the antifreeze |

The values of parameter PA47 can have the following meanings:

- 5 = antifreeze check on the water leaving each exchanger and on the common section of the user;
- 6 = antifreeze check on the water leaving the user.

The alarms are activated when the temperature value of the antifreeze probe is lower than parameter PAL36.

With the value of parameter PAL47 set to 5 the antifreeze alarm is managed with the probes installed on the water leaving each exchanger and the water leaving on the common section.

| Alarm code            | AL178, AL179, AL180 and AL181 / AL378, AL379, AL380 and AL381                                                                                       |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Reason for activation | AL178 / AL378: antifreeze threshold reached by the probe placed at the outlet of the heat exchanger of circuit 1                                    |
|                       | AL179 / AL379: antifreeze threshold reached by the probe placed at the outlet of the heat exchanger of circuit 2                                    |
|                       | AL180 / AL380: antifreeze threshold reached by the probe placed at the outlet of the heat exchanger of circuit 3                                    |
|                       | AL181 / AL381: antifreeze threshold reached by the probe placed at the outlet of the heat exchanger of circuit 4                                    |
|                       | AL178, AL179, AL180 and AL181 / AL378, AL379, AL380 and AL381: antifreeze threshold reached by the probe placed at the outlet on the common section |
| Reset                 | When the temperature measured by the antifreeze probe is higher than the value set in parameter PAL36 plus PA37                                     |
| Reset mode            | Manual                                                                                                                                              |
| Alarm icon            | Flashing                                                                                                                                            |
| AlarmLog              | Yes                                                                                                                                                 |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                           |
| Anti-freeze heaters   | They follow the control                                                                                                                             |
| Unit pump             | Follows the control or switched off                                                                                                                 |
| The other devices     | They follow the control                                                                                                                             |
| Compressors           | AL178 / AL378, those of heat exchanger 1 switched off                                                                                               |
|                       | AL179 / AL379, those of heat exchanger 2 switched off                                                                                               |
|                       | AL180 / AL380, those of heat exchanger 3 switched off                                                                                               |
|                       | AL181 / AL381, those of heat exchanger 4 switched off                                                                                               |

With the value of parameter PAL47 set to 6, the antifreeze alarm is managed with the probe installed on the water leaving the evaporator.

|                       |                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL217 \ AL417</b>                                                                                             |
| Reason for activation | The temperature measured by the antifreeze probe is lower than the value set in parameter PAL36                  |
| Reset                 | When the temperature measured by the antifreeze probe is higher than the value set in parameter PAL36 plus PAL37 |
| Reset mode            | Manual                                                                                                           |
| Alarm icon            | Flashing                                                                                                         |
| AlarmLog              | Yes                                                                                                              |
| Alarm relay           | Yes                                                                                                              |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                        |
| Anti-freeze heaters   | They follow the control                                                                                          |
| Unit pump             | Follows the control or switched off                                                                              |
| The other devices     | They follow the control                                                                                          |
| Compressors           | Switched off                                                                                                     |

#### Inlet water probe antifreeze alarm

|                       |                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL216</b>                                                                                                 |
| Reason for activation | The temperature measured by inlet water probe is lower than the value set in parameter PAL36                 |
| Reset                 | When the temperature measured by inlet water probe is higher than the value set in parameter PAL36 plus PAL3 |
| Reset mode            | Manual                                                                                                       |
| Alarm icon            | Flashing                                                                                                     |
| AlarmLog              | Yes                                                                                                          |
| Buzzer                | Yes                                                                                                          |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                    |
| Anti-freeze heaters   | They follow the control                                                                                      |
| Unit pump             | Follows the control or switched off                                                                          |
| The other devices     | They follow the control                                                                                      |
| Compressors           | Switched off                                                                                                 |

### 3.2.4 Source-side antifreeze alarms

The antifreeze alarms depend on the number of source-side heat exchangers present in the unit.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value  | UM | Description                                                                        |
|-----------|--------|----|------------------------------------------------------------------------------------|
| PAL42     | 3.0    | °C | Source-side water antifreeze - alarm threshold                                     |
| PAL43     | 4.0    | °C | Source-side water antifreeze - alarm differential                                  |
| PAL48     | 2 or 5 | -  | Source-side water antifreeze - Selection of probe on which to check the antifreeze |

The values of parameter PA48 can have the following meanings:

- 2 = antifreeze check on the outgoing water;
- 5 = antifreeze check on the water leaving each heat exchanger and on the common section;

With the value of parameter PAL48 set to 2, the antifreeze alarm is managed with the probe installed on the outgoing water.

| Alarm code            | AL215 \ AL415                                                                                                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------|
| Reason for activation | The temperature measured by the antifreeze probe is lower than the value set in parameter PAL42                 |
| Reset                 | When the temperature measured by the antifreeze probe is higher than the value set in parameter PAL42 plus PA43 |
| Reset mode            | Manual                                                                                                          |
| Alarm icon            | Flashing                                                                                                        |
| AlarmLog              | Yes                                                                                                             |
| Alarm relay           | Yes                                                                                                             |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                       |
| Anti-freeze heaters   | They follow the control                                                                                         |
| Source-side pump      | Follows the control or switched off                                                                             |
| The other devices     | They follow the control                                                                                         |
| Compressors           | Switched off                                                                                                    |

With the value of parameter PAL48 set to 5, the antifreeze alarm is managed with the probes installed on the water leaving each heat exchanger and the water leaving on the common section.

The alarms are activated when the temperature value of the antifreeze probe is lower than parameter PAL42.

| Alarm code            | AL182 and AL183 / AL382 and AL383                                                                                                                                                                                                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reason for activation | AL182 / AL382: antifreeze threshold reached by the probe placed at the outlet of the heat exchanger of circuit 1<br>AL183 / AL383: antifreeze threshold reached by the probe placed at the outlet of the heat exchanger of circuit 2<br>AL182 and AL183 / AL382 and AL383: antifreeze threshold reached by the probe placed at the outlet on the common section |
| Reset                 | When the temperature measured by the antifreeze probe is higher than the value set in parameter PAL42 plus PA43                                                                                                                                                                                                                                                 |
| Reset mode            | Manual                                                                                                                                                                                                                                                                                                                                                          |
| Alarm icon            | Flashing                                                                                                                                                                                                                                                                                                                                                        |
| AlarmLog              | Yes                                                                                                                                                                                                                                                                                                                                                             |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                                                                                                                                                                                                                       |
| Anti-freeze heaters   | They follow the control                                                                                                                                                                                                                                                                                                                                         |
| Source-side pump      | Follows the control or switched off                                                                                                                                                                                                                                                                                                                             |
| The other devices     | They follow the control                                                                                                                                                                                                                                                                                                                                         |
| Compressors           | AL182 / AL382, those of heat exchanger 1 switched off<br>AL183 / AL383, those of heat exchanger 2 switched off                                                                                                                                                                                                                                                  |

### 3.2.5 Low incoming water temperature alarm

The alarm is active only in heat pump operating mode.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                                          |
|-----------|-------|------|----------------------------------------------------------------------|
| PAL84     | 3     | -    | Maximum number of alarms in one hour                                 |
| PAL85     | 90    | 10 s | Low user-side inlet temperature alarm delay in heat pump mode        |
| PAL86     | 25.0  | °C   | Low user-side inlet temperature alarm threshold in heat pump mode    |
| PAL87     | 5.0   | °C   | Low user-side inlet temperature alarm differential in heat pump mode |

|                       |                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL14</b>                                                                                                                         |
| Reason for activation | With unit running, if the user-side exchanger inlet water temperature is lower than parameter PAL86 for the time of parameter PAL85 |
| Reset                 | When the user-side exchanger inlet water temperature is higher than parameter PAL86 plus parameter PAL87                            |
| Reset mode            | Automatic for a number of interventions in one hour equal to the value of parameter PAL84, and then manual                          |
| Alarm icon            | Flashing                                                                                                                            |
| AlarmLog              | Yes                                                                                                                                 |
| Alarm relay           | Yes                                                                                                                                 |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                           |
| Compressors           | Switched off                                                                                                                        |
| The other devices     | They follow their control                                                                                                           |

### 3.2.6 High incoming water temperature alarm

The alarm is active only in chiller operating mode.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                                                     |
|-----------|-------|------|---------------------------------------------------------------------------------|
| PAL60     | 4     | -    | Maximum number of user-side high temperature alarms in one hour in chiller mode |
| PAL61     | 30    | 10 s | User-side high temperature delay in chiller mode                                |
| PAL62     | 30.0  | °C   | User-side high temperature alarm threshold in chiller mode                      |
| PAL63     | 5.0   | °C   | User-side high temperature alarm differential in chiller mode                   |

|                       |                                                                                                      |
|-----------------------|------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL148</b>                                                                                         |
| Reason for activation | With unit running, if the user-side exchanger inlet water temperature $\geq$ PAL62 for PAL61 seconds |
| Reset                 | When the user-side exchanger inlet water temperature $\leq$ PAL62 - PAL63.                           |
| Reset mode            | Automatic, and becomes manual after the number of occurrences/ hour of PAL60                         |
| Alarm icon            | Flashing                                                                                             |
| AlarmLog              | Yes                                                                                                  |
| Alarm relay           | No                                                                                                   |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                            |
| All devices           | They follow their control                                                                            |

### 3.2.7 Wrong phase sequence alarm

The alarm is detected only for the time set in parameter CO7 when the controller is started.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter             | Value                                                                                                            | UM | Description                        |
|-----------------------|------------------------------------------------------------------------------------------------------------------|----|------------------------------------|
| CO7                   | 25                                                                                                               | s  | Load activation delay at switch-on |
| <b>Alarm code</b>     | <b>AL55</b>                                                                                                      |    |                                    |
| Reason for activation | With digital input open for time CO7 seconds when the controller is switched on.                                 |    |                                    |
| Reset                 | After correctly connecting the phase sequence, when the controller is next started with the digital input closed |    |                                    |
| Alarm icon            | Flashing                                                                                                         |    |                                    |
| AlarmLog              | Yes                                                                                                              |    |                                    |
| Alarm relay           | Yes                                                                                                              |    |                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                        |    |                                    |
| All devices           | Switched off                                                                                                     |    |                                    |

### 3.2.8 Maximum/minimum voltage alarm

|                       |                                           |
|-----------------------|-------------------------------------------|
| <b>Alarm code</b>     | <b>AL201</b>                              |
| Reason for activation | With digital input open                   |
| Reset                 | When the digital input closes             |
| Reset mode            | Automatic                                 |
| Alarm icon            | Flashing                                  |
| AlarmLog              | Yes                                       |
| Alarm relay           | Yes                                       |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b> |
| All devices           | Switched off                              |

### 3.2.9 Alarms for expansion modules not connected

If communication between the controller and the expansion module fails, the outputs of the expansion module are deactivated after 5 seconds.

|                       |                                                                      |
|-----------------------|----------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL164</b>                                                         |
| Reason for activation | Non-communication between the controller and expansion module IPX306 |
| Reset                 | If the module is disabled or resumes communication                   |
| Reset mode            | Automatic                                                            |
| Alarm icon            | Flashing                                                             |
| AlarmLog              | Yes                                                                  |
| Alarm relay           | Yes                                                                  |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                            |
| IPX306                | Outputs deactivated after 5 seconds                                  |
| The other devices     | Depends on the configuration                                         |

|                       |                                                                      |
|-----------------------|----------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL165</b>                                                         |
| Reason for activation | Non-communication between the controller and expansion module IPX315 |
| Reset                 | If the module is disabled or resumes communication                   |
| Reset mode            | Automatic                                                            |
| Alarm icon            | Flashing                                                             |
| AlarmLog              | Yes                                                                  |
| Alarm relay           | Yes                                                                  |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                            |
| IPX315                | Outputs deactivated after 5 seconds                                  |
| The other devices     | Depends on the configuration                                         |

### 3.2.10 Flowzer VFPP-VPS alarm

|                       |                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL245</b>                                                                                |
| Reason for activation | Serial communication failure<br>The alarm activates after the delay set on parameter "CO43" |
| Reset                 | Restoration of communication                                                                |
| Reset mode            | Automatic                                                                                   |
| Alarm icon            | Flashing                                                                                    |
| AlarmLog              | Yes                                                                                         |
| Alarm relay           | Yes                                                                                         |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                   |
| Pump                  | Stopping of the user-side pump                                                              |
| Unit                  | Stop due to flow switch alarm                                                               |

### 3.2.11 Energy meter alarm

|                       |                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL246</b>                                                                                |
| Reason for activation | Serial communication failure<br>The alarm activates after the delay set on parameter "CO43" |
| Reset                 | Restoration of communication                                                                |
| Reset mode            | Automatic                                                                                   |
| Alarm icon            | Flashing                                                                                    |
| AlarmLog              | Yes                                                                                         |
| Alarm relay           | Yes                                                                                         |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                   |
| Values measured       | The values get reset on the function-specific screens.                                      |
| Current limitation    | The function will not get enabled.                                                          |
| Unit                  | Normal operation continues.                                                                 |

### 3.2.12 “RTC” clock alarm

|                       |                                            |
|-----------------------|--------------------------------------------|
| <b>Alarm code</b>     | <b>AL211</b>                               |
| Reason for activation | Low level of controller battery charge     |
| Reset                 | When the controller time or date is reset. |
| Reset mode            | Automatic                                  |
| Alarm icon            | Flashing                                   |
| AlarmLog              | Yes                                        |
| Alarm relay           | Yes                                        |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>  |
| All devices           | They follow their control                  |



Replace the controller if the alarm is not cleared after setting the time.

### 3.2.13 Internal memory alarm

|                       |                                           |
|-----------------------|-------------------------------------------|
| <b>Alarm code</b>     | <b>AL1</b>                                |
| Reason for activation | Incorrect programming of the controller   |
| Reset                 | Correct programming                       |
| Reset mode            | Automatic                                 |
| Alarm icon            | Flashing                                  |
| AlarmLog              | Yes                                       |
| Alarm relay           | Yes                                       |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b> |
| All devices           | Stopping of operation                     |



Contact the manufacturer.

## 3.3 Function alarms

Alarms linked to the functions managed by the controller are described below.

### 3.3.1 Pump alarms

The alarms that regard the pumps are shown below.

#### Pump maintenance

|                       |                                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL143 / AL443 maintenance of pump 1; AL144 / AL444 maintenance of pump 2</b> |
| Reason for activation | This is detected when the work hours exceed the set limit                       |
| Reset                 | Upon deletion of the hours in the Service or Maintenance menu                   |
| Alarm icon            | Flashing                                                                        |
| AlarmLog              | Yes                                                                             |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                       |
| Pump in alarm         | Follows its control                                                             |
| The other devices     | They follow their control                                                       |

#### Thermal overload protection of pumps

|                   |                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b> | <b>AL45 / AL345 Thermal overload protection of pump 1; AL46 / AL346 Thermal overload protection of pump 2</b> |
| Reset             | With digital input closed                                                                                     |
| Reset mode        | Always manual                                                                                                 |
| Alarm icon        | Flashing                                                                                                      |
| AlarmLog          | Yes                                                                                                           |
| <b>Devices</b>    | <b>Behaviour in the event of an alarm</b>                                                                     |
| Pump              | Operation of the pump in alarm is prevented                                                                   |
| The other devices | They follow their control                                                                                     |

#### Maintenance of recovery pumps/desuperheater

|                       |                                                                         |
|-----------------------|-------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL241 maintenance of pump 1; AL242 maintenance of pump 2</b>         |
| Reason for activation | This is detected when the work hours exceed the value of parameter PA36 |
| Reset                 | Upon deletion of the hours in the Service or Maintenance menu           |
| Alarm icon            | Flashing                                                                |
| AlarmLog              | Yes                                                                     |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                               |
| Pump in alarm         | Follows its control                                                     |
| The other devices     | They follow their control                                               |

#### Thermal overload protection in recovery pumps/desuperheater

|                   |                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------|
| <b>Alarm code</b> | <b>AL243 Thermal overload protection of pump 1; AL244 Thermal overload protection of pump 2</b> |
| Reset             | With digital input closed                                                                       |
| Reset mode        | Always manual                                                                                   |
| Alarm icon        | Flashing                                                                                        |
| AlarmLog          | Yes                                                                                             |
| <b>Devices</b>    | <b>Behaviour in the event of an alarm</b>                                                       |
| Pump              | Operation of the pump in alarm is prevented                                                     |
| Recovery          | Prevented if a back-up pump is not available                                                    |
| The other devices | They follow their control                                                                       |

### Maintenance of source-side pumps

|                       |                                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL146 / AL446 maintenance of pump 1; AL147 / AL447 maintenance of pump 2</b> |
| Reason for activation | This is detected when the work hours exceed the value of parameter PA36         |
| Reset                 | Upon deletion of the hours in the Service or Maintenance menu                   |
| Alarm icon            | Flashing                                                                        |
| AlarmLog              | Yes                                                                             |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                       |
| Pump in alarm         | Follows its control                                                             |
| The other devices     | They follow their control                                                       |

### Thermal overload protection of source-side pumps

|                   |                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b> | <b>AL48 / AL348 Thermal overload protection of pump 1; AL49 / AL349 Thermal overload protection of pump 2</b> |
| Reset             | With digital input closed                                                                                     |
| Reset mode        | Always manual                                                                                                 |
| Alarm icon        | Flashing                                                                                                      |
| AlarmLog          | Yes                                                                                                           |
| <b>Devices</b>    | <b>Behaviour in the event of an alarm</b>                                                                     |
| Pump              | Operation of the pump in alarm is prevented                                                                   |
| The other devices | They follow their control                                                                                     |

### 3.3.2 Recovery alarms

The alarms that regard recovery are shown below.

|                                |                                                                        |
|--------------------------------|------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL207, AL208, AL209, AL210 circuit 1, 2, 3, 4 recovery disabled</b> |
| Reason for activation          | This is detected if the delivery pressure exceeds the set limit        |
| Reset                          | When the delivery pressure is lower than value RC7 - RC8 for time RC9  |
| Reset mode                     | Manual                                                                 |
| Alarm icon                     | Flashing                                                               |
| AlarmLog                       | Yes                                                                    |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                              |
| Circuit in alarm               | Recovery deactivated                                                   |
| The other circuits and devices | They follow their control                                              |

### 3.3.3 Pump down alarms

The alarms regarding pump down are shown below.

|                                |                                                                           |
|--------------------------------|---------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL122, AL123, AL124, AL125 pump down alarm for circuits 1, 2, 3, 4</b> |
| Reason for activation          | When the switching off of a refrigerant circuit is required               |
| Reset                          | Automatic, and becomes manual after repeated occurrences                  |
| Reset mode                     | Only the service personnel may reset the manual alarm.                    |
| Alarm icon                     | Flashing                                                                  |
| AlarmLog                       | Yes                                                                       |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                 |
| Circuit in alarm               | Deactivated                                                               |
| The other circuits and devices | They follow their control                                                 |

### 3.3.4 Refrigerant leak alarms

The refrigerant leak alarms are shown below.

If the refrigerant leak causes hazardous conditions, the electro-mechanical management procedure is illustrated in the “Instruction Manual for Installation, Use and Maintenance”.

|                                |                                                                                     |
|--------------------------------|-------------------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL156, AL157, AL158, AL159 refrigerant leak alarm of circuits 1, 2, 3, 4</b>     |
| Reason for activation          | When the digital input of the controller regarding the refrigerant detector is open |
| Reset                          | Automatic, and becomes manual after repeated occurrences                            |
| Reset mode                     | Only the service personnel may reset the manual alarm.                              |
| Alarm icon                     | Flashing                                                                            |
| AlarmLog                       | Yes                                                                                 |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                           |
| Circuit in alarm               | Depending on the setting, it is stopped or follows the control                      |
| The other circuits and devices | They follow their control                                                           |

### 3.3.5 Alarms concerning refrigerant leak detector sensor maintenance

The alarms warning about maintenance of the refrigerant leak detector are shown below.

|                       |                                                                        |
|-----------------------|------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL300 Refrigerant sensor inspection/calibration about to expire</b> |
| Reason for activation | When the inspection/calibration expiry date is approaching.            |
| Reset                 | Manual                                                                 |
| Reset mode            | Only the service personnel may reset the manual alarm.                 |
| Alarm icon            | Flashing                                                               |
| AlarmLog              | Yes                                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                              |
| The unit              | Normal operation continues.                                            |

|                       |                                                        |
|-----------------------|--------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL322 Refrigerant sensor calibration expired</b>    |
| Reason for activation | After the inspection/calibration time has expired.     |
| Reset                 | Manual                                                 |
| Reset mode            | Only the service personnel may reset the manual alarm. |
| Alarm icon            | Flashing                                               |
| AlarmLog              | Yes                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>              |
| The unit              | Normal operation continues.                            |

|                       |                                                                                           |
|-----------------------|-------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL342 Unit OFF - The refrigerant sensor inspection/calibration time has expired.</b>   |
| Reason for activation | After the inspection/calibration time (“PAL130” = “1”) has expired (“PAL128” + “PAL129”). |
| Reset                 | Manual                                                                                    |
| Reset mode            | Only the service personnel may reset the manual alarm.                                    |
| Alarm icon            | Flashing                                                                                  |
| AlarmLog              | Yes                                                                                       |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                 |
| The unit              | Unit blocked                                                                              |

### 3.3.6 Fast Restart alarms

The alarms regarding this function are shown below.

#### Alarm for power supply with UPS in 24 hours

|                       |                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL192</b>                                                                                                                                  |
| Reason for activation | With digital input open                                                                                                                       |
| Reset                 | With digital input closed                                                                                                                     |
| Reset mode            | Automatic with number of occurrences per hour smaller than or equal to PAL66<br>Manual with number of occurrences per hour greater than PAL66 |
| Alarm icon            | Flashing                                                                                                                                      |
| AlarmLog              | YES                                                                                                                                           |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                     |
| All devices           | OFF                                                                                                                                           |

#### Alarm for power supply with UPS in an hour

|                       |                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL201</b>                                                                                                                                  |
| Reason for activation | With digital input open                                                                                                                       |
| Reset                 | With digital input closed                                                                                                                     |
| Reset mode            | Automatic with number of occurrences per hour smaller than or equal to PAL33<br>Manual with number of occurrences per hour greater than PAL33 |
| Alarm icon            | Flashing                                                                                                                                      |
| AlarmLog              | YES                                                                                                                                           |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                     |
| All devices           | OFF                                                                                                                                           |

#### The limit for Fast Restart without UPS in 24 hours has been reached

|                       |                                                                          |
|-----------------------|--------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL239</b>                                                             |
| Reason for activation | The number of Fast Restarts with automatic reset has been exceeded       |
| Reset                 | After the next midnight                                                  |
| Reset mode            | Automatic                                                                |
| Alarm icon            | Flashing                                                                 |
| AlarmLog              | YES                                                                      |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                |
| All devices           | In case of blackout, the unit restarts without the Fast Restart function |

### 3.3.7 “ACS” alarms

Below is a list of the alarms regarding the “ACS” function.

#### Thermal cutout of heater supplementing heating power in “ACS” system

|                                |                                                                                                          |
|--------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL250, AL251, AL252 and AL253 Thermal cutout alarm - heaters supplementing heating power in "ACS"</b> |
| Reason for activation          | Upon opening of the digital input configured for the corresponding alarms                                |
| Reset                          | Only after closing of the digital input                                                                  |
| Reset mode                     | Manual                                                                                                   |
| Alarm icon                     | Flashing                                                                                                 |
| AlarmLog                       | Yes                                                                                                      |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                                                |
| Output in alarm                | Output regulated if "ACS39" = 0; no regulation if "ACS39" = 1                                            |
| The other circuits and devices | They follow their control                                                                                |

#### Exit from “ACS” due to max. time

|                       |                                                                                                                       |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL254 Warning: exiting "ACS" due to max. time</b>                                                                  |
| Reason for activation | It is detected when the “ACS” function does not achieve the corresponding setpoint within the time stored in “ACS28”. |
| Reset                 | If the demand persists, after the time set in “ACS10” has elapsed                                                     |
| Reset mode            | Automatic                                                                                                             |
| Alarm icon            | No                                                                                                                    |
| AlarmLog              | No                                                                                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                             |
| “ACS” function        | Stopped                                                                                                               |
| System demands        | They follow their control                                                                                             |

#### Exiting anti legionella cycle due to max. time

|                       |                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL255 Warning: exiting Anti legionella cycle due to max. time</b>                  |
| Reason for activation | If the anti legionella cycle does not finish within the time set in parameter "ACS22" |
| Reset                 | Automatic                                                                             |
| Reset mode            | Automatic                                                                             |
| Alarm icon            | No                                                                                    |
| AlarmLog              | Yes                                                                                   |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                             |
| Unit functions        | After regulations                                                                     |

### Forced exit from “ACS” function

|                           |                                                                                                               |
|---------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>         | <b>AL257 Warning: forced exit from “ACS”</b>                                                                  |
| Reason for activation     | As soon as “ACS7” value relating to output water temperature from unit is achieved                            |
| Reset                     | Drop of the output water temperature in the unit by the value set in “ACS8” as opposed to the “ACS7” setpoint |
| Reset mode                | Automatic until the number of times set in “ACS29” is achieved, and then manual                               |
| Alarm icon                | No                                                                                                            |
| AlarmLog                  | Yes                                                                                                           |
| <b>Devices</b>            | <b>Behaviour in the event of an alarm</b>                                                                     |
| “ACS” function            | Deactivated                                                                                                   |
| Air conditioning function | After temperature regulation                                                                                  |

### Failure to perform anti legionella cycle

|                           |                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>         | <b>AL258 Warning: failure to perform anti legionella cycle</b>                                              |
| Reason for activation     | The production of hot sanitary water has not achieved the setpoint within the time set in parameter “ACS7”. |
| Reset                     | Automatic                                                                                                   |
| Reset mode                | Automatic                                                                                                   |
| Alarm icon                | No                                                                                                          |
| AlarmLog                  | Yes                                                                                                         |
| <b>Devices</b>            | <b>Behaviour in the event of an alarm</b>                                                                   |
| Air conditioning function | After temperature regulation                                                                                |

### “ACS” reference probe malfunctioning or not connected

|                           |                                                                    |
|---------------------------|--------------------------------------------------------------------|
| <b>Alarm code</b>         | <b>AL109 - “ACS” reference probe alarm</b>                         |
| Reason for activation     | The “ACS” reference probe is malfunctioning or it is not connected |
| Reset                     | As soon as correct probe operation is resumed                      |
| Reset mode                | Automatic                                                          |
| Alarm icon                | Flashing                                                           |
| AlarmLog                  | Yes                                                                |
| <b>Devices</b>            | <b>Behaviour in the event of an alarm</b>                          |
| “ACS” function            | Deactivated                                                        |
| Air conditioning function | After temperature regulation                                       |

### 3.3.8 Alarms relating to 2-zone function (GIT option)

Below is a list of the alarms linked to the function that is used to control up to 2 zones of the system (GIT option).

#### Probe error in secondary circuit

|                                |                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL333 Error: probe in secondary circuit 1 AL334 Error: probe in secondary circuit 2</b> |
| Reason for activation          | The probe in the zone is malfunctioning or it is not connected.                            |
| Reset                          | As soon as correct probe operation is resumed                                              |
| Reset mode                     | Automatic                                                                                  |
| Alarm icon                     | Flashing                                                                                   |
| AlarmLog                       | Yes                                                                                        |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                                  |
| Alarmed zone                   | The pump stops and the 3-way valve is overridden to standby position.                      |
| The other circuits and devices | They follow their control                                                                  |

#### Secondary circuit alarm

|                                |                                                                            |
|--------------------------------|----------------------------------------------------------------------------|
| <b>Alarm code</b>              | <b>AL340 Secondary circuit 1 alarmed AL341 Secondary circuit 2 alarmed</b> |
| Reason for activation          | With opening of the relevant digital input                                 |
| Reset                          | With digital input closed                                                  |
| Reset mode                     | Automatic                                                                  |
| Alarm icon                     | Flashing                                                                   |
| AlarmLog                       | Yes                                                                        |
| <b>Devices</b>                 | <b>Behaviour in the event of an alarm</b>                                  |
| Alarmed zone                   | The pump stops and the 3-way valve is overridden to standby position.      |
| The other circuits and devices | They follow their control                                                  |

### 3.3.9 Tank thermoregulation alarms (TSS option)

The function "Thermoregulation from tank-mounted probe (TSS option)" is connected with a probe alarm.

#### Tank probe error

|                       |                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL339 Tank probe error</b>                                                                                                       |
| Reason for activation | The probe in the zone is malfunctioning or it is not connected.                                                                     |
| Reset                 | As soon as correct probe operation is resumed                                                                                       |
| Reset mode            | Automatic                                                                                                                           |
| Alarm icon            | Flashing                                                                                                                            |
| AlarmLog              | Yes                                                                                                                                 |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                           |
| Function management   | The function is disabled: the controller carries on thermoregulation with the reference probe and according to the stored setpoint. |

### 3.3.10 Auxiliary heating alarm

With reference to auxiliary heating management, a digital input is installed to manage the display of a serious alarm, if any. Refer to the wiring diagram for the relevant digital input.

|                       |                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL326 Auxiliary heating alarm</b>                                                                |
| Reason for activation | Opening of relevant digital input                                                                   |
| Reset                 | Automatic upon closing of relevant digital input                                                    |
| Reset mode            | Automatic                                                                                           |
| Alarm icon            | Flashing                                                                                            |
| AlarmLog              | Yes                                                                                                 |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                           |
| Function management   | The function is disabled. If the unit is in heat pump mode, heating continues with the compressors. |

## 3.4 Circuit alarms

The circuit alarms occur only on the compressors of the circuit involved.

### 3.4.1 High-pressure alarms

For each refrigerant circuit, the delivery pressure is controlled by safety pressure switches and by pressure sensors. The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                               |
|-----------|-------|-----|-----------------------------------------------------------|
| PAL11     | 39.5  | bar | High pressure alarm threshold                             |
| PAL12     | 5.0   | bar | High pressure alarm differential                          |
| PAL13     | 2     | -   | Maximum number of alarms in one hour due to high pressure |
| FA2       | 0     | -   | Ventilation operating mode                                |

#### Pressure switch high pressure alarm

|                       |                                                                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL6 for circuit 1, AL7 for circuit 2, AL8 for circuit 3 and AL9 for circuit 4</b>                                                     |
| Reason for activation | With unit running, when the digital input opens where the relevant pressure switch is connected                                          |
| Reset                 | When the relevant digital input closes                                                                                                   |
| Reset mode            | Manual                                                                                                                                   |
| Alarm icon            | Flashing                                                                                                                                 |
| AlarmLog              | Yes                                                                                                                                      |
| Alarm relay           | Yes                                                                                                                                      |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                |
| Compressors           | Only the compressors of the circuit involved are switched off                                                                            |
| Ventilation           | In chiller operating mode, if FA2=0, with activation of the alarm, ventilation is forced for 60 seconds at maximum speed before stopping |
| The other devices     | They follow their control                                                                                                                |

### Probe high pressure alarm

|                       |                                                                                                               |
|-----------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL10 for circuit 1, AL11 for circuit 2, AL12 for circuit 3 and AL13 for circuit 4</b>                      |
| Reason for activation | With unit running, if the value measured by the pressure probe is $\geq$ PAL11                                |
| Reset                 | When the value measured by the pressure probe is $\leq$ (PAL11 - PAL12)                                       |
| Reset mode            | Automatic, and becomes manual after PAL13 occurrences/hour                                                    |
| Alarm icon            | Flashing                                                                                                      |
| AlarmLog              | Yes                                                                                                           |
| Alarm relay           | Yes                                                                                                           |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                     |
| Compressors           | Only the compressors of the circuit involved are switched off                                                 |
| Ventilation           | If FA2=0, with activation of the alarm, ventilation is forced for 60 seconds at maximum speed before stopping |
| The other devices     | They follow their control                                                                                     |

### 3.4.2 High discharge gas temperature alarm

The parameter involved is shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM | Description                                                           |
|-----------|-------|----|-----------------------------------------------------------------------|
| PAL50     | 135.0 | °C | Delivery gas high temperature alarm threshold                         |
| PAL51     | 30.0  | °C | Delivery high temperature alarm differential                          |
| PAL52     | 2     | -  | Maximum number of alarms in one hour due to high delivery temperature |
| FA2       | 0     | -  | Ventilation operating mode                                            |

|                       |                                                                                                               |
|-----------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL57 for circuit 1, AL58 for circuit 2, AL59 for circuit 3 and AL60 for circuit 4</b>                      |
| Reason for activation | If the value measured by the temperature probe is $\geq$ PAL50                                                |
| Reset                 | When the value measured by the temperature probe is $\leq$ (PAL50 - PAL51)                                    |
| Reset mode            | Automatic, and becomes manual after PAL52 occurrences/hour                                                    |
| Alarm icon            | Flashing                                                                                                      |
| AlarmLog              | Yes                                                                                                           |
| Alarm relay           | Yes                                                                                                           |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                     |
| Compressors           | Only the compressors of the circuit involved are switched off                                                 |
| Ventilation           | If FA2=0, with activation of the alarm, ventilation is forced for 60 seconds at maximum speed before stopping |
| The other devices     | They follow their control                                                                                     |

### 3.4.3 Alarm for low difference between high and low pressure

Checking of the difference between high and low pressure values takes place when at least one compressor of the circuit involved is running.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                         |
|-----------|-------|-----|---------------------------------------------------------------------|
| PAL89     | 5.0   | bar | Low pressure difference alarm threshold                             |
| PAL90     | 90    | s   | Low pressure difference alarm delay on starting of compressors      |
| PAL91     | 10    | s   | Low pressure difference alarm delay at steady state                 |
| PAL92     | 2     | -   | Maximum number of alarms in one hour due to low pressure difference |

|                       |                                                                                                                                                                                                |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm code            | AL114 for circuit 1, AL115 for circuit 2, AL116 for circuit 3 and AL117 for circuit 4                                                                                                          |
| Reason for activation | When a compressor of the circuit starts, if the pressure difference is $\leq$ PAL89 for PAL90 seconds<br>After PAL90 has elapsed, if the pressure difference is $\leq$ PAL89 for PAL91 seconds |
| Reset mode            | Automatic, and becomes manual after PAL52 occurrences/hour                                                                                                                                     |
| Alarm icon            | Flashing                                                                                                                                                                                       |
| AlarmLog              | Yes                                                                                                                                                                                            |
| Alarm relay           | Yes                                                                                                                                                                                            |
| Devices               | Behaviour in the event of an alarm                                                                                                                                                             |
| Compressors           | Only the compressors of the circuit involved are switched off                                                                                                                                  |
| The other devices     | They follow their control                                                                                                                                                                      |

### 3.4.4 Probe low pressure alarm

For each refrigerant circuit, the suction pressure is controlled by a pressure sensor.

The controlled limits are different with the different operating modes.

If the value of parameter PAL5 is set to "1", pressure control is also done during defrost.

If the value of parameter PAL7 is set to "1", pressure control is also done with the unit switched off.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                                |
|-----------|-------|-----|----------------------------------------------------------------------------|
| PAL1      | 15    | s   | Low pressure alarm delay on starting of the circuit                        |
| PAL2      | 4.5   | bar | Low pressure alarm threshold in chiller operating mode                     |
| PAL3      | 1.0   | bar | Low pressure alarm differential in chiller operating mode                  |
| PAL4      | 2     | -   | Maximum number of alarms in one hour due to low pressure                   |
| PAL5      | 1     | -   | Enables the low pressure alarm during defrost                              |
| PAL6      | 10    | s   | Low pressure alarm delay during defrost                                    |
| PAL7      | 0     | -   | Enables the low pressure alarm with unit switched off                      |
| PAL8      | 2.0   | bar | Low pressure alarm threshold in heat pump operating mode / defrost mode    |
| PAL9      | 1.0   | bar | Low pressure alarm differential in heat pump operating mode / defrost mode |
| PAL10     | 5     | s   | Low pressure alarm delay at steady state (excluding defrost)               |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>            | <b>AL203 for circuit 1, AL204 for circuit 2, AL205 for circuit 3 and AL206 for circuit 4</b>                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Reason for activation</b> | If the value measured by the pressure probe is $\leq$ PAL2 in chiller operating mode<br>If the value measured by the pressure probe is $\leq$ PAL8 in heat pump operating mode and defrost mode<br>The alarm is detected PAL1 seconds after the first compressor of the circuit starts.<br>When delay PAL1 has elapsed, the alarm is detected after PAL10 during operation.<br>During defrost, after the first reversal of the refrigeration cycle, the alarm is detected after PAL6 seconds |
| <b>Reset</b>                 | In chiller operating mode, when the value measured by the pressure probe is $\geq$ (PAL2 + PAL3)<br>In heat pump operating mode, when the value measured by the pressure probe is $\geq$ (PAL8 + PAL9)                                                                                                                                                                                                                                                                                       |
| <b>Reset mode</b>            | Automatic, and becomes manual after PAL4 occurrences/hour                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Alarm icon</b>            | Flashing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>AlarmLog</b>              | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Alarm relay</b>           | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Devices</b>               | <b>Behaviour in the event of an alarm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Compressors</b>           | Only the compressors of the circuit involved are switched off                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>The other devices</b>     | They follow their control                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### 3.4.5 Forcing of capacity reduction from low pressure probe

This function is always present in units with the value of parameter UN3 on "1".

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                              |
|-----------|-------|-----|--------------------------------------------------------------------------|
| UN9       | 5.0   | bar | Low pressure capacity reduction threshold in chiller operating mode      |
| UN10      | 1.0   | bar | Low pressure capacity reduction differential in chiller operating mode   |
| UN11      | 2.5   | bar | Low pressure capacity reduction threshold in heat pump operating mode    |
| UN12      | 1.0   | bar | Low pressure capacity reduction differential in heat pump operating mode |
| UN13      | 50    | %   | Capacity reduction percentage for individual circuit                     |
| UN17      | 2     | min | Capacity reduction activation time limit                                 |
| UN18      | 2     | min | Time between two capacity reductions of the same circuit                 |

|                       |                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm code            | <b>AL193 for circuit 1, AL194 for circuit 2, AL195 for circuit 3 and AL196 for circuit 4</b>                                                                                                                                                          |
| Reason for activation | If the value measured by the pressure probe is < UN9 in chiller operating mode or UN12 in heat pump mode                                                                                                                                              |
| Reset                 | When the value measured by the pressure probe is > (UN9 + UN10) in chiller operating mode<br>When the value measured by the pressure probe is > (UN12 + UN13) in heat pump operating mode<br>In any case, when the time of parameter UN17 has elapsed |
| Reset mode            | Automatic                                                                                                                                                                                                                                             |
| Alarm icon            | Flashing                                                                                                                                                                                                                                              |
| AlarmLog              | Yes                                                                                                                                                                                                                                                   |
| Alarm relay           | No                                                                                                                                                                                                                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                                                                                                             |
| All devices           | Follow their control                                                                                                                                                                                                                                  |

### 3.4.6 Forcing of capacity reduction from high pressure probe

This function is always present in units with the value of parameter UN3 on "1".

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM  | Description                                                               |
|-----------|-------|-----|---------------------------------------------------------------------------|
| UN5       | 39.0  | bar | High pressure capacity reduction threshold in chiller operating mode      |
| UN6       | 3.0   | bar | High pressure capacity reduction differential in chiller operating mode   |
| UN7       | 39.0  | bar | High pressure capacity reduction threshold in heat pump operating mode    |
| UN8       | 5.0   | bar | High pressure capacity reduction differential in heat pump operating mode |
| UN13      | 50    | %   | Capacity reduction percentage for individual circuit                      |
| UN17      | 2     | min | Capacity reduction activation time limit                                  |
| UN18      | 2     | min | Time between two capacity reductions of the same circuit                  |

|                       |                                                                                                                                                                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm code            | <b>AL197 for circuit 1, AL198 for circuit 2, AL199 for circuit 3 and AL200 for circuit 4</b>                                                                                                                                                       |
| Reason for activation | If the value measured by the pressure probe is > UN5 in chiller operating mode or UN7 in heat pump mode                                                                                                                                            |
| Reset                 | When the value measured by the pressure probe is < (UN5 - UN6) in chiller operating mode<br>When the value measured by the pressure probe is > (UN7 + UN8) in heat pump operating mode<br>In any case, when the time of parameter UN17 has elapsed |
| Reset mode            | Automatic                                                                                                                                                                                                                                          |
| Alarm icon            | Flashing                                                                                                                                                                                                                                           |
| AlarmLog              | Yes                                                                                                                                                                                                                                                |
| Alarm relay           | No                                                                                                                                                                                                                                                 |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                                                                                                          |
| All devices           | Follow their control                                                                                                                                                                                                                               |

### 3.4.7 Low superheating alarm

The alarm refers to the refrigerant circuits and its occurrence causes the relevant compressors to stop.

The parameters involved are shown in the table.



The values of the parameters are representative. In specific cases, different values can be set.

| Parameter | Value | UM   | Description                                       |
|-----------|-------|------|---------------------------------------------------|
| Et30      | 30    | 10 s | Low superheating function activation delay        |
| Et37      | 2.0   | °C   | Chiller - Low superheating protection threshold   |
| Et54      | 2.0   | °C   | Heat pump - Low superheating protection threshold |
| Et76      | 60    | s    | Low superheating alarm delay                      |

|                       |                                                                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL170 for circuit 1, AL171 for circuit 2, AL172 for circuit 3 and AL173 for circuit 4</b>                                                 |
| Reason for activation | If the measured superheating value is lower than threshold ET37 for a time longer than the sum of the values set in parameters ET30 and ET76 |
| Automatic reset       | Until the number of occurrences in one hour set in parameter PAL4 is reached                                                                 |
| Manual reset          | When the number of occurrences in one hour set in parameter PAL4 is exceeded                                                                 |
| Alarm icon            | Flashing                                                                                                                                     |
| AlarmLog              | Yes                                                                                                                                          |
| Alarm relay           | YES                                                                                                                                          |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                    |
| Compressors           | Only those of the circuit involved are switched off                                                                                          |
| The other devices     | They follow their control                                                                                                                    |



In the event of a low superheating alarm, make sure the valve is working correctly using the manual controls.

If the alarm persists, contact the manufacturer.

### 3.4.8 Expansion module XEV20D not connected alarm

If communication between the controller and an expansion module stops or there is no power to an expansion module, the valve is closed after 5 seconds.

|                       |                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL160 for circuit 1, AL161 for circuit 2, AL162 for circuit 3 and AL163 for circuit 4</b> |
| Reason for activation | Non-communication between the controller and relevant expansion module XEV20D                |
| Reset                 | If the module is disabled or resumes communication                                           |
| Reset mode            | Automatic                                                                                    |
| Alarm icon            | Flashing                                                                                     |
| AlarmLog              | Yes                                                                                          |
| Alarm relay           | Yes                                                                                          |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                    |
| Compressors           | The compressors of the circuit involved are switched off                                     |
| The other devices     | They follow their control                                                                    |

## 3.5 Compressor alarms

The alarms of a compressor are:

- compressor overload protection
- compressor oil level
- compressor maintenance;

### 3.5.1 Compressor Overload Protection Alarm

|                          |                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>        | <b>AL18, AL19, AL20, AL21, AL22, AL23, AL24, AL25, AL26, AL27, AL28, AL29, AL30, AL31, AL32, AL33</b>               |
| Reason for activation    | The alarm is detected after the compressor is switched on<br>It is detected when the relevant digital input is open |
| Reset                    | When the digital input closes                                                                                       |
| Reset mode               | Always manual; after repeated occurrences, only the service personnel can reset the alarm                           |
| Alarm icon               | Flashing                                                                                                            |
| AlarmLog                 | Yes                                                                                                                 |
| <b>Devices</b>           | <b>Behaviour in the event of an alarm</b>                                                                           |
| Compressor in alarm      | Always switched off                                                                                                 |
| Compressors not in alarm | According to case, they follow their control or<br>all compressors of the same circuit are switched off             |
| Ventilation              | If in common with other compressors, it follows its control, otherwise it stops                                     |
| Other devices            | They follow their control                                                                                           |



The digital input activating the “compressor thermal overload protection” alarm can be used to connect the alarm contact of various devices.

To trace back the cause of the alarm, refer to the wiring diagram of the unit where the contacts of the connected devices are shown.

### 3.5.2 Compressor maintenance alarm

|                       |                                                                                                                       |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL127, AL128, AL129, AL130, AL131, AL132, AL133, AL134, AL135, AL136, AL137, AL138, AL139, AL140, AL141, AL142</b> |
| Reason for activation | This is detected when the work hours of the compressor exceed the set limit                                           |
| Reset                 | Upon deletion of the hours in the Service or Maintenance menu                                                         |
| Alarm icon            | Flashing                                                                                                              |
| AlarmLog              | YES                                                                                                                   |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                             |
| Compressor in alarm   | Follows its control                                                                                                   |
| All                   | They follow their control                                                                                             |

## 3.6 Probe error alarms

The temperatures and pressures that concern the management of the unit are measured through the analogue inputs of the controller.

The software application manages the signals detected by the analogue inputs and checks that they fall within the set operating range.

If the detected signal is outside the operating range, the controller indicates the error and acts accordingly.

The alarms generated by the controller as a result of incorrect reading of the analogue inputs are shown below.

### 3.6.1 Temperature probes

#### Discharge gas temperature probe error

|                       |                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL61 for circuit 1, AL62 for circuit 2, AL63 for circuit 3 and AL64 for circuit 4</b> |
| Reason for activation | When the value measured by the analogue input is outside the set operating range         |
| Reset                 | When the value measured by the analogue input falls within the set operating range       |
| Reset mode            | Automatic                                                                                |
| Alarm icon            | Flashing                                                                                 |
| AlarmLog              | Yes                                                                                      |
| Alarm relay           | Yes                                                                                      |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                |
| Compressors           | Only the compressors of the circuit involved are switched off                            |
| The other devices     | They follow their control                                                                |

#### Bypass temperature probe error

|                       |                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL325</b>                                                                            |
| Reason for activation | When the value measured by the analogue input is outside the set operating range        |
| Reset                 | When the value measured by the analogue input falls within the set operating range      |
| Reset mode            | Automatic                                                                               |
| Alarm icon            | Flashing                                                                                |
| AlarmLog              | Yes                                                                                     |
| Alarm relay           | Yes                                                                                     |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                               |
| Unit pump             | Operation at the set speed in manual mode                                               |
| Bypass valve          | Where fitted, operation is according to the opening percentage setpoint in manual mode. |
| The other devices     | They follow their control                                                               |

#### User inlet water temperature probe error

|                       |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL65 \ AL265</b>                                                                |
| Reason for activation | When the value measured by the analogue input is outside the set operating range   |
| Reset                 | When the value measured by the analogue input falls within the set operating range |
| Reset mode            | Automatic                                                                          |
| Alarm icon            | Flashing                                                                           |
| AlarmLog              | Yes                                                                                |
| Alarm relay           | Yes                                                                                |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                          |
| Compressors           | All the compressors of the unit switched off                                       |
| The other devices     | They follow their control                                                          |

### User outlet water temperature probe error

|                       |                                                                                                                          |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL66 / AL266 for circuit 1, AL67 / AL267 for circuit 2, AL68 / AL268 for circuit 3 and AL69 / AL269 for circuit 4</b> |
| Reason for activation | When the value measured by the analogue input is outside the set operating range                                         |
| Reset                 | When the value measured by the analogue input falls within the set operating range                                       |
| Reset mode            | Automatic                                                                                                                |
| Alarm icon            | Flashing                                                                                                                 |
| AlarmLog              | Yes                                                                                                                      |
| Alarm relay           | Yes                                                                                                                      |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                |
| Compressors           | Only the compressors of the circuit involved are switched off                                                            |
| The other devices     | They follow their control                                                                                                |

### User common outlet water temperature probe error

|                       |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL70</b>                                                                        |
| Reason for activation | When the value measured by the analogue input is outside the set operating range   |
| Reset                 | When the value measured by the analogue input falls within the set operating range |
| Reset mode            | Automatic                                                                          |
| Alarm icon            | Flashing                                                                           |
| AlarmLog              | Yes                                                                                |
| Alarm relay           | Yes                                                                                |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                          |
| All devices           | Deactivated                                                                        |

### Error in recovery system/desuperheater water temperature probes

|                       |                                                                                                          |
|-----------------------|----------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL71 water temperature in common recovery inlet; AL80 water temperature in common recovery outlet</b> |
| Reason for activation | When the value measured by the analogue input is outside the set operating range                         |
| Reset                 | When the value measured by the analogue input falls within the set operating range                       |
| Reset mode            | Automatic                                                                                                |
| Alarm icon            | Flashing                                                                                                 |
| AlarmLog              | Yes                                                                                                      |
| Alarm relay           | Yes                                                                                                      |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                |
| Recovery              | Recovery of the whole unit deactivated                                                                   |
| The other devices     | They follow their control                                                                                |

### System return water temperature probe error

|                       |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL81</b>                                                                        |
| Reason for activation | When the value measured by the analogue input is outside the set operating range   |
| Reset                 | When the value measured by the analogue input falls within the set operating range |
| Reset mode            | Automatic                                                                          |
| Alarm icon            | Flashing                                                                           |
| AlarmLog              | Yes                                                                                |
| Alarm relay           | Yes                                                                                |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                          |
| Free cooling function | Deactivated                                                                        |
| The other devices     | They follow their control                                                          |

### Ambient air temperature probe error

|                       |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL83</b>                                                                        |
| Reason for activation | When the value measured by the analogue input is outside the set operating range   |
| Reset                 | When the value measured by the analogue input falls within the set operating range |
| Reset mode            | Automatic                                                                          |
| Alarm icon            | Flashing                                                                           |
| AlarmLog              | Yes                                                                                |
| Alarm relay           | Yes                                                                                |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                          |
| Free cooling function | Deactivated                                                                        |
| Dynamic set point     | Deactivated if depends on the air temperature                                      |
| The other devices     | They follow their control                                                          |

### Suction temperature probe error

|                       |                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL102 for circuit 1, AL103 for circuit 2, AL104 for circuit 3 and AL105 for circuit 4</b> |
| Reason for activation | When the value measured by the analogue input is outside the set operating range             |
| Reset                 | When the value measured by the analogue input falls within the set operating range           |
| Reset mode            | Automatic                                                                                    |
| Alarm icon            | Flashing                                                                                     |
| AlarmLog              | Yes                                                                                          |
| Alarm relay           | Yes                                                                                          |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                    |
| Compressors           | Only the compressors of the circuit involved are switched off                                |
| The other devices     | They follow their control                                                                    |

### Multilogic system inlet and outlet water temperature probe error

|                       |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL149 System inlet temperature; AL150 System outlet temperature</b>             |
| Reason for activation | When the value measured by the analogue input is outside the set operating range   |
| Reset                 | When the value measured by the analogue input falls within the set operating range |
| Reset mode            | Automatic                                                                          |
| Alarm icon            | Flashing                                                                           |
| AlarmLog              | Yes                                                                                |
| Alarm relay           | Yes                                                                                |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                          |
| Unit                  | All the units change from Multilogic operation to stand-alone operation            |
| The other devices     | They follow their control                                                          |

### Error in secondary circuit water temperature probes

|                       |                                                                                                                                                |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL133 Error: probe in secondary circuit 1 AL134 Error: probe in secondary circuit 2</b>                                                     |
| Reason for activation | When the value measured by the analogue input is outside the set operating range                                                               |
| Reset                 | When the value measured by the analogue input falls within the set operating range                                                             |
| Reset mode            | Automatic                                                                                                                                      |
| Alarm icon            | Flashing                                                                                                                                       |
| AlarmLog              | Yes                                                                                                                                            |
| Alarm relay           | Yes                                                                                                                                            |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                      |
| System valve and pump | Registration of the concerned 3-way valve is disabled: the valve opens at the standby position set in parameter "PID89". The pump is disabled. |
| The other devices     | They follow their control                                                                                                                      |

### 3.6.2 Pressure probes

#### High pressure probe error

|                       |                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL94 for circuit 1, AL95 for circuit 2, AL96 for circuit 3 and AL97 for circuit 4</b> |
| Reason for activation | When the value measured by the analogue input is outside the set operating range         |
| Reset                 | When the value measured by the analogue input falls within the set operating range       |
| Reset mode            | Automatic                                                                                |
| Alarm icon            | Flashing                                                                                 |
| AlarmLog              | Yes                                                                                      |
| Alarm relay           | Yes                                                                                      |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                |
| Compressors           | Only the compressors of the circuit involved are switched off                            |
| The other devices     | They follow their control                                                                |

#### Low pressure probe error

|                       |                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL98 for circuit 1, AL99 for circuit 2, AL100 for circuit 3 and AL101 for circuit 4</b> |
| Reason for activation | When the value measured by the analogue input is outside the set operating range           |
| Reset                 | When the value measured by the analogue input falls within the set operating range         |
| Reset mode            | Automatic                                                                                  |
| Alarm icon            | Flashing                                                                                   |
| AlarmLog              | Yes                                                                                        |
| Alarm relay           | Yes                                                                                        |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                  |
| Compressors           | Only the compressors of the circuit involved are switched off                              |
| The other devices     | They follow their control                                                                  |

### Pressure probe error in system delivery and return lines

|                       |                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL323 system delivery line; AL324 system return line</b>                             |
| Reason for activation | When the value measured by the analogue input is outside the set operating range        |
| Reset                 | When the value measured by the analogue input falls within the set operating range      |
| Reset mode            | Automatic                                                                               |
| Alarm icon            | Flashing                                                                                |
| AlarmLog              | Yes                                                                                     |
| Alarm relay           | Yes                                                                                     |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                               |
| Unit pump             | Operation at the set speed in manual mode                                               |
| Bypass valve          | Where fitted, operation is according to the opening percentage setpoint in manual mode. |
| The other devices     | They follow their control                                                               |

### Error in pressure sensor of heat exchanger

|                       |                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL111 heat exchanger pressure transducer</b>                                         |
| Reason for activation | When the value measured by the analogue input is outside the set operating range        |
| Reset                 | When the value measured by the analogue input falls within the set operating range      |
| Reset mode            | Automatic                                                                               |
| Alarm icon            | Flashing                                                                                |
| AlarmLog              | Yes                                                                                     |
| Alarm relay           | Yes                                                                                     |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                               |
| Unit pump             | Operation at the set speed in manual mode                                               |
| Bypass valve          | Where fitted, operation is according to the opening percentage setpoint in manual mode. |
| The other devices     | They follow their control                                                               |

### Dynamic set point signal error

|                       |                                                                                                                 |
|-----------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Alarm code</b>     | <b>AL112</b>                                                                                                    |
| Reason for activation | When the value measured by the analogue input is outside the set operating range                                |
| Reset                 | When the value measured by the analogue input falls within the set operating range                              |
| Reset mode            | Automatic                                                                                                       |
| Alarm icon            | Flashing                                                                                                        |
| AlarmLog              | Yes                                                                                                             |
| Alarm relay           | Yes                                                                                                             |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                       |
| Dynamic set point     | The set point value will correspond to the highest limit if the measured value is higher than the maximum value |
|                       | The set point value will correspond to the lowest limit if the measured value is lower than the minimum value   |
| The other devices     | They follow their control                                                                                       |

### Amperometric transformer signal error

|                                      |                                                                                    |
|--------------------------------------|------------------------------------------------------------------------------------|
| <b>Alarm code</b>                    | <b>AL113</b>                                                                       |
| Reason for activation                | When the value measured by the analogue input is outside the set operating range   |
| Reset                                | When the value measured by the analogue input falls within the set operating range |
| Reset mode                           | Automatic                                                                          |
| Alarm icon                           | Flashing                                                                           |
| AlarmLog                             | Yes                                                                                |
| Alarm relay                          | Yes                                                                                |
| <b>Devices</b>                       | <b>Behaviour in the event of an alarm</b>                                          |
| Limitation of refrigeration capacity | The limitation managed by the drawn current is deactivated                         |
| The other devices                    | They follow their control                                                          |

## 3.7 System alarms

The unit can be incorporated in a system where it is required to communicate with other controllers serially.

Where communication problems occur, alarms are managed that vary according to the system type.

### 3.7.1 Alarms in Multilogic and Multifree systems

The alarms linked to this function trigger whenever a problem is experienced with the Master setup parameters, the network communication, the status of the featured Slave units, and the additional probes connected to the Master.

#### Communication alarms

|                       |                                                                                                                                                                                                                                                        |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AL15</b>           | <b>Units not aligned</b>                                                                                                                                                                                                                               |
| Reason for activation | It is displayed in the Master unit when one or more connected Slave units are not available for operation. AL15 appears if a Slave unit is OFF from the keyboard or a digital input or if the mode of a Slave unit is set differently from the Master. |
| Reset                 | When operation of the Slave unit that generated it is restored                                                                                                                                                                                         |
| Reset mode            | Automatic                                                                                                                                                                                                                                              |
| Alarm icon            | Flashing                                                                                                                                                                                                                                               |
| AlarmLog              | Yes                                                                                                                                                                                                                                                    |
| Alarm relay           | Yes                                                                                                                                                                                                                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                                                                                                              |
| Master                | Follows the control and divides the required capacity on the connected Slave units                                                                                                                                                                     |
| Other units           | They follow their control                                                                                                                                                                                                                              |

|                       |                                                                                                                                                                                                                                                                        |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AL16</b>           | <b>Communication error between units</b>                                                                                                                                                                                                                               |
| Reason for activation | It is displayed in the Slave units when there is no communication with the Master.                                                                                                                                                                                     |
| Reset                 | When communication is restored                                                                                                                                                                                                                                         |
| Reset mode            | Automatic                                                                                                                                                                                                                                                              |
| Alarm icon            | Flashing                                                                                                                                                                                                                                                               |
| AlarmLog              | Yes                                                                                                                                                                                                                                                                    |
| Alarm relay           | Yes                                                                                                                                                                                                                                                                    |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                                                                                                                                                                                              |
| Master                | If a Slave is not communicating, the Master follows the setpoint and splits the required capacity to the connected Slave units.<br>If the Master remains isolated, it either operates autonomously or remains in standby, according to the value set in parameter MS4. |
| Other units           | The Slave units connected follow the setting of the Master.<br>Slave unit alarmed - it either operates autonomously or remains in standby, according to the value set in parameter MS47.                                                                               |

#### Probe alarms

|                       |                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------|
| <b>AL149</b>          | <b>Err Temp. input plant (Multilogic)</b>                                           |
| <b>AL150</b>          | <b>Err Temp. output plant (Multilogic)</b>                                          |
| Reason for activation | When the value measured by the analogue input is outside the set operating range.   |
| Reset                 | When the value measured by the analogue input falls within the set operating range. |
| Reset mode            | Automatic                                                                           |
| Alarm icon            | Flashing                                                                            |
| AlarmLog              | Yes                                                                                 |
| Alarm relay           | Yes                                                                                 |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                           |
| Unit                  | All the units change from Multilogic operation to stand-alone operation             |
| The other devices     | They follow their control                                                           |

## Configuration alarms

|                       |                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------|
| <b>ACF13</b>          | <b>Multilogic network configuration alarm</b>                                                           |
| Reason for activation | It is displayed in the Master when the priority level is not assigned correctly to the networked units. |
| Reset                 | When the priority level is assigned correctly to the units of the network                               |
| Reset mode            | Automatic                                                                                               |
| Alarm icon            | Flashing                                                                                                |
| AlarmLog              | Yes                                                                                                     |
| Alarm relay           | Yes                                                                                                     |
| <b>Devices</b>        | <b>Behaviour in the event of an alarm</b>                                                               |
| Unit                  | Maintains the "OFF" state that should have been set before modifying the "MS" parameters                |
| The other devices     | They follow their control                                                                               |

### 3.7.2 Alarms in systems with Smart Link+ function

Alarms connected to this function warn about communication failure between the refrigerant unit and the ventilating units, with respect to the set-up parameters.

#### Communication alarms

|                        |                                                                                    |
|------------------------|------------------------------------------------------------------------------------|
| <b>AL386 ... AL395</b> | <b>Ventilating unit AHU1 ... AHU10 offline</b>                                     |
| Reason for activation  | This alarm appears when no ventilating unit is connected to the allocated address. |
| Reset                  | Connect the ventilating unit if it is not connected.                               |
|                        | Set the correct serial address.                                                    |
|                        | Disable the unit connected to the alarmed address.                                 |
| Reset mode             | Automatic                                                                          |
| Alarm icon             | Flashing                                                                           |
| AlarmLog               | Yes                                                                                |
| Alarm relay            | Yes                                                                                |
| <b>Devices</b>         | <b>Behaviour in the event of an alarm</b>                                          |
| Unit                   | Operation continues with the other units that are correctly connected.             |

## 3.8 Configuration alarms

The controller management software ensures that the configuration of the unit is consistent with that of the I/O and, in general, with the functions present.

In the event of inconsistency, the controller reports the reason through codes.

The codes managed with the descriptions of the causes generating them are shown in the table.

| Code  | Description                                     |
|-------|-------------------------------------------------|
| ACF1  | Configuration file error                        |
| ACF2  | Free cooling parameter configuration error      |
| ACF3  | ACS parameter configuration error               |
| ACF4  | inlet outlet configuration error                |
| ACF5  | On/off, set point parameter configuration error |
| ACF6  | Circuit parameter configuration error           |
| ACF7  | Pump parameter configuration error              |
| ACF8  | Compressor parameter configuration error        |
| ACF9  | Antifreeze heater parameter configuration error |
| ACF10 | Fan parameter configuration error               |
| ACF11 | Defrost parameter configuration error           |
| ACF12 | Auxiliary relay parameter configuration error   |
| ACF13 | Multilogic parameter configuration error        |
| ACF14 | not necessary                                   |
| ACF15 | Heat recovery parameter configuration error     |

These alarms may appear if the parameters that manage the functions or updates of the controller are changed.



If this should occur, contact the customer service centre, reporting the alarm code that appears on the display.

---

## 4 FAQ

---

### 4.1 Frequently Asked Questions

The necessary instructions for working on the controller, with regard to the main functions of the unit, are given below.

### 4.2 Switching the unit on and off

---

#### 4.2.1 Switch the unit on and off from the keypad

In order to switch the unit on and off from the keypad, make sure the feature is active.

Press, for more than 2 seconds, the button with .

#### 4.2.2 Switch the unit on and off from external OK signal

In order to switch the unit on and off from external OK signal, make sure the feature is active.

To switch the unit on, close the external OK signal. To switch it off, open it.

The external OK signal should be connected to terminals "1" and "2" present in the terminal board.



The external OK signal must be a potential-free contact.

#### 4.2.3 Switch the unit on and off from the BMS

In order to switch the unit on and off from the BMS, make sure the feature is active.

See dedicated BMS management document.

### 4.3 Changes in operation

---

#### 4.3.1 Change of operating mode from cooling to heating from the keypad

In order to change the operating mode from the keypad, make sure the feature is active.

The change of operating mode takes place with the unit switched off.

If the operation takes place with the unit running, the unit will switch off automatically when the change is made.

Switch off the unit by pressing, for more than 2 seconds, the button .

With the unit switched off, press button **MENU**, and then confirm with **ENTER** and finally, press, for more than 2 seconds, the button  that will become  for operation in heating mode.

Press the button again  on the main screen to restart the unit.

#### 4.3.2 Change of operating mode from heating to cooling and vice versa from external OK signal

In order to change operating mode from the external OK signal, make sure the feature is active.

The change of operating mode from the external OK signal is present as an alternative to the change from the keypad.

If there is provision in the unit for the change of operating mode from the external OK signal, it must be open for operation in cooling mode and closed for operation in heating mode.

Terminals "1" and "8" are present in the terminal board for connection of the external OK signal.

During the status change, the unit goes into standby and then into the destination mode.



The external OK signal must be a potential-free contact.

### 4.3.3 Change of operating mode from heating to cooling and vice versa from the BMS



The change of operating mode from the BMS is equivalent to the change from the keypad, and therefore it is an alternative to the change from digital input.

In order to switch the unit on and off from the BMS, make sure the feature is active.  
See dedicated BMS management document.

## 4.4 Changing the setpoint

### 4.4.1 Change of the set point in cooling operating mode from the keypad

Press the button **MENU**, press twice on button **ENTER**. It is now possible to change the set point value, within the set limits, with buttons  and .

The value must be confirmed by pressing the button **ENTER**. Pressing twice on the button **ESC** returns to the main screen.

### 4.4.2 Change of set point in heating operating mode from the keypad

Press the "Menu" button, after the first pressing of the button **ENTER** move the cursor to the winter setpoint by pressing the button  and then confirm with the button **ENTER**. It is now possible to change the value of the set point, within the set limits, with the buttons  and .

The value must be confirmed by pressing the button **ENTER**. Pressing twice on the button **ESC** returns to the main screen.

### 4.4.3 Change of set point in heating operating mode from the BMS

In order to switch the unit on and off from the BMS, make sure the feature is active.  
See dedicated BMS management document.

### 4.4.4 Change of the second set point in cooling operating mode from the keypad

Press the button **MENU**, button **ENTER**, button  and then button **ENTER**. It is now possible to change the value of the second set point, within the set limits, with buttons  and .

The value must be confirmed by pressing the button **ENTER**. On pressing button  and pressing twice on button **ESC** returns to the main screen.

### 4.4.5 Change of the second set point in heating operating mode from the keypad

Press the button **MENU**, button **ENTER**, button  , button  and then button **ENTER**. It is now possible to change the value of the second set point, within the set limits, with buttons  and .

The value must be confirmed by pressing the button **ENTER**. On pressing button  and pressing twice on button **ESC** returns to the main screen.

### 4.4.6 Change of the set point from external OK signal

If the double set point from external OK signal is included in the unit, with OK signal open, the first set point is active, and with OK signal closed, the second set point is active.

Terminals "200" and "206" are present in the terminal board for connection of the external OK signal.



The external OK signal must be a potential-free contact.

#### 4.4.7 Time band setup procedure

A click on the “MENU” button in the main screen gives access to the “MENU” screen.

Use the “arrow down” button to select “ENERGY SAVING” and press “ENTER” to confirm and thus access the menu with the function setup screens.

The first screen is used to enable the “Energy saving” and “Auto shutdown” functions.

ES and automatic timed switch-on/off

Date/Hour 01/01/XXXX Sunday 00:00

ENERGY SAVING : ON

Auto shutdown : ON

Navigation buttons: ESC, ALARM, ENTER

The second screen is used to define the three time bands specifying the start and end time. The time can be set up in intervals of ten minutes each.

|                     | Start | End   |
|---------------------|-------|-------|
| Working time band 1 | 00:00 | 00:00 |
| Working time band 2 | 00:00 | 00:00 |
| Working time band 3 | 00:00 | 00:00 |

Navigation buttons: ESC, ALARM, ENTER

The third and the fourth screens are used to allocate each week day a time band or a combination of the three time bands contemplated for the “Energy saving” and “Auto ON/OFF” functions.

|           | Energy Saving | Auto ON/OFF |
|-----------|---------------|-------------|
| Monday    | None          | None        |
| Tuesday   | None          | None        |
| Wednesday | None          | None        |

Navigation buttons: ESC, ALARM, ENTER

|          | Energy Saving | Auto ON/OFF |
|----------|---------------|-------------|
| Thursday | None          | None        |
| Friday   | None          | None        |
| Saturday | None          | None        |
| Sunday   | None          | None        |

Navigation buttons: ESC, ALARM, ENTER

When the unit is switched to “OFF” based on the time band, the symbol of a clock appears in the main screen under the text “OFF”.

When the “Energy saving” function is active, which changes the operating setpoint of the unit, the symbol “€” appears on the right-hand side of the screen.

---

## 4.5 Managing recovery

---

### 4.5.1 Activate and deactivate recovery from the keypad

From the main screen, press button  to move around in the recovery management screen.

On pressing and holding down, for 2 seconds, button  recovery will be deactivated.

On pressing and holding down, for 2 seconds, button  recovery will be activated.

On pressing button **ESC** returns to the main screen.

### 4.5.2 Activate and deactivate recovery from external OK signal

If activation of recovery from external OK signal is included in the unit, with OK signal closed, recovery is active and with OK signal open, recovery is not active.

Terminals "1" and "8" are present in the terminal board for connection of the external OK signal.



The external OK signal must be a potential-free contact.



If activation of recovery from external OK signal is included in the unit, so that the controller can manage recovery, the external OK signal must be closed and recovery must have been activated from the keypad.

### 4.5.3 Change of the recovery set point from the keypad

From the main screen, press button  to move around in the recovery management screen.

After pressing button **ENTER** it is possible to change the recovery set point value, within the set limits, with buttons  and .

The value must be confirmed by pressing the button **ENTER**.

On pressing button **ESC** returns to the main screen.

---

## 4.6 “ACS” management

### 4.6.1 Switch the “ACS” on and off using the keypad.

To enable the “ACS” function using the controller, the operator has to go to the Home page and press button  which gives access to the screen for function management.

Once in the “ACS” function screen, press button  which will switch to  as soon as the function is enabled.

When you press button  which will switch to  The function will thus be disabled.

### 4.6.2 Switch the air conditioning system on and off using the keypad.

To enable the air conditioning system using the controller, the operator has to go to the Home page and press the button  which gives access to the screen for function management.

Once in the “ACS” function screen, press button  which will switch to  as soon as the function is enabled.

When you press button  which will switch to  The function will thus be disabled.

### 4.6.3 Switch the “ACS” on and off by means of an external OK signal.

In order to switch the “ACS” function on and off by means of an external OK signal, make sure the function is enabled.

To switch the unit on, close the external OK signal. To switch it off, open it.

The external OK signal should be connected to terminals "1" and "9" in the terminal board.



The external OK signal must be a potential-free contact.

### 4.6.4 Switch the air conditioning system on and off by means of an external OK signal.

In order to switch the air conditioning system on and off by means of an external OK signal, make sure the function is enabled.

To switch the unit on, close the external OK signal. To switch it off, open it.

The external OK signal should be connected to terminals "1" and "7" in the terminal board.



The external OK signal must be a potential-free contact.

### 4.6.5 Editing “ACS” setpoint

To edit the setpoint of the “ACS” function, the operator has to go to the Home page and press button  which gives access to the screen for function management.

When you press button **ENTER** A click on the setpoint field causes the keypad to appear. Buttons  and  are pressed to edit the parameter within the admissible value range.

The change must be confirmed with button **ENTER** .

## 4.7 Management from BMS

### 4.7.1 RS485 serial connection

The connection must be made through serial port "RS485 B" using terminals 97, 98 and 99, based on the indicated polarities.



Terminal "99", marked with "gnd", should be used only if you are certain it is not earthed.  
The serial communication works even without its connection.



Connection of the "gnd" terminal to earth will damage the controller with consequent shutting down of the unit.

### 4.7.2 RS485 serial line

Starting from the Master, the serial connection must be made by connecting one unit after another on the terminals of the relevant board in accordance with standard RS-485.



No more than two wires can be present on the same terminal.

The end of line impedance can be inserted using the jumper in the board only if the unit is the last slave of the serial line.  
The jumper is normally inserted in only one of the two connectors.

The end of line impedance is inserted by placing the jumper on both connectors.



Fig. 57 Jumper inserted in only one connector

### 4.7.3 Enable ON/OFF from the BMS



In the service branch, if you select icon  and on confirming with button **ENTER** you will access the "Parameter Programming" branch.

In the "Parameter Programming" branch, select the "SP" group and confirm with **ENTER**.

Set parameter "SP6" to "1".



With activation of "ON/OFF" from the BMS, activation from the keypad and from digital input remain active.  
To start the unit, there must be the OK signal of all of them, but to stop it, the absence of just one OK signal is sufficient.



Enabling of "ON/OFF" from the BMS prevents the change of set point from the keypad.

#### 4.7.4 Enable the change of operating mode from the BMS

In heat pump units, for the change of operating mode from cooling to heating and vice versa from the BMS, besides setting parameter "SP6" to "1", as described in the previous point, it is necessary to also set parameter "SP9" to "0".



Enabling of the change of operating mode from the BMS prevents the change of operating mode from digital input.



Enabling of the change of operating mode from the BMS prevents the change of set point from the keypad.

#### 4.7.5 Enable the change of set point from the BMS

In the service branch, if you select icon  and on confirming with button **ENTER** you will access the "Parameter Programming" branch.

In the "Parameter Programming" branch, select the "SP" group and confirm with **ENTER**.

Set parameter "SP6" to "1".

Refer to the dedicated BMS management document as regards the variables involved.



Enabling of "ON/OFF" from the BMS prevents the change of set point from the keypad.

#### 4.7.6 Enable the change of operating mode from I/O

In heat pump units, to enable the change of operating mode from cooling to heating and vice versa from digital input, in the service branch, if you select icon  and on confirming with button **ENTER** you will access the "Parameter Programming" branch.

In the "Parameter Programming" branch, select the "SP" group and confirm with **ENTER**.

Set parameter "SP9" to "1".

#### 4.7.7 Change of the settings of the "BMS" serial communication

After entering the service branch with password, using button  select icon  and confirm with button **ENTER**.

In the "Control panel" menu, using button  select "System information" and confirm with button **ENTER**.

With buttons ,  and **ENTER** it is possible to move around the screen and edit the parameters.



After making the change, wait for the controller to restart, which will take about 60 seconds.

---

## 4.8 Resetting of partial counters

### 4.8.1 Resetting the compressor hours of operation and starts

The number of hours of operation of the compressors can be reset in the loop of screens dedicated to Service or in the Maintenance screens.

For resetting in the Service branch, see the relevant "Compressors" chapter

The "Maintenance" loop screens are present in the "info" branch.

In the "info" branch, when the screens showing the number of hours of operation of the compressors are accessed, the following icon is present: .

When you press the button under icon  you will access the main screen of the maintenance loop.

The maintenance branch is password protected.

The password is "200".

With buttons ,  set the correct password and confirm with button **ENTER** to access the first of the protected screens.

In the first screen, the following symbols are present:  and .

With buttons ,  select the compressor symbol in reverse video and confirm with button **ENTER** to access the modification screens.

With buttons ,  select the compressor and, using button **RESET HOURS** reset the hours of operation.

### 4.8.2 Resetting the number of starts of the compressors

The number of starts of the compressors can be reset in the loop of screens dedicated to Service or in the Maintenance screens.

For resetting in the Service branch, see the relevant "Compressors" chapter

The "Maintenance" loop screens are present in the "info" branch.

In the "info" branch, when the screens showing the number of starts of the compressors are accessed, the following icon is present: .

When you press the button under icon  you will access the main screen of the maintenance loop.

The maintenance branch is password protected.

The password is "200".

With buttons ,  set the correct password and confirm with button **ENTER** to access the first of the protected screens.

In the first screen, the following symbols are present:  and .

With buttons ,  select the compressor symbol in reverse video and confirm with button **ENTER** to access the modification screens.

With buttons ,  select the compressor and, using button **RESET STARTS** the number of starts is reset.

### 4.8.3 Resetting of the number of hours of operation of the pumps

The number of hours of operation of the pumps can be reset in the loop of screens dedicated to Service or in the Maintenance screens.

For resetting in the Service branch, see the relevant "Pumps" chapter

The "Maintenance" loop screens are present in the "info" branch.

In the "info" branch, when the screens showing the number of hours of operation of the pumps are accessed, the following icon is present: .

When you press the button under icon  you will access the main screen of the maintenance loop.

The maintenance branch is password protected.

The password is "200".

With buttons ,  set the correct password and confirm with button **ENTER** to access the first of the protected screens.

In the first screen, the following symbols are present:  and .

With buttons ,  select the pump symbol in reverse video and confirm with button **ENTER** to access the modification screens.

With buttons ,  select the pump and, using button  reset the hours of operation.

---

## 4.9 Controller functions

---

### 4.9.1 Updating the time and date of the controller



Since these updates require a reboot of the controller, the unit must be "OFF" in order to do them.

From the main screen, press button **MENU**.

Pressing twice on the button  select "CONFIG", confirm with button **ENTER** to enter the "Configuration" screen, and confirm again with button **ENTER** to enter the "Date/Time" screen.

With buttons ,  and **ENTER** it is possible to move around the screen and edit the parameters.

After the parameters have been updated, when you press on button **SET** the changes made are confirmed and the controller is restarted.

### 4.9.2 Changing the IP addresses



Since these updates require a reboot of the controller, the unit must be "OFF" in order to do them.

To change an IP address, see the relevant chapter in the "Controller manual".



After making the change, wait for the controller to restart, which will take about 60 seconds.

### 4.9.3 Recovery of the "Service" password

The password is available on the SAP portal

---

## 4.10 Replacements

---

### 4.10.1 Replacing the electronic expansion valve driver

To replace the driver, strictly follow the instructions given below.

1. Put the unit in the off state.
2. Turn off the power to the electrical control panel.
3. Disconnect and uninstall the old driver.
4. Correctly address the new driver using the dip switches.
5. Install the new driver by connecting only the CAN-Bus connector and the power connector.



Do not connect the connector of the electronic valve.

After powering up the electrical control panel again, continue as follows.

6. Wait for the “screensaver” screen to appear on the display to be certain that the controller has fully started (during this time, the controller sends the driver the operating parameters).
7. After the controller has fully started, turn off the power to it again.
8. Complete the connection of the driver by connecting the valve connector.

Now the unit can be powered up and its operating state restored.



If necessary, this procedure can be carried out for several drivers at the same time.

---

## 4.11 WEB pages

The web server integrated in the controller is accessed through the Ethernet port. Access to these pages requires the user to know his/her IP address.

The factory-set IP address is 10.2.3.20

The set IP address is in any case displayed in one of the controller screens. The steps to access the screen with the IP address are as follows:

- go to the main screen and press the "menu" button;
- use the arrows to select "CONFIG" and press "ENTER";
- select "SYSTEM INFORMATION" and press "ENTER" to access the screen with the IP address.

### 4.11.1 Access to controller WEB pages

Access to the WEB pages is gained as follows:

- open a web browser of your PC (FireFox, IE, etc.)
- in the address bar, type in 10.2.3.20 or the modified IP address;
- login

**enter the Username, i.e. user1;**

**enter the Password, i.e. pwuser1.**

It is now possible to browse the WEB pages of the controller.

### 4.11.2 Where to find the controller "MAC address"

Go to the user interface and follow the path: Menu -> CONFIG -> System information.

Use the WEB pages to access the "Information" screen.

## 4.12 Swegon Inside

### 4.12.1 The unit can be connected to Swegon INSIDE.

All the units are supplied with an identification certificate “ID” which is required to connect them to Swegon INSIDE.  
The minimum conditions below must be checked for the connection of units manufactured before 2024 to Swegon INSIDE:

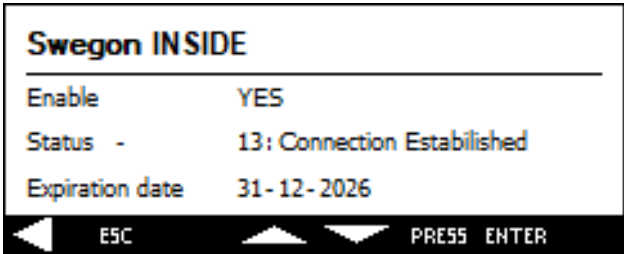
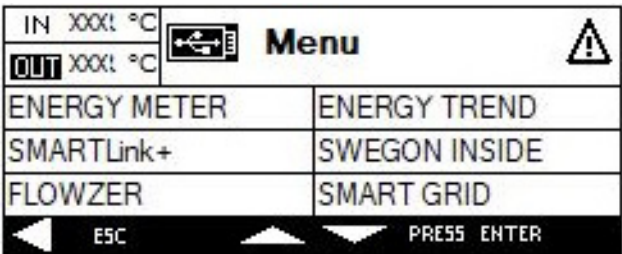
- controller iPro, code MIDX125A or MIDX126A;
- user interface, code MIDX130.
- App Version 711.138.129;
- HMI Version 7\*.\*.\*;
- Web Version 711.146.42.

If problems are experienced, please contact the Swegon after-sales service network.

### 4.12.2 How to access the Swegon INSIDE screens in the unit

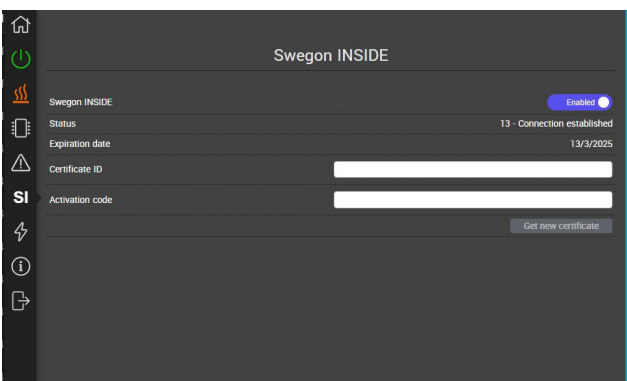
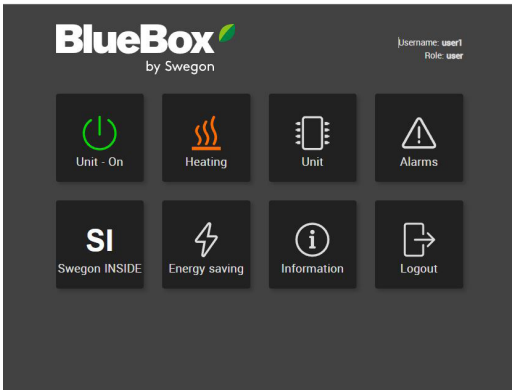
#### Access with the user interface

Access to this function is gained by selecting “Swegon INSIDE” in the Menu page.



#### Access with the Web pages

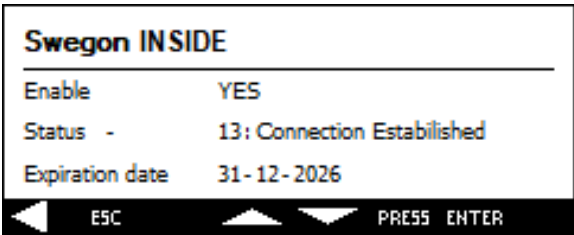
Access to this function is gained by selecting “YES” Swegon INSIDE in the main page.



### 4.12.3 How to enable/disable Swegon INSIDE

#### Access with the user interface

The Swegon INSIDE screen is used to enable/disable Swegon INSIDE.



**Access with the Web pages**

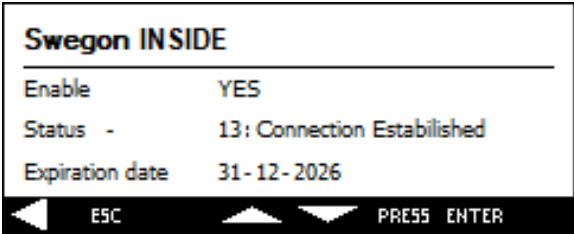
The Swegon INSIDE screen is used to enable/disable Swegon INSIDE.



**4.12.4 How to view the certificate expiry date**

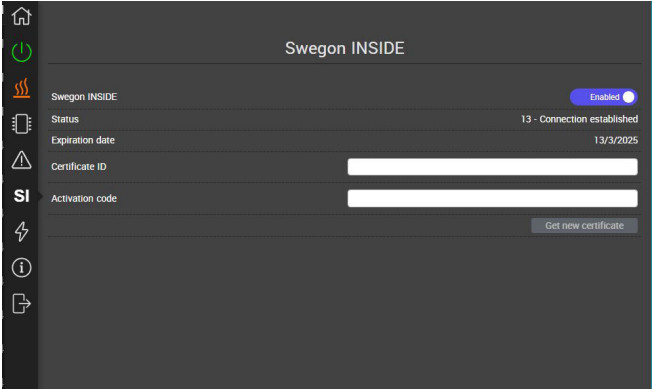
**Access with the user interface**

The expiry date of the certificate is visible in the Swegon INSIDE screen.



**Access with the Web pages**

The expiry date of the certificate is visible in the Swegon INSIDE screen.



**4.12.5 Validity of ID certificate for connection to Swegon INSIDE**

The ID certificate is valid for 2 years from the date of unit factory acceptance testing and it is renewed automatically if the connection to the Swegon INSIDE portal is made within the validity term.

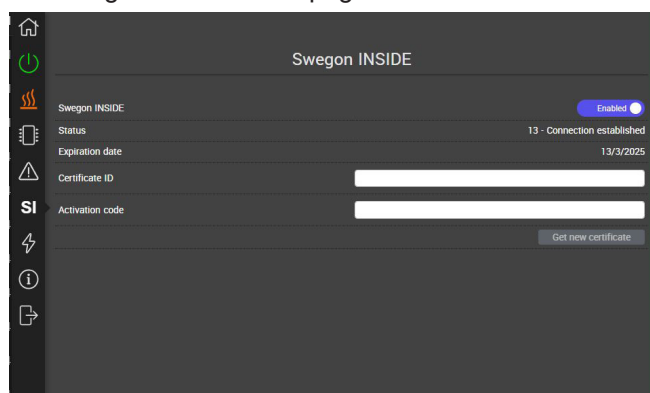
if the connection to the Swegon INSIDE portal is not made within the validity term of the ID certificate, the certificate expires.

#### 4.12.6 What to do if the ID certificate has expired or is missing

If you need a new ID certificate, you have to access the Swegon portal - ref. section “**How to access the Swegon INSIDE portal**” - and click the link to ask for a new certificate.

Fill in the form and receive an alphanumeric code.

Enter the received information in the Swegon INSIDE web page of the unit controller.

The screenshot shows the 'Swegon INSIDE' web interface. On the left is a vertical sidebar with icons for home, power, flame, a document, a warning triangle, 'SI' (Service Information), a lightning bolt, an information 'i' icon, and a share icon. The main content area has a title 'Swegon INSIDE' at the top. Below it, there's a section for 'Swegon INSIDE' with an 'Enabled' toggle switch. Underneath, the 'Status' is '13 - Connection established'. The 'Expiration date' is '13/3/2025'. There are two input fields: 'Certificate ID' and 'Activation code'. A 'Get new certificate' button is located at the bottom right of the form area.

Click “Receive new certificate”.



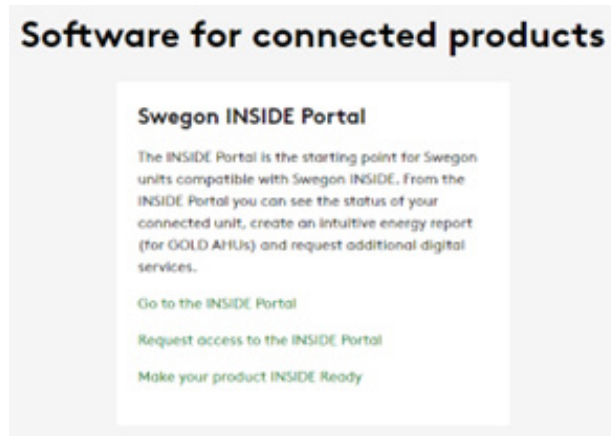
For the “Receive new certificate” field to be active, press the button on the top right-hand side to disable Swegon INSIDE.

It takes Swegon INSIDE around 30 seconds to be disabled.

#### 4.12.7 How to gain access to the Swegon INSIDE portal

Access to the portal requires that the user creates his/her own account on our website (<https://www.swegon.com/it/support-to/software/>).

Scroll the page until “Software for connected products” and find the links required to access the portal, to create your account, and to ask for a new certificate.



##### Creating an account

To create an account, click the link “Ask for access to INSIDE portal”, fill out the form with the required information, and then press “SUBMIT”.

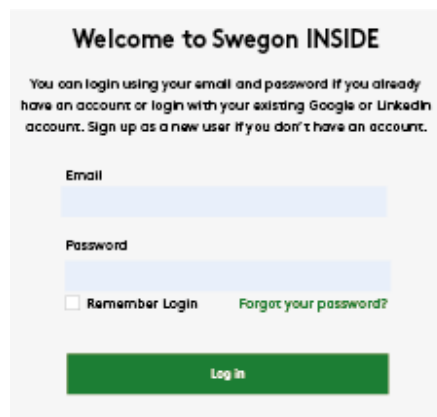
##### Generating the request for a new certificate

To ask for a new certificate, click the link “Make your INSIDE product ready”, fill out the form with the required information, and then press “SUBMIT”.



Select “Cooling & Heating” in the field “Select product”.

Create your account and register at least one unit, after which access the “log in” screen in the Swegon INSIDE portal.

A screenshot of the "Welcome to Swegon INSIDE" login screen. It includes instructions on how to login (email/password, Google, or LinkedIn) and a sign-up option for new users. There are input fields for "Email" and "Password", a "Remember Login" checkbox, a "Forgot your password?" link, and a green "Log in" button at the bottom.

### 4.12.8 Information displayed in the Swegon INSIDE portal

The “Products” menu in the Swegon INSIDE portal gives access to the associated units.

| Products                     |                          |                  |               |                  |              |           |
|------------------------------|--------------------------|------------------|---------------|------------------|--------------|-----------|
| Search (name, serial number) |                          |                  |               |                  |              |           |
| Name ↑                       | Product type             | Building         | Serial number | Software version | Active alarm | Connected |
| Epsilon Sky HI               | BlueBox Epsilon SKY      | Swegon Cantarana | 5810169537    | 41.1.3           |              |           |
| GEYSER Sky R0 (R290)         | BlueBox Chiller/Heatpump | Swegon Cantarana | 5810169904    | 701.138.120.4    |              |           |
| OPEN SPACE                   | GOLD                     | Swegon Cantarana | 2005780940    | 2.43             |              |           |
| Titan Sky Hi R0 HP           | BlueBox Chiller/Heatpump | Swegon Cantarana | 5810068684    | 701.138.120      |              |           |
| Zeta Rev                     | BlueBox Chiller/Heatpump | Swegon Cantarana | 5810009172    | 701.138.120      |              |           |

The last registered operating status and active alarms, if any, are visible for units that have an active connection.

Titan Sky Hi R0 HP

Connected

Software version: 701.138.129

Serial number: 5810068684

Information

Last update: less than 1 min ago

Device type

Air/Water Unit

Device model

6.1

User inlet

58.7 °C

User outlet

59.1 °C

Outdoor temperature

20.2 °C

Unit status

Heating

Real setpoint

60.0 °C

Alarm

No alarm

Cooling mode setpoint

7.0 °C

Heating mode setpoint

60.0 °C

Domestic hot water setpoint

-

Temperature

°C

°F

Active alarms

---

**Page intentionally blank**

---

**Page intentionally blank**

---

**Page intentionally blank**

---

**Page intentionally blank**

---

---

**Swegon Operations s.r.l.**

Via Valletta, 5 - 30010

Cantarana di Cona, (VE) Italy - T. +39 0426 921111 - F. +39 0426 302222

[www.blueboxcooling.com](http://www.blueboxcooling.com) - [info@swegon.it](mailto:info@swegon.it)

Swegon Operations s.r.l. with sole shareholder - VAT no. 02481290282

Company directed and coordinated by Investment Latour (Sweden)

