# CONTROL MANUAL

## Heat Pump Chiller

This Heat Pump Chiller uses the refrigerant R410A.

**Model No.**

| | Outdoor Unit | |
|---|---|---|
| **Class** | Standard without buffer tank | With buffer tank |
| **20** | U-020CWNB | U-020CWBS |
| **25** | U-025CWNB | U-025CWBS |
| **30** | U-030CWNB | U-030CWBS |
| **35** | U-035CWNB | U-035CWBS |
| **40** | U-040CWNB | U-040CWBS |
| **45** | U-045CWNB | U-045CWBM |
| **55** | U-055CWNB | U-055CWBM |
| **65** | U-065CWNB | U-065CWBM |
| **75** | U-075CWNB | U-075CWBM |
| **90** | U-090CWNB | U-090CWBM |
| **105** | U-105CWNB | U-105CWBM |
| **125** | U-125CWNB | U-125CWBM |
| **140** | U-140CWNB | U-140CWBL |
| **150** | U-150CWNB | U-150CWBL |
| **170** | U-170CWNB | U-170CWBL |
| **190** | U-190CWNB | U-190CWBL |
| **210** | U-210CWNB | U-210CWBL |

Read through the Installation Instructions before you proceed with the installation. In particular, you will need to read under the “ IMPORTANT ! ” section at the top of the page.

Panasonic. **CM_ECOI-W_20-210_EN_09.19**

September 2019

# Contents

# 1. Description

## 1.1. Abbreviations

| Abb. | Unit | Description |
|---|---|---|
| BP | bar | Evaporation pressure |
| BMS | - | Building Management System |
| CDT | °C | Compressor backflow temperature |
| CST | °C | Compressor aspiration temperature |
| EEV | - | Electronic pressure reducing valve |
| EWT | °C | Entering water temperature |
| HMI | - | Human-Machine interface = display |
| HP | bar | Condensation pressure |
| LWT | °C | Leaving water temperature |

| Abb. | Unit | Description |
|---|---|---|
| PME | - | Pressure switch for lack of water |
| OAT | °C | Outside air temperature |
| OCT | °C | Battery temperature |
| SPC | °C | Temperature setting in cool mode defined by the user |
| | | |
| SPH | °C | Temperature setting in heat mode defined by the user |
| | | |
| SP* | °C | Actual water temperature setting |
| WPT | - | Hydraulic pressure transducer |

## 1.2. Applicable units

| Temperature | Pressure | Voltage | Current | Power |
|---|---|---|---|---|
| °C | Gauge bar | V | A | W |

## 1.3. Application versions

This manual is intended for the software versions and electrical boards listed below.
Refer to the electrical schematics provided with the unit that incorporate subsequent developments and possible customizations.

## 1.4. 20 to 125 models

**Software version 203**

| Equipment | Main controller | Integrated HMI | Remote HMI |
|---|---|---|---|
| **Hardware** | POL423 | POL871 | POL895 |
| **Firmware** | V10.32 | V9.12 | TBD |

| Ventilation | | 20 to 55 | 65 to 75 | 90 to 125 |
|---|---|---|---|---|
| **PV/GV** | **Power** | SE4629 | SE4631 | SE4633 |
| | **Command** | SE4630 | SE4632 | SE4634 |
| **Modulating** | **Power** | SE4635 | SE4637 | SE4639 |
| | **Command** | SE4636 | SE4638 | SE4640 |

## 1.5. 140 to 210 models

**Software version 108**

| Equipment | Main controller | Extension | | Integrated MMI | Remote IHM | Communication BacNet MS/TP | Communication LON | Communication BacNet IP |
|---|---|---|---|---|---|---|---|---|
| **Hardware** | POL687 | POL96 | POL98 | POL871 | POL895 | POL904 | POL906 | POL908 |
| **Firmware** | V10.36 | V10.32 | V10.32 | V9.12 | TBD | V10.30 | V9.26 | V10.30 |

| Ventilation | | 140 to 210 |
|---|---|---|
| **PV/GV** | **Power** | SE4595C / SE4596D |
| | **Command** | SE4597C / SE4598C |
| **Modulating** | **Power** | SE4605B / SE4606B |
| | **Command** | SE4607C / SE4608C |

# 2. Purpose

## 2.1. Introduction

This document describes the functioning of the SIEMENS controller for units of the ECOi-W range. It is intended for the installation technician and the end user. More complete information is available in the following documents:

- TDM: technical description of units and performances
- IMM: installation and maintenance recommendations, commissioning procedure

## 2.2. Application

The SIEMENS controller is designed to manage units within the ECOi-W range. This range is used for the production of chilled water (chiller) and / or hot water (heat pump) using the outside air as a primary source of energy.

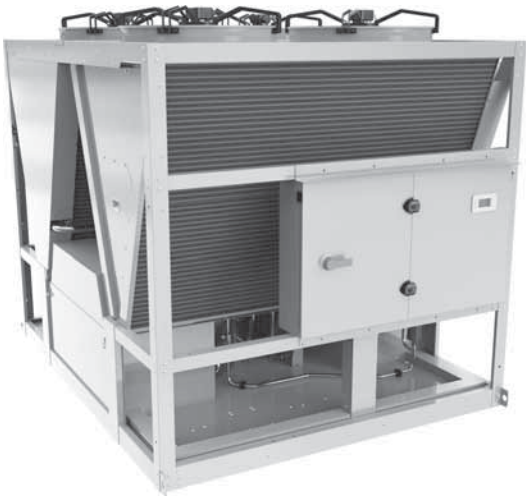
## 2.3. Operating principle

The ECOi-W range consists of:

- Single-circuit units - size 20 to 40
- Single-circuit units - size 45 to 125
- Dual-circuit units - size 140 to 210

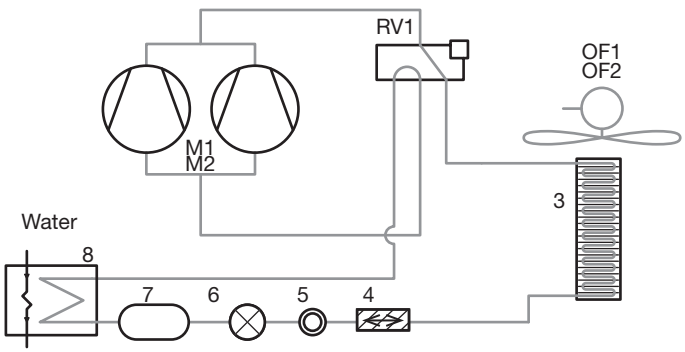
ECOi-W 20 to 40

ECOi-W 45 to 125

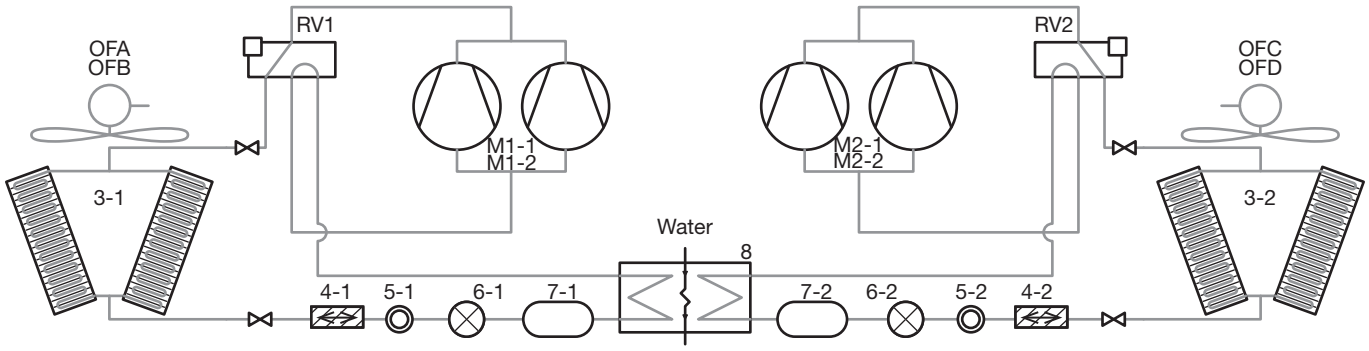


ECOi-W 140 to 210

As illustrated by the block diagrams, the single-circuit units are equipped with two single-speed compressors mounted in tandem (M1 / M2), an air / refrigerant battery (3) swept by one or two axial fans (OF1 / OF2), a thermostatic expansion valve (6) and a water / refrigerant plate heat exchanger (8). The ECOi-W heat pump type units are equipped with a 4-way valve (RV1) enabling the switchover between the hot and cold modes.



The dual-circuit units are identical to the single-circuit units with the exception of the (electronic) expansion and the plate heat exchanger (dual type - common to both circuits).




The ECOi-W range proposes optional items of equipment, adding features to the units:

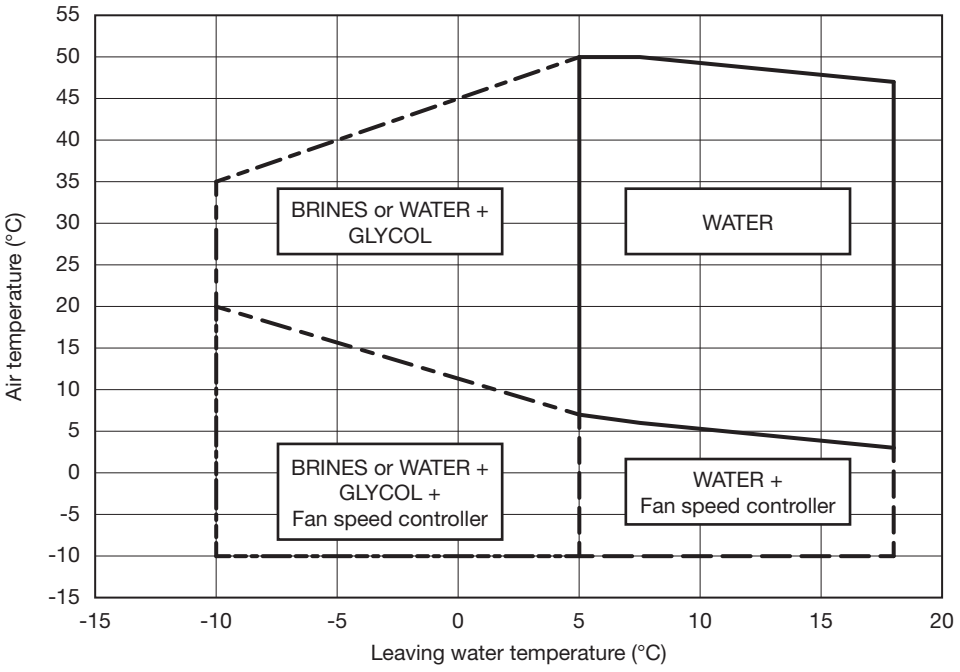
- “All Seasons” option: the axial fans are powered by one or two frequency inverters (depending on the size) to ensure the correct operation of the machine in cooling mode at low outside temperatures (Refer to the § “”All Seasons” option”, page 18)
- “High Pressure Fans” option: the axial fans are of EC type and logic control provided by the “All Seasons” option (Refer to the § “”High pressure fans” option”, page 19)
- “Hydraulic Pump” option: the units have one or several integrated pumps allowing them to ensure their water feed and distribution in the customer network.
- “Variable Primary Flow” option: a frequency inverter enables the speed of the hydraulic pump to be modulated (Refer to the § “”Variable primary flow” option”, page 20)

## 2.4. Operating envelopes

The ECOi-W machines are thermodynamic machines, designed to operate within certain ranges of air and water temperature. The control sets up the security points that guarantee units within correct limits, but also allow them to operate temporarily outside of this range in a secure manner (e.g. commissioning with a hot water loop in summer or a cold water loop in winter).

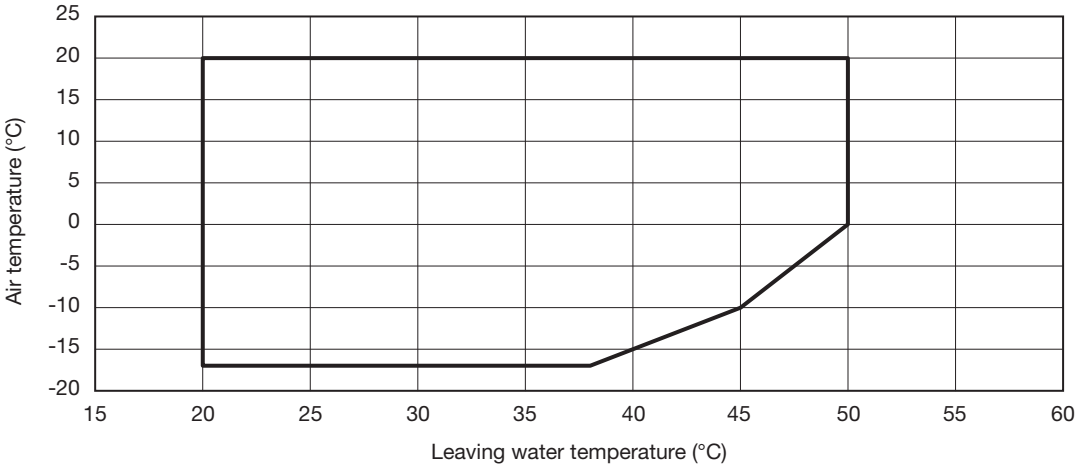
The following envelopes indicate the Leaving Water Temperature (LWT), ranges as a function of Outside Air Temperature (OAT), in both operating modes.

**Cooling mode**

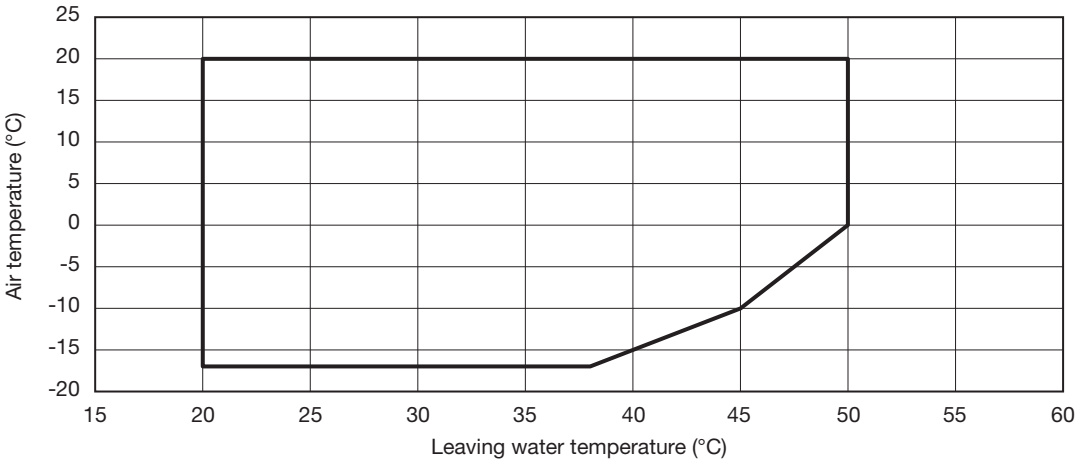


**Heating mode**

20 to 125 models.



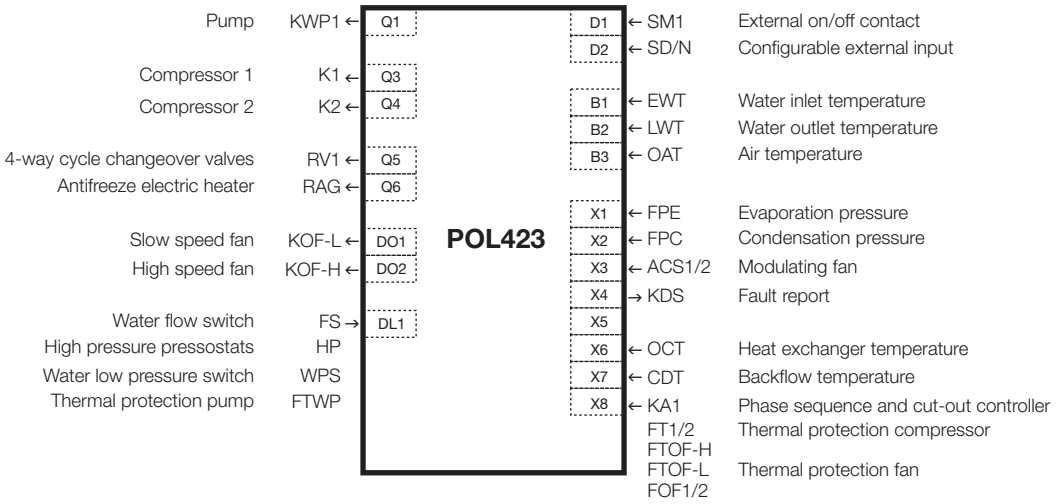

140 to 210 models*.



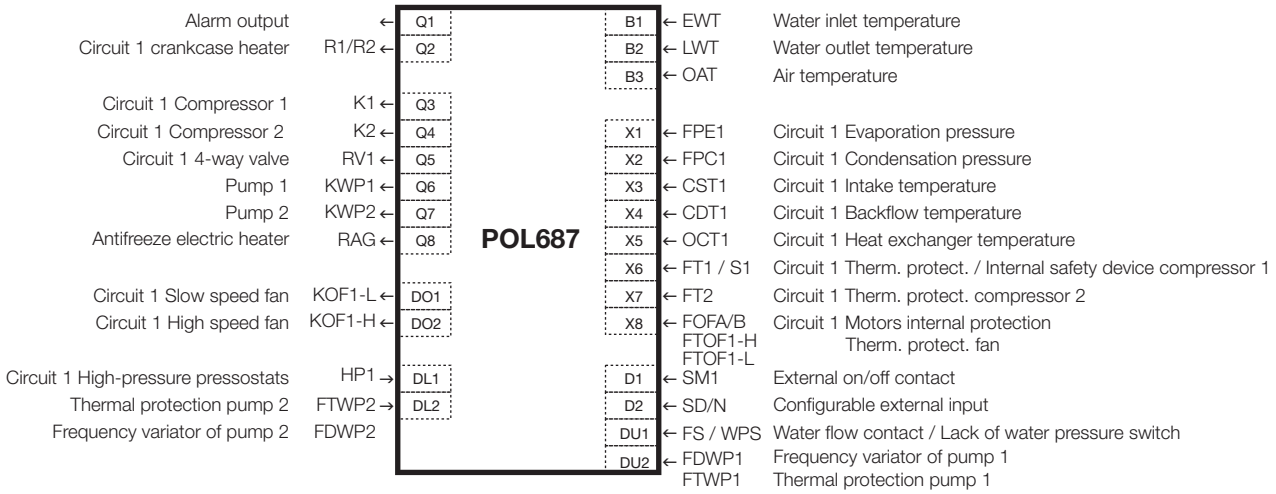

* 55°C can be achieved with periodic operation.
Please contact your local Panasonic sales or service representative for full details.

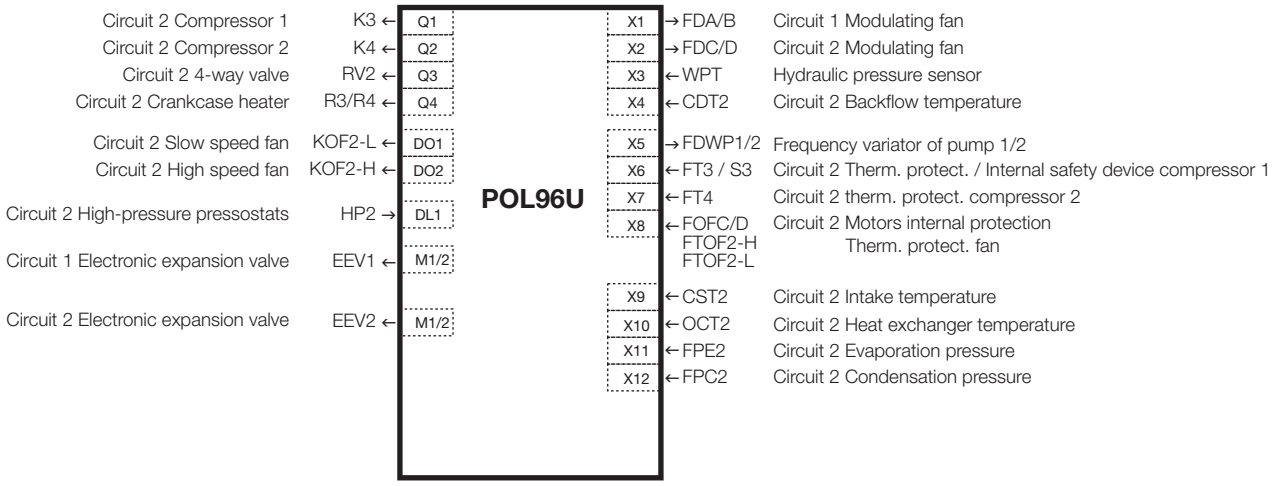
# 3. Interfaces

## 3.1. Inputs / outputs of the controller 20/25/30/35/40/45/55/65/75/90/105/125



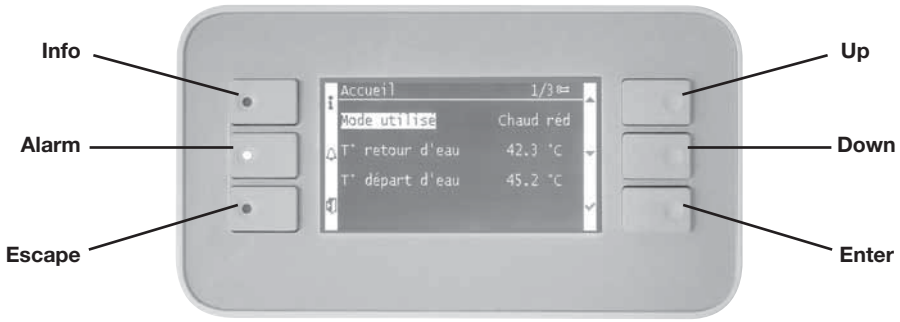

## 3.2. Inputs / outputs of the controller 140/150/170/190/210



## 3.3. Integrated display

This user interface is a liquid crystal display with 6 buttons. It is connected to the “BSP BUS” port of the controllers POL423 and POL687 with an RJ45 cable (maximum distance 2,5m).




| | |
|---|---|
| **INFO** | From any screen, this button returns the user to the main menu or home screen and, like the ESCAPE button, invalidates a current modification. |
| **ALARM** | When pressing the alarm button (the red LED flashes if an alarm is active), the alarm management menu is displayed (see § List of warning and alarms). |
| **ESCAPE** | Returns to the previous level in the menu tree. Pressing this button during modification invalidates the change being made and returns the user to the previous menu. This function is very important if a setting is inadvertently modified. |
| **UP/DOWN** | These buttons have two functions<br>1. In a menu, they are used to move up and down the list of possible options<br>2. They can change the value of a setting when it has been selected |
| **ENTER** | This button has three functions<br>3. It is used to access a submenu<br>4. Activate the modification of a setting<br>5. Validate the modification of a setting |

## 3.4. Remote display

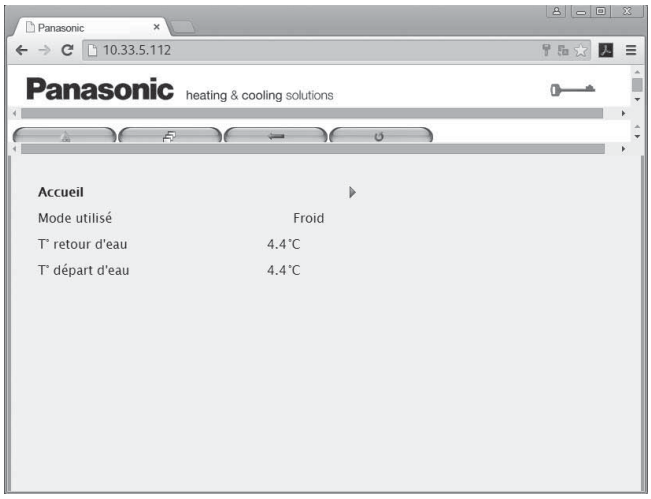
This user interface is a liquid crystal display with 3 buttons and a scroll wheel. It can be connected to the POL423 and POL687 controllers in one of 2 ways:

- to the “BSP BUS” port with an RJ45 cable: maximum distance 2,5m
- to the “PB BUS” port with 2-wire cable: maximum distance 100m. The display then accesses all of the controllers present on this bus


| | |
|---|---|
| **INFO** | From any screen, this button returns the user to the main menu or home screen and, like the ESCAPE button, invalidates a current modification. |
| **ALARM** | When pressing the alarm button (the red LED flashes if an alarm is active), the alarm management menu is displayed (see § alarms). |
| **ESCAPE** | Returns to the previous level in the menu tree. Pressing this button during modification invalidates the change being made and returns the user to the previous menu. This function is very important if a setting is inadvertently modified. |
| **OK** | The scroll wheel has five functions:<br>1. In a menu, it is used to move up and down the list of possible options.<br>2. It can change the value of a setting when it has been selected.<br>3. It is used to access a submenu<br>4. Activate the modification of a setting<br>5. Validate the modification of a setting |

## 3.5. Web display

This interface is available on dual-circuit (models 140 - 210), connected to an IP network. A Web browser enables access to a unit indicating its IP address and using the WEB account (password: SBTAdmin!).




## 3.6. Communication protocols

The available communication protocols depend on the unit controller. Some are native to the controller and others require an additional communication module.

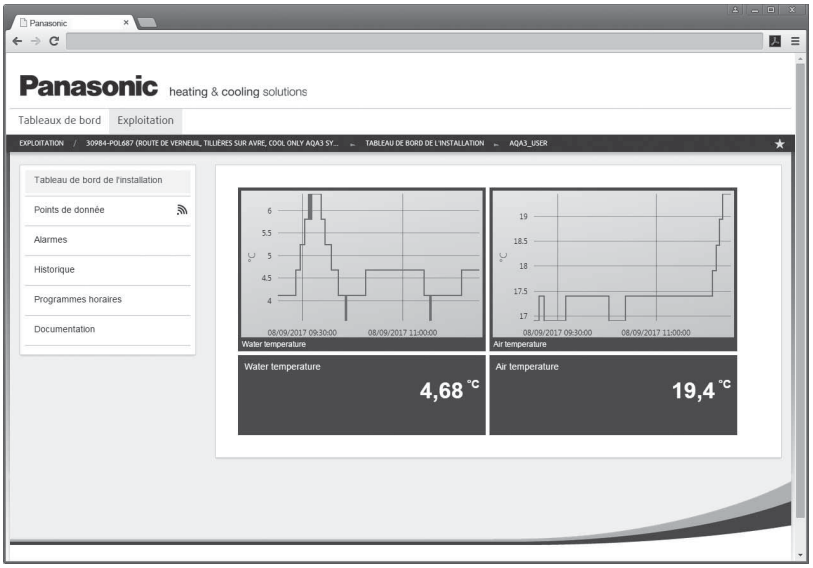
| **Protocols** | **20 to 125** | | **140 to 210** |
|---|---|---|---|
| **Standard controller** | POL423 | POL688 | POL687 |
| **RTU Modbus** | Standard (by default) | Not available | Standard (by default) |
| **TCP/IP modbus** | Not available | Standard | Standard |
| **BacNet MS/TP** | Standard | | Module POL904 |
| **BacNet IP** | Not available | Standard | Module POL908 |
| **LON** | Not available | | Module POL906 |

The connection specifications and the information made available by these protocols are discussed in the Communication Manual.
By default, the controllers are configured in RTU Modbus

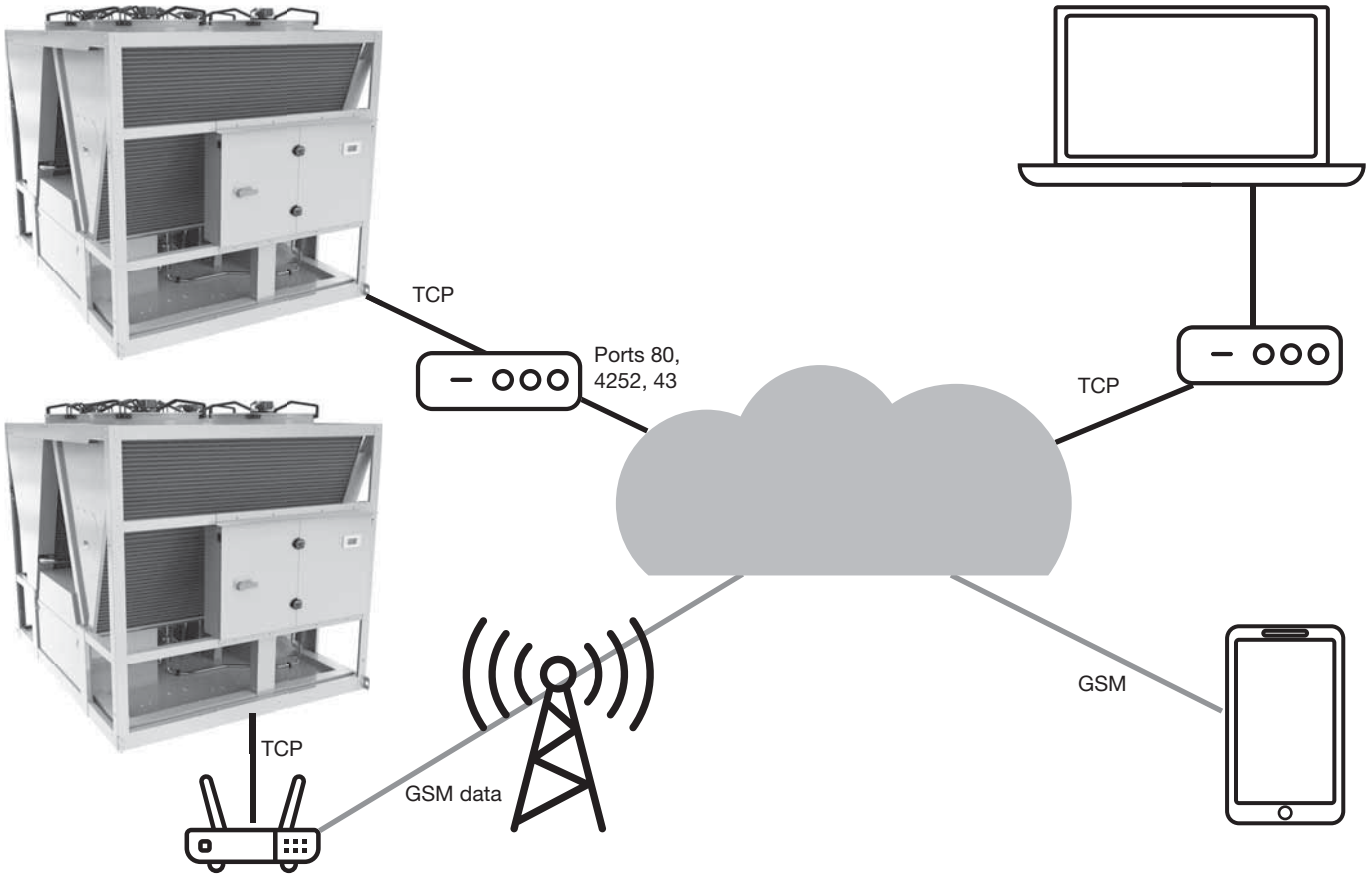
- address 1
- 9600 baud rate
- without parity
- 1 bit of stop

## 3.7. Panasonic cloud

The ECOi-W chiller cloud system allows the units to be remotely supervised. In particular, it gives access to the main unit parameters and alarms, saves the values sent by the controller and enables updating of the entire application (temperature control, configuration, user interface, list of network variables).



The units are connected either via the customer's intranet or independently of the customer intranet via an optional GSM gateway router.

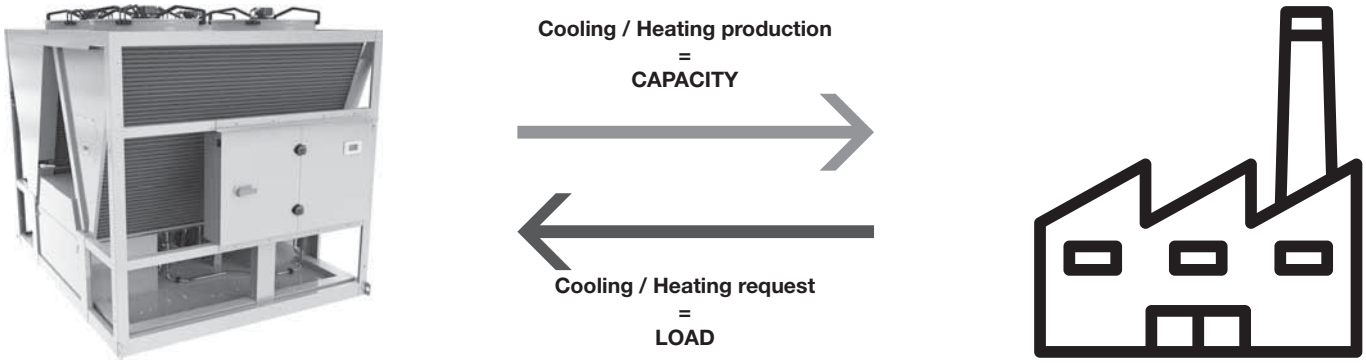


# 4. Thermal Control

## 4.1. Introduction

### 4.1.1. Load and capacity

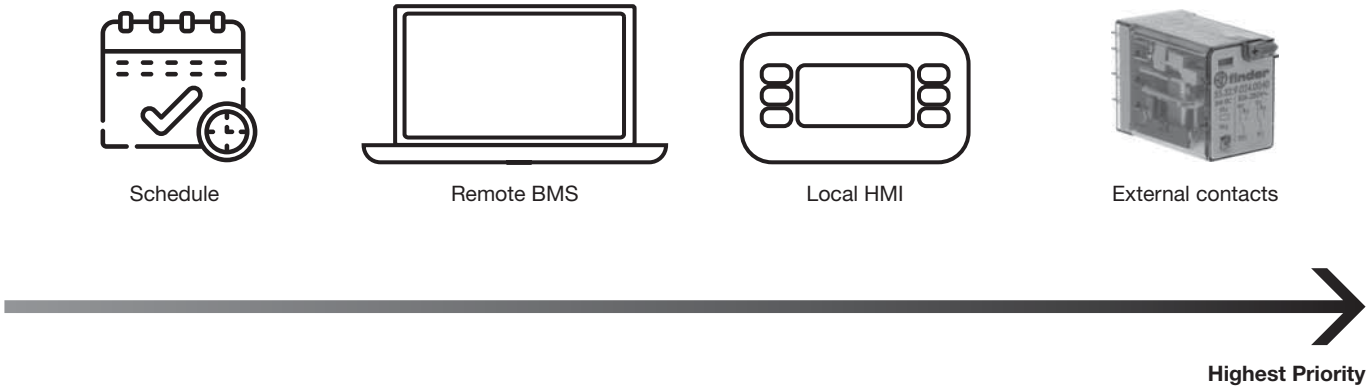
The function of the ECOi-W units is to maintain the client's water circuit at the temperature, within the operating ranges of the units, specified by the client. The temperature of the water from the client's network translates as the "LOAD", to which the unit must respond. The temperature of the water delivered by the unit translates as "CAPACITY".




### 4.1.2. Control of units

The ECOi-W units are controlled in order of priority:

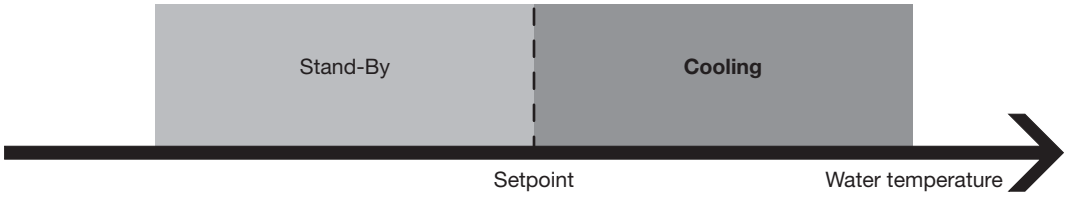
1. Timing programming: this scheduling is integrated in the controller
2. BMS: the remote supervision transmits it commands according to the communication protocols
3. HMI: the commands are given by the user directly on the unit (integrated display) or remotely (remote display)
4. Digital inputs: the client can transmit commands electro-mechanically over 2 dry contacts:
   - Input D1: ON/OFF
   - Input D2: configurable



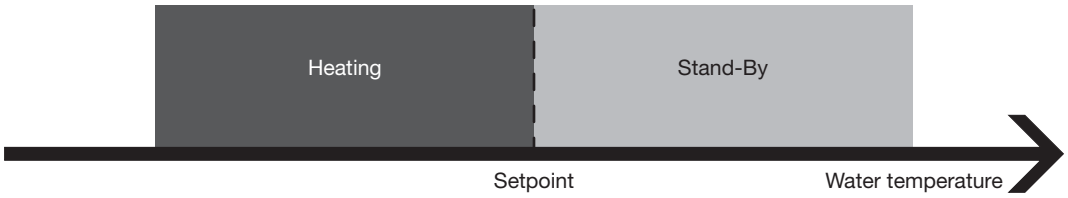
#### 4.1.3. Operating modes

The ECOi-W units offer three operating modes:

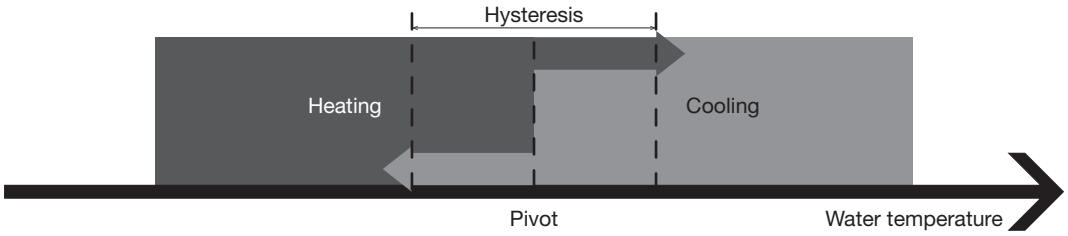
- Cooling mode = the unit cools the water circuit. The unit is regulated according to the water temperature sensor:
  - If the measurement is less than the set-point: the unit is on stand-by
  - If the measurement is above the set-point: the thermodynamic cycle operates




- Heating mode = the unit heats the water circuit. The unit is regulated according to the water temperature sensor:
  - If the measurement is below the set-point: the thermodynamic cycle operates
  - If the measurement is above the set-point: the unit is on stand-by




- Auto-changeover mode = the unit automatically switches between the cooling mode and the heating mode described above. The changeover is carried out according to the air temperature. A hysteresis is introduced to stabilize the air circuit and prevent excessive operational changes..




## 4.2. Water settings and water anti-freeze protection

The user can define the water temperature setting to control according to the range:

- ECOi-W 20 to 125 (2 compressors): either the entering water temperature EWT (default), or the leaving water temperature LWT
- ECOi-W 140 to 210 (4 compressors): the leaving water temperature LWT

For each mode the user can define the temperature setting to be controlled:

- Heating mode SPH (default 40°C): between 25 and 50°C
- Cooling mode SPC (default 8°C): maximum value is 12°C, the minimum value depends on the water anti-freeze protection. By default, the water circuit is considered unprotected and the minimum value is set at +4°C. To define a lower set-point, it is mandatory to protect the water circuit against frost and to check the glycol level.

| Glycol level | SPC minimum value |
|---|---|
| 0% | +4°C |
| 10% | 0°C |
| 20% | -3°C |
| > 30% | -10°C |

In the case of water law being activated (Refer to the § “Water law”, page 16) and for reduced modes (Refer to the § “Reduced mode”, page 17), the control uses an actual set-point SP*, calculated automatically, that can differ from the SPC and SPH user settings.

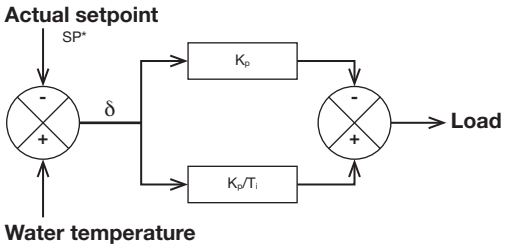
## 4.3. Temperature control

Temperature control ensures that the water sensor selected by the client (EWT or LWT) attains the actual set-point, SP*. To manage the compressors more efficiently, the control uses the concepts of load and capacity.

**Load formulation**

The load is calculated via an algorithm PI minimizing the difference between the unit measurement and the set-point.

The coefficient of PI depends on the range, the water temperature to be controlled and the operating mode. They can not be modified. They correspond to the minimum volumes of the primary water circuit (s) indicated in the IMM.




| Range | Temperature to be controlled | Coefficient | Units | Cool mode | Heat mode |
|---|---|---|---|---|---|
| 20 to 125 | EWT | Kp | %/K | 10 | 10 |
| | | Ti | s | 60 | 60 |
| | LWT | Kp | %/K | 4 | 4 |
| | | Ti | s | 50 | 50 |
| 140 to 210 | LWT | Kp | %/K | 4 | 5 |
| | | Ti | s | 180 | 60 |

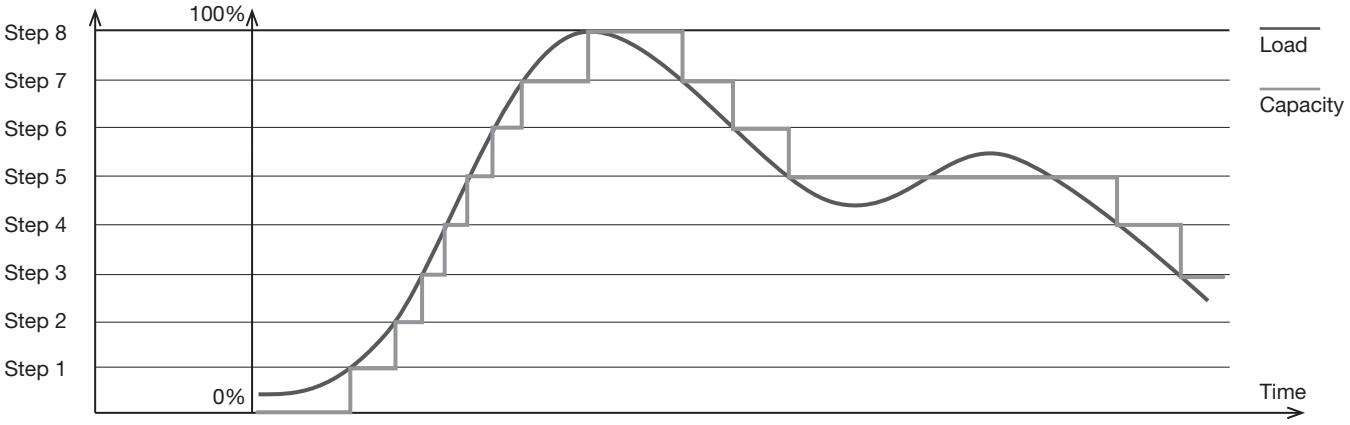
**Capacity steps**

The capacity of the unit is staged by combining the activations of the compressors. The capacity of a step is proportional to the power of the activated compressors as is shown in the following table for a ECOi-W 210:

| Compressor | | | Stepping | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Circuit | N° | Power | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | C2 | 39,7 | OFF | ON | OFF | ON | ON | OFF | ON | OFF | ON |
| | C1 | 64,7 | OFF | OFF | ON | OFF | OFF | ON | OFF | ON | ON |
| 2 | C2 | 39,7 | OFF | OFF | OFF | ON | OFF | OFF | ON | ON | ON |
| | C1 | 64,7 | OFF | OFF | OFF | OFF | ON | ON | ON | ON | ON |
| Capacity (%) | | | 0 | 19 | 31 | 38 | 50 | 62 | 69 | 81 | 100 |

**Response to the client load**

The temperature control dynamically adapts to the stepping of the capacity of the unit to the load of the client water circuit.



# 5. Equipment management

## 5.1. Temperature sensors

The temperatures are measured by CTN sensors 10kΩ. Resistance measurements are converted to temperature with coefficients scaled over the entire temperature range to ensure sufficient accuracy (<1 K) regardless of the operating point of the unit.

**Specific case of outside air temperature (OAT)**

The measurement of the CTN sensor undergoes several post-treatments.
- Stabilized operation: the temperature is equal to the sliding average over 5min.
- Defrost cycle: the temperature is fixed at its last value before the start of the cycle.
- Unit turned off: the temperature is not current.
- Unit in start-up phase after a stoppage:
  - Less than 15min: the temperature is not current
  - More than 15min: the temperature is current after 90 seconds of ventilation operation

## 5.2. Pressure sensors

**Pressure transducers**

The relative pressures of refrigerant (BP, HP) and water (WPT) are measured by ratiometric transducers. The voltage signal is converted into a pressure value by the controller.

**HP pressure switch**

This normally closed pressure switch trips when the condensing pressure is too high.

**PME pressure switch (lack of water)**

This normally closed pressure switch trips when the hydraulic pressure is insufficient.

## 5.3. Compressors

The compressors are activated/deactivated according to the unit capacity stepping (Refer to the § “Temperature control”, page 13). The following anti short-cycle secures the duration of compressors:
- Minimum activation time = 90s
- Maximum activation time = 120s
- Maximum of 12 start-ups per hour

## 5.4. Fans

The controller manages the speed of the fans according to the condensing pressure (cooling mode) or the evaporation pressure (heating mode):
- Dual-speed ventilation: obtained by supplying the AC motor with star or triangle
- Modulating ventilation: obtained by supplying the AC motor with a frequency inverter or by using the EC motor

The speed is stabilized by hysteresis and, if there is modulation, by ramps.
Modulating ventilation is intrinsic to the option “All Seasons” (Refer to the § “”All Seasons” option”, page 18) and “High Pressure Fans” (Refer to the § “”High pressure fans” option”, page 19).

## 5.5. Electronic pressure reducing valve

The electronic pressure reducing valve is managed directly by the controller. This enables the controller to:
- Pre-position the pressure reducing valve at start-up according to the operating conditions
- Pre-position the pressure reducing valve before a change in capacity
- Control the evaporation pressure
- Control over-heating
- Stabilize the opening of the pressure reducing valve during specific transients (e.g. defrosting)
- Close the pressure releasing valve when the circuit is stopped

## 5.6. 4-Way valve

The 4-way valve enables switching between cooling mode (valve deactivated) and heating mode (valve activated). Switchover requires either stopping the tandem compressors for more than a minute, or a gap of less than 4 bar between the BP and the HP.

## 5.7. Carter resistance

### 5.7.1. 20 to 125 models

The carter resistances are not controlled directly by the controller but are coupled to the compressors:

- Compressor deactivated: resistance activated
- Compressor activated: resistance deactivated

### 5.7.2. 140 to 210 models

The carter resistances are controlled directly by the controller coupled to the circuit:
The two compressors in tandem are activated: resistances deactivated
One compressor deactivated for over 15min: resistances activated

### 5.7.3. Preheating

If the unit has been powered off for more than 3 hours (e.g. power failure, 1st power up at start-up, etc.), the controller requires a preheating phase of the compressors before starting the temperature control. By default this phase takes 30min

## 5.8. Anti-freeze resistance

The antifreeze resistances are bonded to the plate heat exchanger and covered with thermal insulation. They participate in the protection of the hydraulic circuit when ambient conditions create a risk of freezing (Refer to the § “Antifreeze protection of the plate exchanger”, page 25).

## 5.9. Hydraulic pump

Units can optionally include 1 pump, 2 pumps mounted in parallel (ECOi-W 20 to 125) or 1 double pump (ECOi-W 140 to 210). In the latter two cases, only one motor operates at a time, the other being a backup. The pumps are controlled in terms of:

- Fixed speed (standard): directly by the controller
- Modulating speed: the AC motor of the pump is powered by a variable frequency drive. The “Variable Primary Flow” option offers the modulating speed (Refer to the § “Operating principle”, page 4).

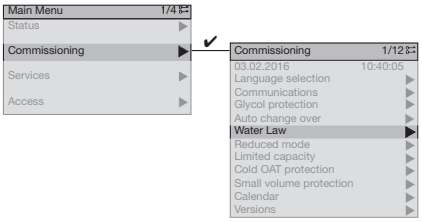
The controller:

- Either powers or stops the pump when the unit is on stand-by
- In the case of a double pump, automatically switches to the second motor in the case of a problem with the first motor.
- Periodically restarts the pump in order to avoid any clogging due to inactivity. This functionality can be adjusted and is deactivated by default:
  - Restart frequency: 72h
  - Duration of restart: 120s

# 6. Additional functionalities

## 6.1. Water law

The water law allows the temperature set-point to be adapted according to the exterior temperature. By default the water law is deactivated.



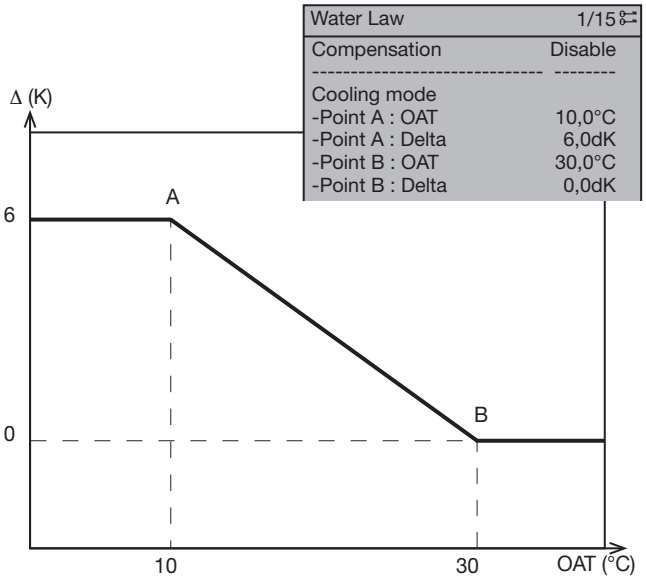

**CAUTION** The water law is automatically activated if the unit is operating in auto-changeover mode.

### 6.1.1. Cooling mode

The water law adds to the set-point SPC defined by the user a temperature Δ offset function:
SP* = SPC + Δ(OAT)

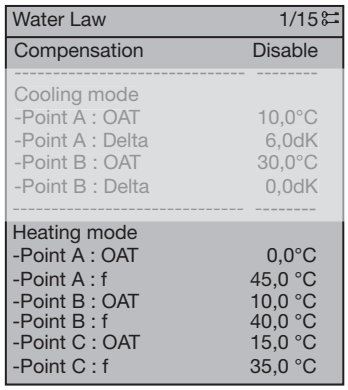
The offset is defined by the points A and B

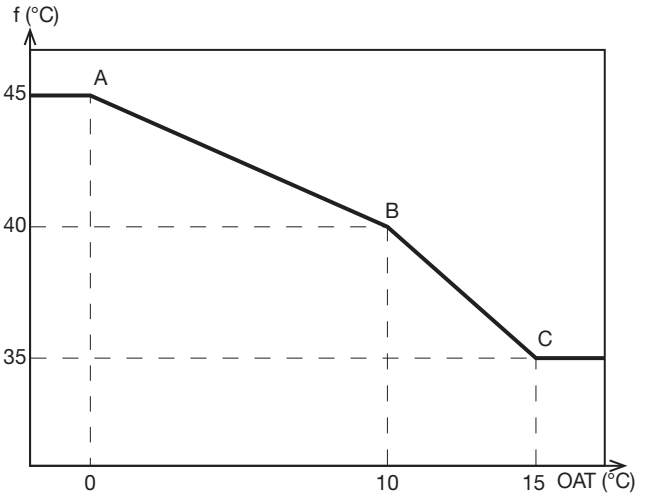
| Points | Coordinates | Unit | Min. | Max. | Default |
|---|---|---|---|---|---|
| A | OAT | °C | 10 | 30 | 10 |
| | Delta | K | DB | 8 | 6 |
| B | OAT | °C | 20 | 36 | 30 |
| | Delta | K | 0 | DA | 0 |




### 6.1.2. Heating mode

The water law recalculates the set-point according to the outside temperature. The function f is defined by the points A, B and C:

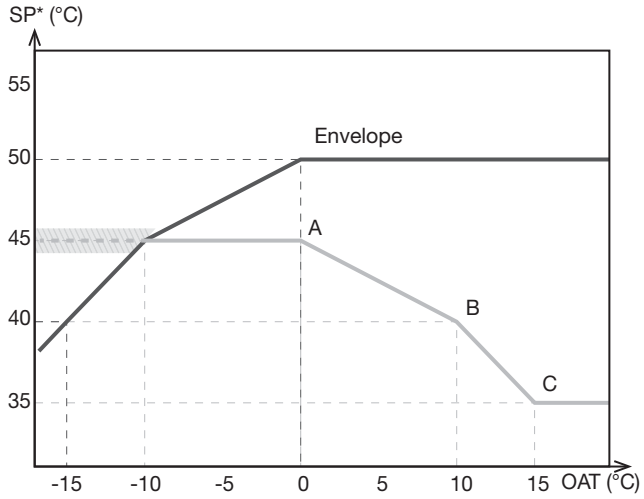



| Points | Coordinates | Unit | Min. | Max. | Default |
|---|---|---|---|---|---|
| A | OAT | °C | -20 | OATB | 0 |
| | f | °C | fB | 50 | 45 |
| B | OAT | °C | OATA | OATC | 10 |
| | f | °C | fC | fA | 40 |
| C | OAT | °C | OATB | 50 | 15 |
| | f | °C | 20 | fB | 35 |

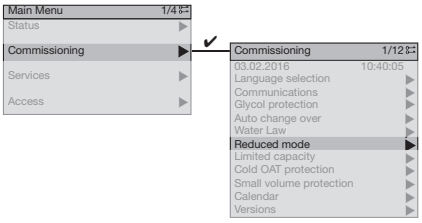
To secure the unit at low temperatures, the water law automatically limits the effective set-point to the operating envelope (Refer to the § “Operating envelopes”, page 5):
SP* = min [ f(OAT), envelope heating mode ]

In the example below, the water law substitutes the operating envelope for function f below OAT -10°C. The shaded part of the function f is therefore not retained.



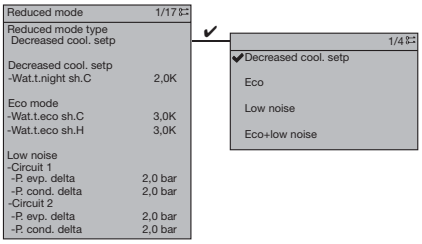

## 6.2. Reduced mode

The reduced modes enable the electrical consumption to be reduced and/or reduce the noise level. By default the reduced mode is deactivated.




**“Decreased cool. setp” (cooling mode only)**

This mode offsets the set-point downward to accumulate cold in the water loop when electricity is cheaper:
SPC reduced = SPC - offset
The offset can be adjusted between 0 and 15 K and by default is at 2 K.




**“Eco”**

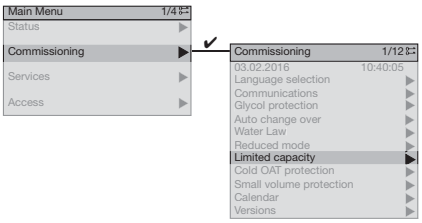
This mode enables the set-points to be relaxed that there is less stress on the compressors:
SPC reduced = SPC + cold offset
SPH reduced = SPH - heat offset
The offsets can be adjusted between 0 and 15 K and by default is at 3 K.

**“Low noise”**

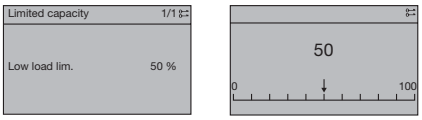
This mode enables the fans to be slowed down so that they make less noise. The slowdown is achieved by offsetting the pressure set-point:
SPPEvap reduced = SPPEvap – BP offset
SPPCnd reduced = SPPCnd + HP offset
The offsets can be adjusted between 0 and 2 bar and by default is at 2 bar.

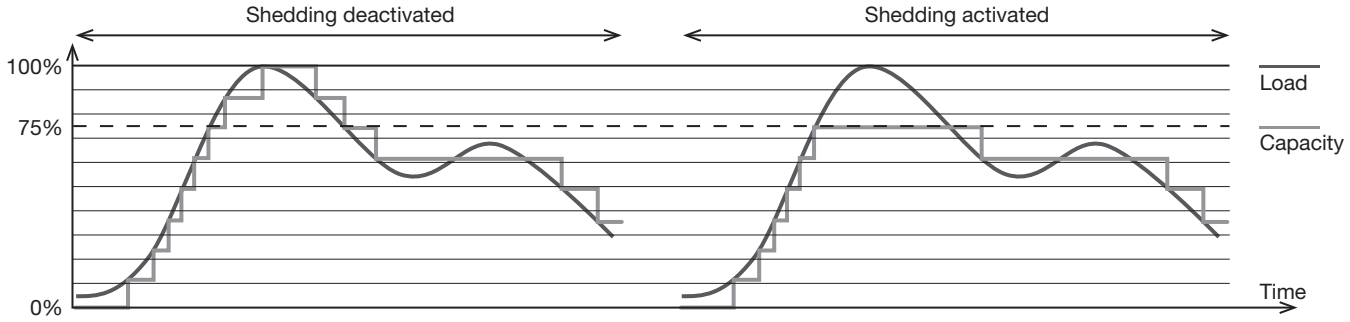
## 6.3. Load shedding mode

The load shedding mode limits the electrical power consumption of the unit by limiting its capacity. The amount limited is defined by a maximum value of capacity, setting between 0 and 100%. By default the load shedding mode is deactivated.




The example below illustrates the limiting of the unit to 75% of its capacity. As long as load shedding is not activated, the unit adjusts its capacity to respond to load. When load shedding is activated, the unit limits its capacity below the limiting value.



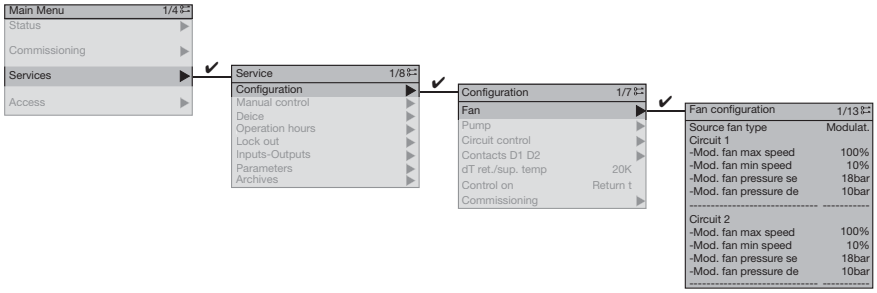



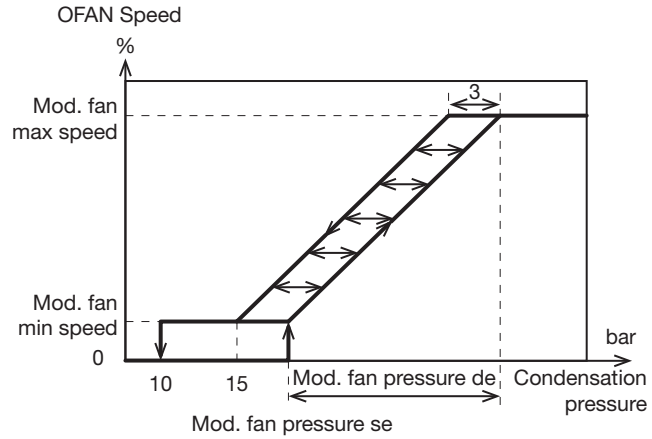

## 6.4. "All Seasons" option

The option “All Seasons” allows the exchanges of the battery with the outside air throughout the year to be adjusted by modulating the flow of air. This adjustment is obtained by powering the fans via the frequency inverters managed by the controller.

### 6.4.1. Cooling mode

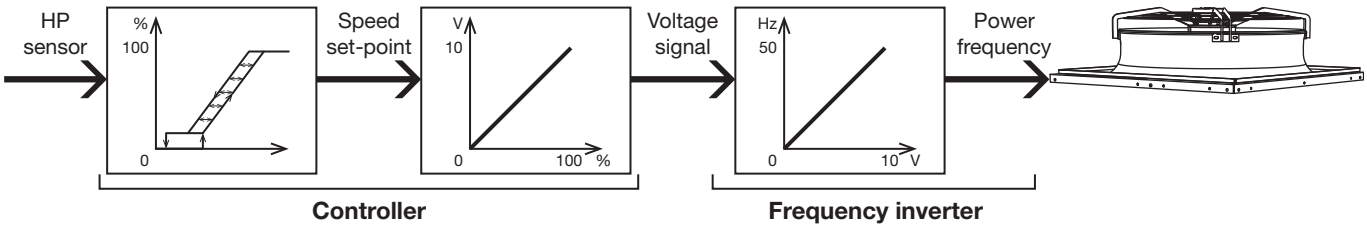
The controller manages the condensation pressure, speeding up the fans as the pressure increases. A hysteresis of 3 bar stabilizes the fan speed, both for increases and drops in pressure. The speed set-point is defined by the setpoint (Mod. fan pressure se), the ramp (Mod. fan pressure de) and the speed range (Mod. fan max speed, Mod. fan min speed).



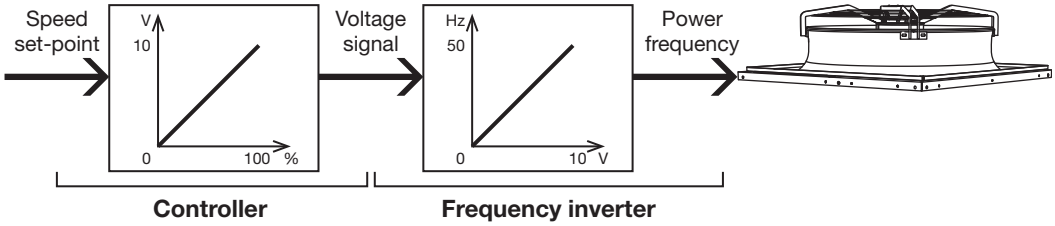

| Circuit 1 / 2 | | | |
|---|---|---|---|
| **Setting** | **Default** | **Min.** | **Max.** |
| **Mod. fan max speed** | 100% | 0% | 100% |
| **Mod. fan min speed** | 10% | 0% | 100% |
| **Mod. fan pressure se** | 18 bar | 16 bar | 20 bar |
| **Mod. fan pressure de** | 10 bar | 8 bar | 10 bar |

The controller converts the speed set-point into a 0..10V signal and sends it to the frequency inverter. The inverter converts the 0..10V signal into a 0..50Hz fan power frequency.




### 6.4.2. Heating Mode

The fans turn at a fixed speed, that can be regulated between 0 and 100%.

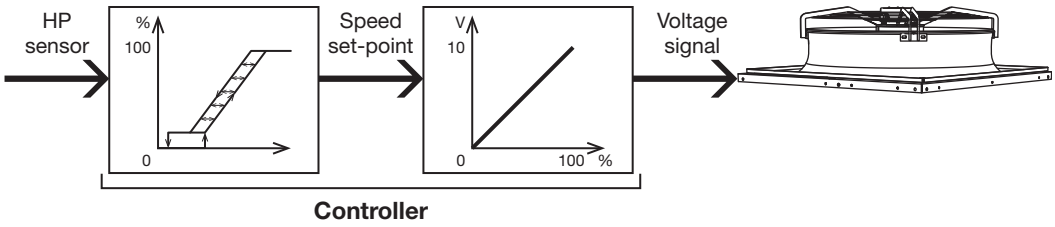



## 6.5. "High pressure fans" option

The "High Pressure Fans" option allows air rejected by the fans to be funneled. To meet the load drop due to the funneling, the fans deliver more pressure than the standard fans and are of EC type. These fans are managed by the controller, without frequency inverters.

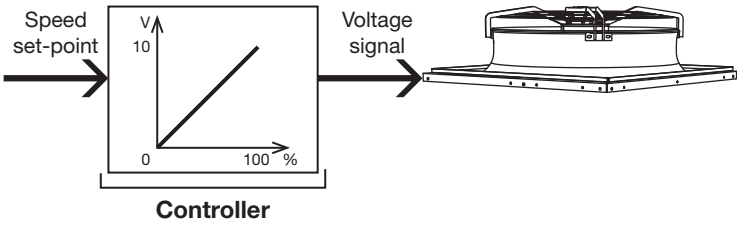
### 6.5.1. Cooling mode

The principle for controlling the fans is identical to that of the "All Seasons" option.



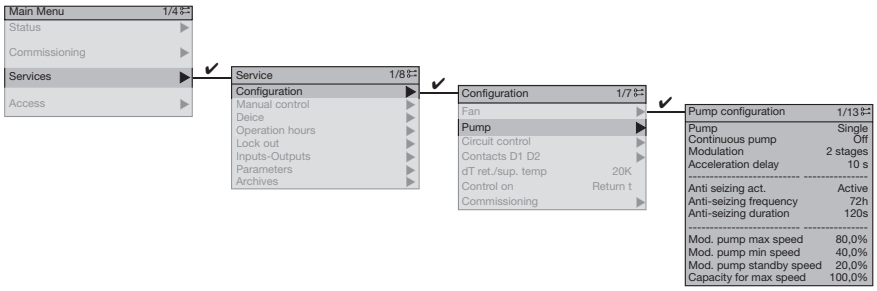

### 6.5.2. Heating mode

The principle for controlling the fans is identical to that of the "All Seasons" option.



## 6.6. "Variable primary flow" option

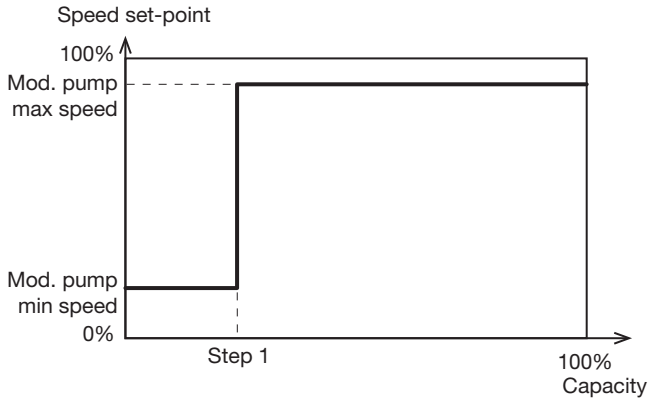
The "Variable Primary Flow" option is used to modulate the power of the hydraulic pump in order to reduce its electrical consumption and/or help maintain the hydrostatic equilibrium of the installation. This modulation is obtained by powering the pump through a frequency inverter.




**CAUTION** The minimum frequency of the pump must not be less than the manufacturer's recommendations (e.g. 30Hz) and must ensure a sufficient rate for the unit (See § PHYSICAL CHARACTERISTIC in the Installation and maintenance manual).

### 6.6.1. Constant speed mode

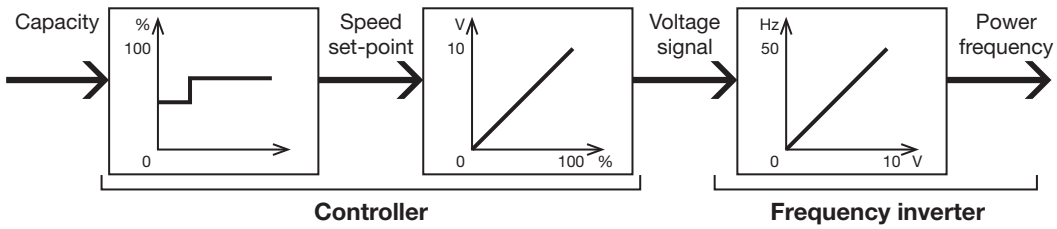
The pump operates at a fixed speed whatever the unit capacity. This speed is determined during commissioning to adjust the power of the pump to the load drops of the installation.
When the load is insufficient to activate the 1st stage of capacity, the pump runs at a reduced speed to limit the consumption of electricity.

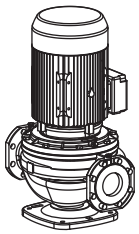



| Pump configuration | 1/13 |
|---|---|
| Pump | Single |
| Continuous pump | Off |
| Modulation | 2 stages |
| Acceleration delay | 10 s |
| Anti seizing act. | Active |
| Anti-seizing frequency | 72h |
| Anti-seizing duration | 120s |
| Mod. pump max speed | 80,0% |
| Mod. pump min speed | 40,0% |
| Mod. pump standby speed | 20,0% |
| Capacity for max speed | 100,0% |

| Setting | Default | Min. | Max. |
|---|---|---|---|
| **Mod. pump max speed** | 100% | 0% | 100% |
| **Mod. pump standby speed** | 60% | 0% | 100% |

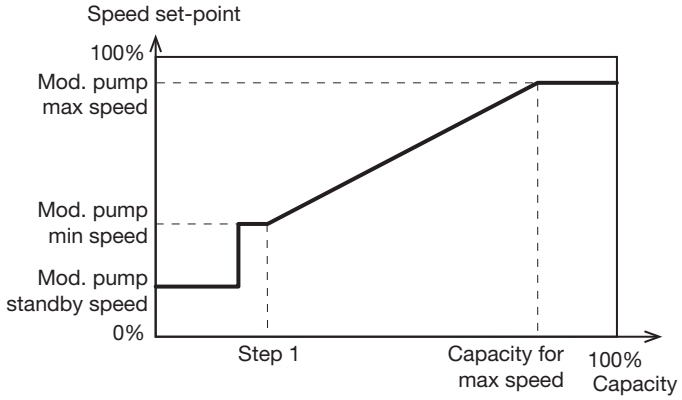
The controller converts the speed set-point into a 0..10V signal and sends it to the frequency inverter. The inverter converts the 0..10V signal into a 0..50Hz frequency for the pump.



### 6.6.2. Constant speed mode vs capacity

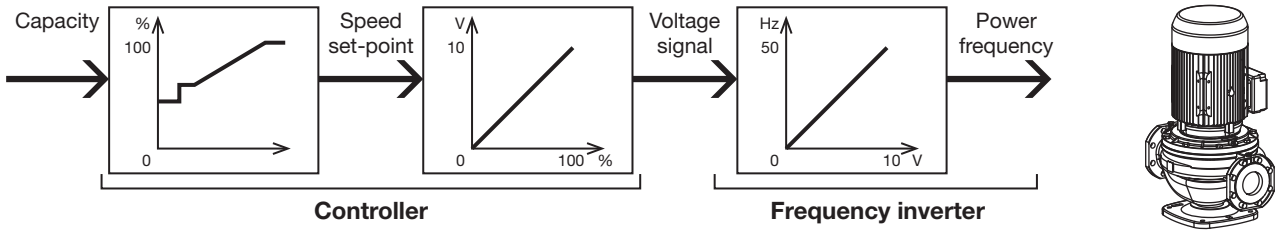
The speed of the pump depends on the capacity of the unit. This speed range is determined during commissioning to adjust the power of the pump to the load drops of the installation.
When the load is insufficient to activate the 1st stage of capacity, the pump runs at a reduced speed to limit the consumption of electricity.




| Pump configuration | 1/13 |
|---|---|
| Pump | Single |
| Continuous pump | Off |
| Modulation | 2 stages |
| Acceleration delay | 10 s |
| Anti seizing act. | Active |
| Anti-seizing frequency | 72h |
| Anti-seizing duration | 120s |
| Mod. pump max speed | 80,0% |
| Mod. pump min speed | 40,0% |
| Mod. pump standby speed | 20,0% |
| Capacity for max speed | 100,0% |

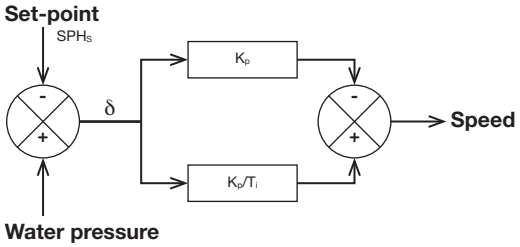
| Setting | Default | Min. | Max. |
|---|---|---|---|
| **Mod. pump max speed** | 100% | 0% | 100% |
| **Mod. pump min speed** | 70% | 0% | 100% |
| **Mod. pump standby speed** | 60% | 0% | 100% |
| **Capacity for max speed** | 100% | 0% | 100% |

The controller converts the speed set-point into a 0..10V signal and sends it to the frequency inverter. The inverter converts the 0..10V signal into a 0..50Hz frequency for the pump.




### 6.6.3. Constant output pressure mode

The pump modulates its speed to maintain constant water pressure at the unit output. This pressure is measured by a pressure transducer mounted on the outlet tube. The load is calculated via an algorithm PI minimizing the difference between the transducer measurement and the set-point.




The set-point depends on the installation. It can be adjusted during commissioning.

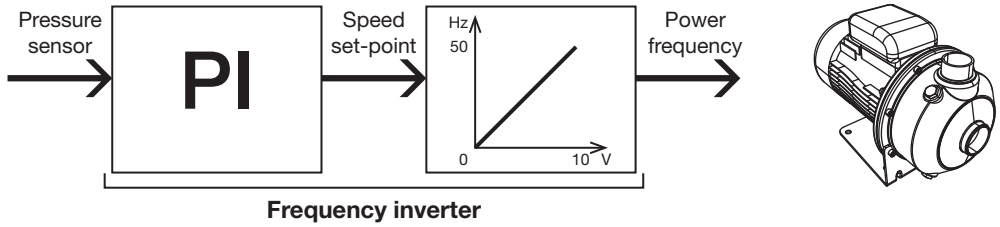
| Setting | Units | Default | Min. | Max. |
|---|---|---|---|---|
| **SPHs** | bar | 2.0 | 0 | 10 |

The PI coefficients depend on the range and the installation. They can be adjusted during commissioning.

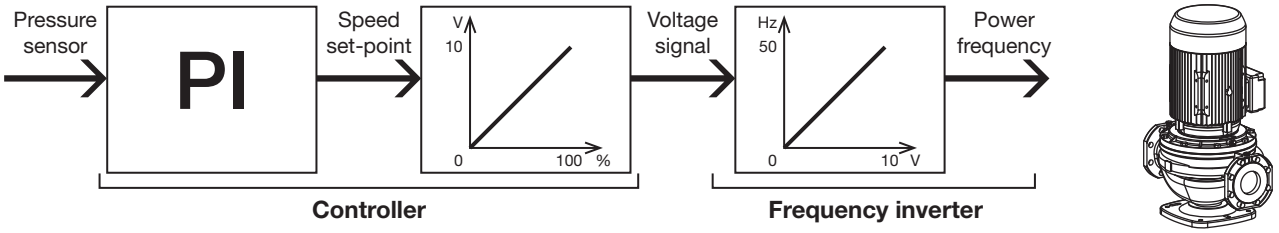
| Range | Coefficient | Units | Default | Min. | Max. |
|---|---|---|---|---|---|
| **20 to 125** | Kp | Hz/% | 1 | 0.1 | 100 |
| | Ti | s | 1 | 0 | 3,600 |
| **140 to 210** | Kp | %/bar | 0.25 | 0 | 50 |
| | Ti | s | 50 | 0 | 1,200 |

The PI algorithm is in the frequency inverter for ECOi-W ranges 20 to 125, and in the controller in the range ECOi-W 140 to 210. The pressure transducer is connected to the equipment in charge of the PI algorithm.

20 to 125 models.

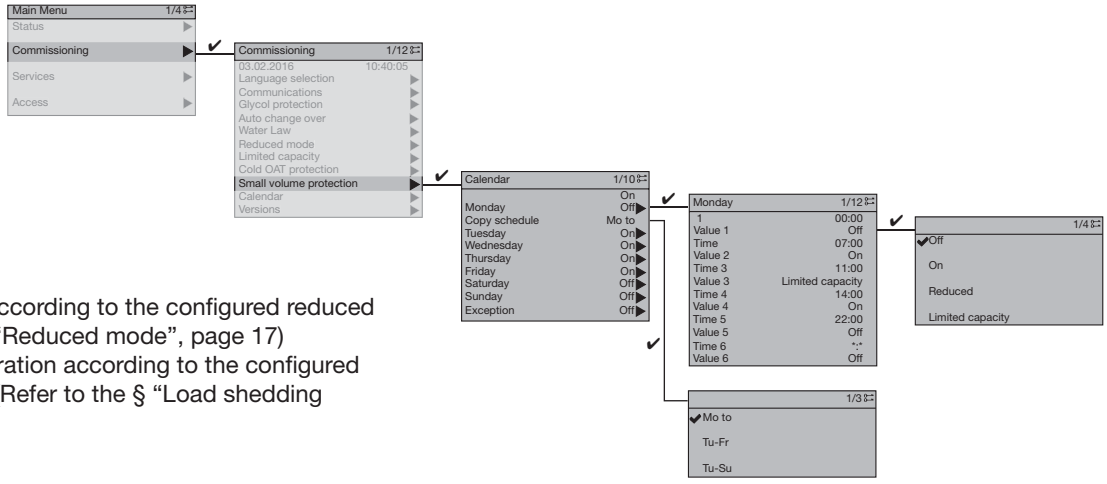



140 to 210 models.




## 6.7. Scheduling

Scheduling enables operating commands to be programmed throughout the week:

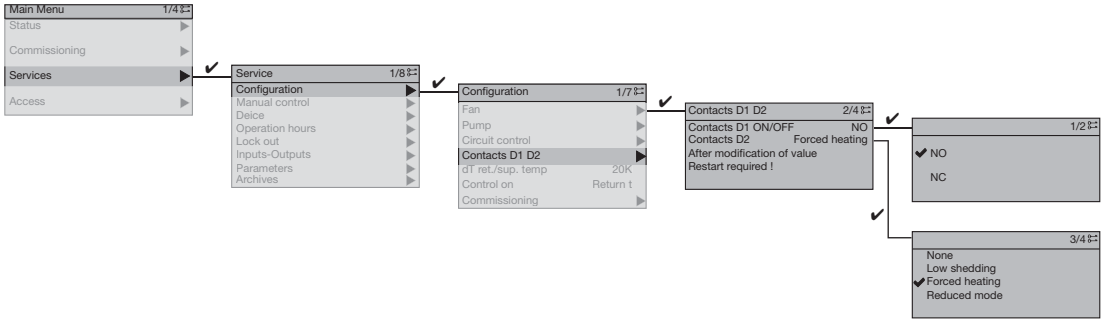



- OFF: unit on standby
- ON: normal operation
- Reduced: operation according to the configured reduced mode (Refer to the § “Reduced mode”, page 17)
- Limited capacity: operation according to the configured limitation of capacity (Refer to the § “Load shedding mode”, page 18)

INFORMATION It is possible to program up to 6 command changes per day.

# 7. Client digital inputs and priorities

## 7.1. D1 on/off input




The input D1 enables activation and stoppage of remote temperature control with a dry contact. It has the highest priority among the unit control means (Refer to the § “Control of units”, page 11).

The input D1 can be configured as Normally Open (default) and Normally Closed:

| Configuration | Contact open | Contact closed |
|---|---|---|
| Normally Open | Operation order | Stop order |
| Normally Closed | Stop order | Operation order |

## 7.2. D2 configurable input

The input D2 enables activation and stoppage of an option remotely with a dry contact. It ranks just after the input D1 in the order of priorities (Refer to the § “Control of units”, page 11).

The options available via the input D2 are:
- Reduced mode (Refer to the § “Reduced mode”, page 17)
- Load shedding mode (Refer to the § “Load shedding mode”, page 18)
- Forced heating mode

The input D2 is Normally Open:

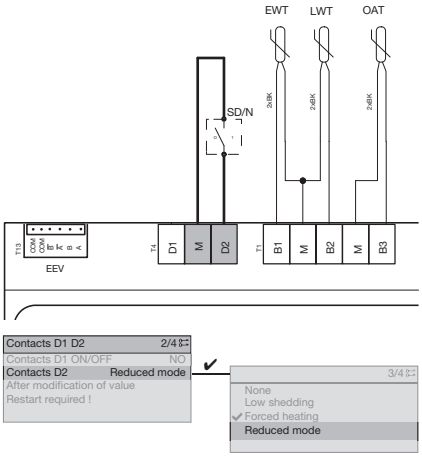
| Configuration | Contact open | Contact closed |
|---|---|---|
| Normally Open | Option activation | Option deactivation |

## 7.3. Cascade of priorities

The following tables indicate the operating order of the unit resulting from demands of various controllers according to their priority.

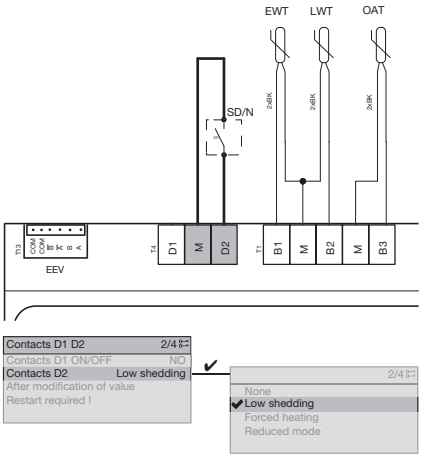
### 7.3.1. CAS D1 = ON / D2 configured in reduced mode

| Status D2 | HMI | BMS | Scheduling | Resulting order |
|---|---|---|---|---|
| Activated | s.o. | s.o. | s.o. | Reduced mode |
| Deactivated | OFF | s.o. | s.o. | OFF |
| | ON | s.o. | s.o. | ON |
| | Reduced mode | s.o. | s.o. | Reduced mode |
| | Load shedding mode | s.o. | s.o. | Load shedding mode |
| | Delegation | OFF | s.o. | OFF |
| | | ON | s.o. | ON |
| | | Reduced mode | s.o. | Reduced mode |
| | | Load shedding mode | s.o. | Load shedding mode |
| | | Auto | OFF | OFF |
| | | | ON | ON |
| | | | Reduced mode | Reduced mode |
| | | | Load shedding mode | Load shedding mode |



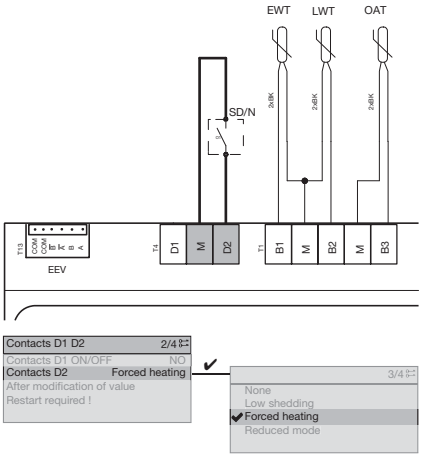

### 7.3.2. CAS D1 = ON / D2 configured in load shedding mode

| Status D2 | MMI | BMS | Scheduling | Resulting order |
|---|---|---|---|---|
| Activated | s.o. | s.o. | s.o. | Load shedding mode |
| Deactivated | OFF | s.o. | s.o. | OFF |
| | ON | s.o. | s.o. | ON |
| | Reduced mode | s.o. | s.o. | Reduced mode |
| | Load shedding mode | s.o. | s.o. | Load shedding mode |
| | Delegation | OFF | s.o. | OFF |
| | | ON | s.o. | ON |
| | | Reduced mode | s.o. | Reduced mode |
| | | Load shedding mode | s.o. | Load shedding mode |
| | | Auto | OFF | OFF |
| | | | ON | ON |
| | | | Reduced mode | Reduced mode |
| | | | Load shedding mode | Load shedding mode |




### 7.3.3. CAS D1 = ON / D2 configured in forced heating mode

| Status D2 | MMI | BMS | Scheduling | Resulting order |
|---|---|---|---|---|
| Activated | s.o. | s.o. | s.o. | Heating |
| Deactivated | Cooling | s.o. | s.o. | Cooling |
| | Heating | s.o. | s.o. | Heating |
| | Auto changeover | Cooling | s.o. | Cooling |
| | | Heating | s.o. | Heating |
| | | Auto changeover | s.o. | Auto changeover |



# 8. Protections, warnings and alarms

The application has equipment protection procedures based on the sensors of the unit (temperature, pressure) and on the electromechanical safety devices (pressure switch, magneto-thermal circuit breaker, internal safety, etc.).
Some procedures may temporarily change the operation of the unit and give rise to a warning (e.g. preheating compressors, defrosting the battery, partial load operation, activation of antifreeze heaters, etc.) while others may stop a circuit or even the unit and lead to an alarm (e.g. HP cutoff, phase order setting, etc.).
Most of the alarms are cleared automatically. In the case of repetition, they may cause the logging of a circuit or even the unit requiring a manual acknowledgment after inspection of the unit and installation.

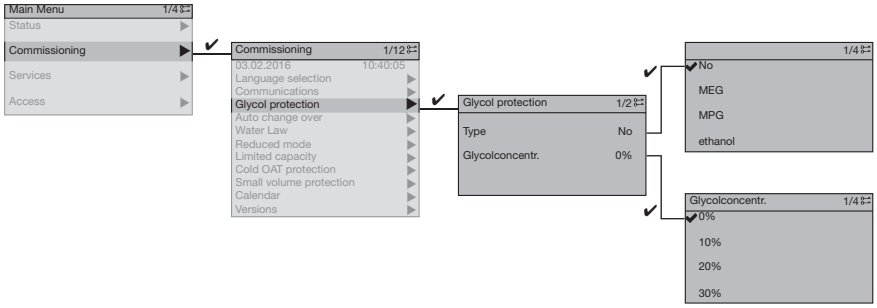
## 8.1. Internal clock

The date and time must be entered during commissioning otherwise the controller logs the unit and raises the alarm “TiInvld” (invalid time). The alarm is automatically resolved by setting the date and time.

## 8.2. Water circuit

### 8.2.1. Antifreeze protection of the plate exchanger

If the water freezes (with or without glycol) the plate exchangers can be damaged. To prevent this risk, two protection methods are implemented depending on the water temperature (both EWT and LWT):




1. Protection: is triggered when the temperature is less than the threshold SpFrPrt and the “Antifreeze protection” warning is raised. The protection activates the antifreeze heaters and the hydraulic pump and limits the capacity of the unit until the temperature exceeds the SpFrPrt threshold by 2K.
2. Safeguard: is triggered when the temperature is less than the threshold LoLm and the “Antifreeze safeguard” alarm is raised. The unit safeguard set-point.

The threshold and limit values depend on the level of glycol:

| | Cycle(s) | Glycol level | | | |
|---|---|---|---|---|---|
| | | 0% | 10% | 20% | > 30% |
| **Threshold** | ON | 4 | -1 | -5 | -13 |
| **SpFrPrt** | OFF | 4 | 0 | -3 | -10 |
| **Limit** | ON | 3 | -2 | -6 | -14 |
| **LoLm** | OFF | 3 | -1 | -4 | -11 |

### 8.2.2. Water flow sensor

The triggering of the sensor (FS) translates a drop in water flow, below the minimum rate for the unit. The “water rate” alarm is displayed when the sensor remains open 3s and stops the unit. The alarm is automatically cleared when the sensor remains closed 30s.

### 8.2.3. “Lack of water” pressure switch

Triggering of the pressure switch (WPS) results in a de-pressurization of the water circuit. A lack of pressure can damage the hydraulic pump.
The pressure switch being connected in series with the water flow sensor, triggering it is treated in the same way.

### 8.2.4. EWT-LWT deviation

An abnormally high deviation between these sensors can signal the drift of a sensor or a lack of flow of water not detected by the flow sensor. The alarm “Delta T°water” is triggered when the deviation is greater than the limit ΔTmax (by default 10K) and is automatically resolved when it returns below 2K of the limit (adjustable value).

#### 8.2.5. Insufficient volume of the water circuit

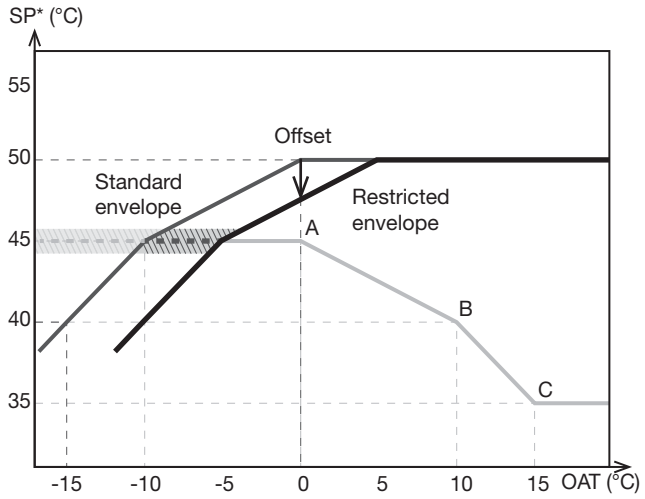
The unit operates in conjunction with the installation water circuit. The coefficients of the PI algorithms and the delays governing the behavior of the equipment in the transient phases are adapted to the expected inertia of the circuit.
The inertia of the water circuit is a reflection of its volume. The IMM specifies the minimum volumes depending on the operating mode and the range:

| Range | Coefficient | Units | Cooling | Heating |
|---|---|---|---|---|
| **ECOi-W 20 to 125** | Application comfort | L/kW | 3,5 | 12,5 |
| | Application process | L/kW | 10,0 | 12,5 |
| **ECOi-W 140 to 210** | Application comfort | L/kW | 3,5 | 6,5 |
| | Application process | L/kW | 10,0 | 6,5 |

Insufficient volume of the water circuit can prevent the establishment of a stabilized coupling between the unit and installation. Unstable functioning can raise alarms that in the case of repetitions can restrict the unit.

In such a situation, it is recommended to notify this installation defect and note the actual volume, install a buffer tank and activate the “Low volume protection”:

- adjustment of the coefficients Kp and Ti of the load calculation (Refer to the § “Temperature control”, page 13) to slow down the capacity variations around the set-point
- restriction of the envelope in unit heating mode to further limit the set-point in heating mode (Refer to the § “Heating mode”, page 16)




## 8.3. Compressors

#### 8.3.1. Thermal protection

Compressors are protected from over-current by manual reset circuit breakers:

- ECOi-W 20 to 125: the contact circuit breaker is connected in series with that of the fans. The alarm “FltFan” is triggered and stops the circuit.
- ECOi-W 140 to 210: the alarm “FltCpr” is triggered and stops the circuit

The alarm is automatically acknowledged by reactivating the circuit breaker.

#### 8.3.2. Backflow temperature

Excessive discharge temperature can damage the compressor. Two levels of protection are implemented:

1. Protection: triggered when the temperature reaches 120°C for 5s and raises the alert “PrtTDcrg”. Protection limits the circuit capacity to 50% until the temperature falls below 110°C.
2. Safeguard: triggered when the temperature reaches 130°C.

#### 8.3.3. Overheating

A minimum overheating is necessary to ensure that the compressors do not draw in liquid. The alarm “SH.LowLim” appears when the overheating is less than 1.3K for 30s and stops the circuit. The alarm is automatically acknowledged.

#### 8.3.4. Evaporation pressure

Too low or too high a pressure at the suction of the compressor can damage it.
Two levels of protection against too low pressure are implemented:

1. Protection: triggers when the pressure is too low and raises the alarm “LOPPrt”. The protection limits the capacity of the circuit until the pressure rises above the protection threshold.
2. Safeguard: is triggered when the pressure drops despite being placed in protection, raises the alarm “LOP” and stops the circuit. The alarm is automatically acknowledged after 3 minutes.

The alarm “MOP” is triggered when the pressure is too high and stops the circuit. The alarm is automatically acknowledged after 3 minutes.

#### 8.3.5. Condensation pressure

Too low or too high a pressure on the compressor discharge can damage it.
The alarm “HPmin” is triggered when the pressure is too low and stops the circuit. The alarm is automatically acknowledged after 3 minutes.
Two levels of protection against too high pressure are implemented:

1. Protection: triggers when the pressure is too great and raises the alarm “HPmaxPrt”. The protection limits the capacity of the circuit until the pressure returns below the protection threshold.
2. Safeguard: is triggered when the pressure increases despite being placed in protection, raises the alarm “HPmax” and stops the circuit. The alarm is automatically acknowledged after 5 minutes.
3. Electro-mechanical safeguard: is triggered when the pressure increases despite the safeguard. The HP pressure switch cuts off the 230V supply of the compressor relays (ECOi-W 20 to 125): 42 barg, ECOi-W 140 to 210: 45 barg). The “HPdet” alarm is raised and error logs the circuit.

#### 8.3.6. Pressure ratio

A ratio of (condensing pressure) / (evaporation pressure) too low or too high can damage the compressor:

- The alarm “PRmin” is triggered when the ratio is too low and stops the circuit. The alarm is automatically acknowledged after 3 minutes.
- The alarm “PRmax” is triggered when the pressure is too high and stops the circuit. The alarm is automatically acknowledged after 4 minutes.

## 8.4. Fans

The fans are protected from over-current by manual reset circuit breakers: In the case of modulating speed, the inverter fault report is wired in series. The alarm “FltFan” is triggered and stops the circuit.
The alarm is automatically acknowledged by reactivating the circuit breaker.

## 8.5. Hydraulic pumps

The pumps are protected from over-current by manual reset circuit breakers:

- ECOi-W 20 to 125: the circuit breaker contact (FTWP) is wired in series with the flow sensor and the “Lack of Water” pressure switch. Triggering is treated in the same way.
- ECOi-W 140 to 210:the circuit breaker contact (FTWP) is wired separately (in the case of modulating speed, the inverter fault report is wired in series). The “Pump” alarm is triggered and stops the unit (no consignment). The alarm is automatically acknowledged by reactivating the circuit breaker.

## 8.6. Temperature and pressure sensors

When an analog sensor fails, the controller disables a circuit or stops the unit and raises the alarm “open loop” (e.g. sensor disconnected, broken wire) or the alarm “short circuit” (e.g. bad connection). These alarms consign the circuit or the complete unit.

## 8.7. Miscellaneous protections

### 8.7.1. Order controller and phase breaker

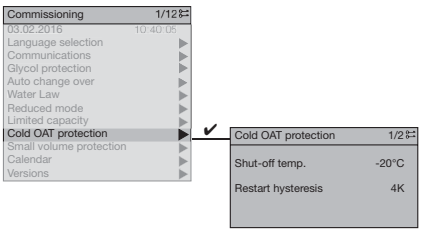
The controller, installed in the electrical panel at the head of the distribution of the phases to the equipment, ensures the correct direction of rotation of compressors, fans and hydraulic pumps. In the case of incorrect power supply, the application logs the unit and raises the alarm “3PhDet”.

### 8.7.2. Coolant leak

If the BP and HP are less than 1 barg, the alarm “RfgLoLvl” is triggered and the unit is locked.

### 8.7.3. Fall in outside temperature

This protection enable the unit to be stopped before other protections if the outside temperature is too cold. The protection is activated when the temperature drops to -20°C (adjustable stop value) and is deactivated when the temperature rises to -16°C (adjustable hysteresis).




### 8.7.4. State of digital and analog outputs

The controller can detect some hardware faults on its digital and analog outputs.
The controller raises the remote alarm type “*.inAlarm” and stops the circuit or unit depending on the controlled equipment.

## 8.8. Error logging of the unit

The repeated occurrence of an alarm after a certain lapse of time may reflect a problem with a unit’s equipment or at the installation level. To safeguard the equipment, the controller logs the unit / the circuit:

- the unit / circuit is stopped and requires a human intervention.

Error logging is triggered by the following incidents:

| **Alarm** | **Incident** | **Logging** |
|---|---|---|
| Water flow (flow sensor or lack of water pressure switch) | 3 alarms in 1 hour | Unit |
| Coolant leak | 1 alarm | Circuit |
| Date/time not set | 1 alarm | Unit |
| Antifreeze safeguard | 1 alarm | Unit |
| Flowswitch | 5 alarms in 1 hour | Unit |
| Delta T water | 3 alarms in 15 min | Unit |
| Sensor EWT (circuit open, short-circuit) | 1 alarm | Unit |
| Sensor LWT (circuit open, short-circuit) | 1 alarm | Unit |
| Sensor OAT (circuit open, short-circuit) | 1 alarm | Unit |
| Sensor CST (circuit open, short-circuit) | 1 alarm | Circuit |
| Sensor CDT (circuit open, short-circuit) | 1 alarm | Circuit |
| Sensor BP (circuit open, short-circuit) | 1 alarm | Circuit |
| Sensor HP (circuit open, short-circuit) | 1 alarm | Circuit |
| Compressor circuit breaker | 1 alarm | Circuit |
| Backflow temperature | 3 alarms in 1 hour | Circuit |
| LOP (minimum evaporation pressure) | 3 alarms in 1 hour | Circuit |
| MOP (maximum evaporation pressure) | 3 alarms in 1 hour | Circuit |
| HPmin (HPmini) | 3 alarms in 1 hour | Circuit |
| HPDet (pressure switch HP) | 1 alarm | Circuit |
| PRmin (minimum pressure ratio) | 3 alarms in 1 hour | Circuit |
| PRmax (maximum pressure ratio) | 3 alarms in 1 hour | Circuit |
| Fan circuit breaker | 1 alarm | Circuit |
| Pump circuit breaker | 1 alarm | Unit |

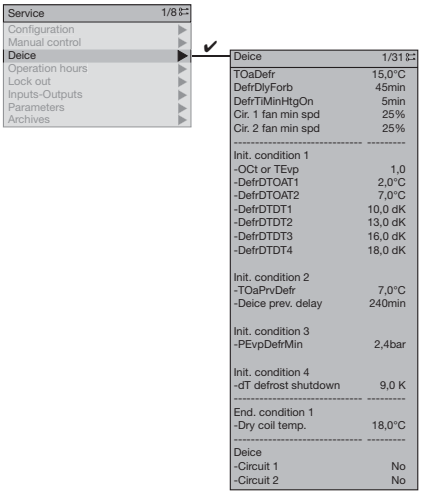
## 8.9. Alarm snapshot

The Alarm Snapshot saves the unit state at the instant the alarm appears. The main elements saved are:
- Unit EWT, LWT, OAT
- Circuit 1: BP, HP, SH, CDT, EEV, OFAN
- Circuit 2: BP, HP, SH, CDT, EEV, OFAN

## 8.10. Defrost cycle

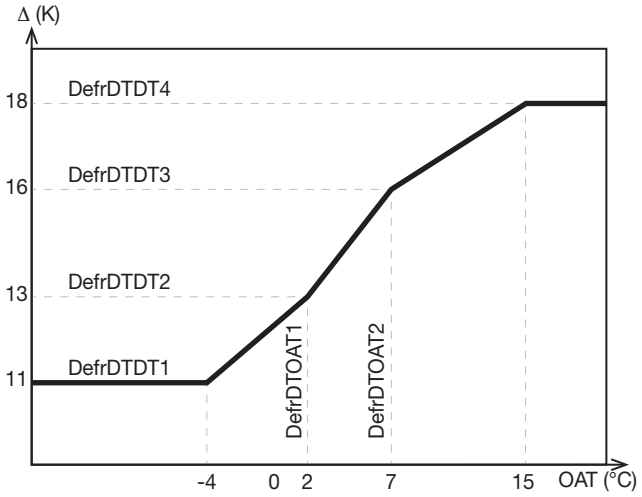
### 8.10.1. Principles

When the unit is operating in heating mode and the outdoor temperature is cool, air humidity may freeze on contact with the fins. Over time, frost accumulates on the batteries, preventing proper heat transfer. These operating conditions degrade the performance of the unit and stress the compressors.
The controller prevents excessive icing of the batteries by initiating a defrost cycle. Such a cycle consists in operating the unit in cooling mode to liquefy the accumulated ice.
On the ECOi-W 140 to 210, the controller prevents the simultaneous defrosting of the circuits. Thus the second circuit provides heat for defrosting the first circuit.




### 8.10.2. Defrost cycle initiation conditions

Four conditions can initiate the defrost cycle:
1. Difference in air / battery temperature (normal condition): when ice accumulates, the difference in outside temperature and battery temperature diverges. The controller starts the cycle when the difference reaches a threshold value Δ and raises the alert “DefrDTReq”.
   The difference is calculated between the sensor OAT and, one of, evaporation temperature (by default) or the sensor OCT.
   The threshold value Δ depends on the outside temperature. The values DefrDTDT* and DefrDTOAT* can be adjusted.
2. Delay between 2 cycles: when air humidity is low, frost accumulates slowly but still creates stressful conditions for the compressors. The controller starts the cycle if the circuit has run for 240min combined with an outside temperature lower than 7°C and raises the warning “TOAPrevDefrReq”
3. Fall in evaporation pressure (protection condition): some ice accumulations can lead to a rapid fall in evaporation pressure. The controller starts the cycle if the evaporation pressure drops to 2.4 bar and raises the warning “DefrPEvpReq”
4. Drying prior to circuit stop: when a circuit is about to stop because the unit is close to the set-point and the batteries are slightly frosted (temperature difference with outside air equal to 10°C), the controller starts the cycle so that the batteries are dry for the next start.




### 8.10.3. Cycle stoppage conditions

Three conditions can stop the defrosting cycle:
1. Dry battery (normal condition): the battery is considered to be dry when the temperature reaches 18°C (adjustable between 16 and 20°C)
2. Cycle too long: the controller stops the cycle after 8 min and raises the warning “DefrTiOut”
3. Water temperature too low (protection condition): the controller stops the cycle if the water flow temperature drops to 10°C and raises the warning “DefrFnsTSu”

# 9. User interface

## 9.1. Organization of information and level of access

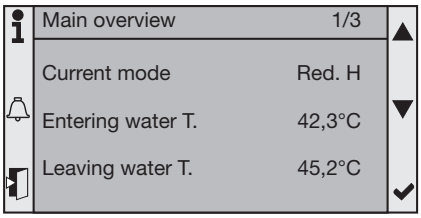
The HMI allows the state of the unit to be visualized and certain adjustments to be made. The information displayed depends upon:
- the configuration of the unit: information not related to the unit do not appear
- the access level: information requiring a higher access level are not displayed

The information is organized into 5 menus.

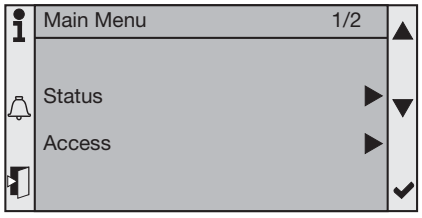
| Menu | Final user | Installer | Maintenance |
|---|---|---|---|
| **Access** | ✔ | ✔ | ✔ |
| **Status** | ✔ | ✔ | ✔ |
| **Commissioning** | ✘ | ✔ | ✔ |
| **Service** | ✘ | ✘ | ✔ |
| **Alarms** | ✔ | ✔ | ✔ |

## 9.2. Home page and main menu

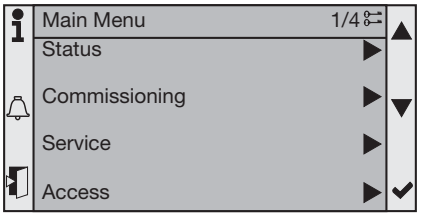
The home page is used to quickly display the state of the unit:
- Operating mode
- Water inlet temperature
- Water outlet temperature




The “Info” button **i** is used to alternate between the home page and the main menu, as well as to return to the main menu at any time. The main menu gives access to other menus depending on access level.




Final user




Maintenance

## 9.3. Menu “access”

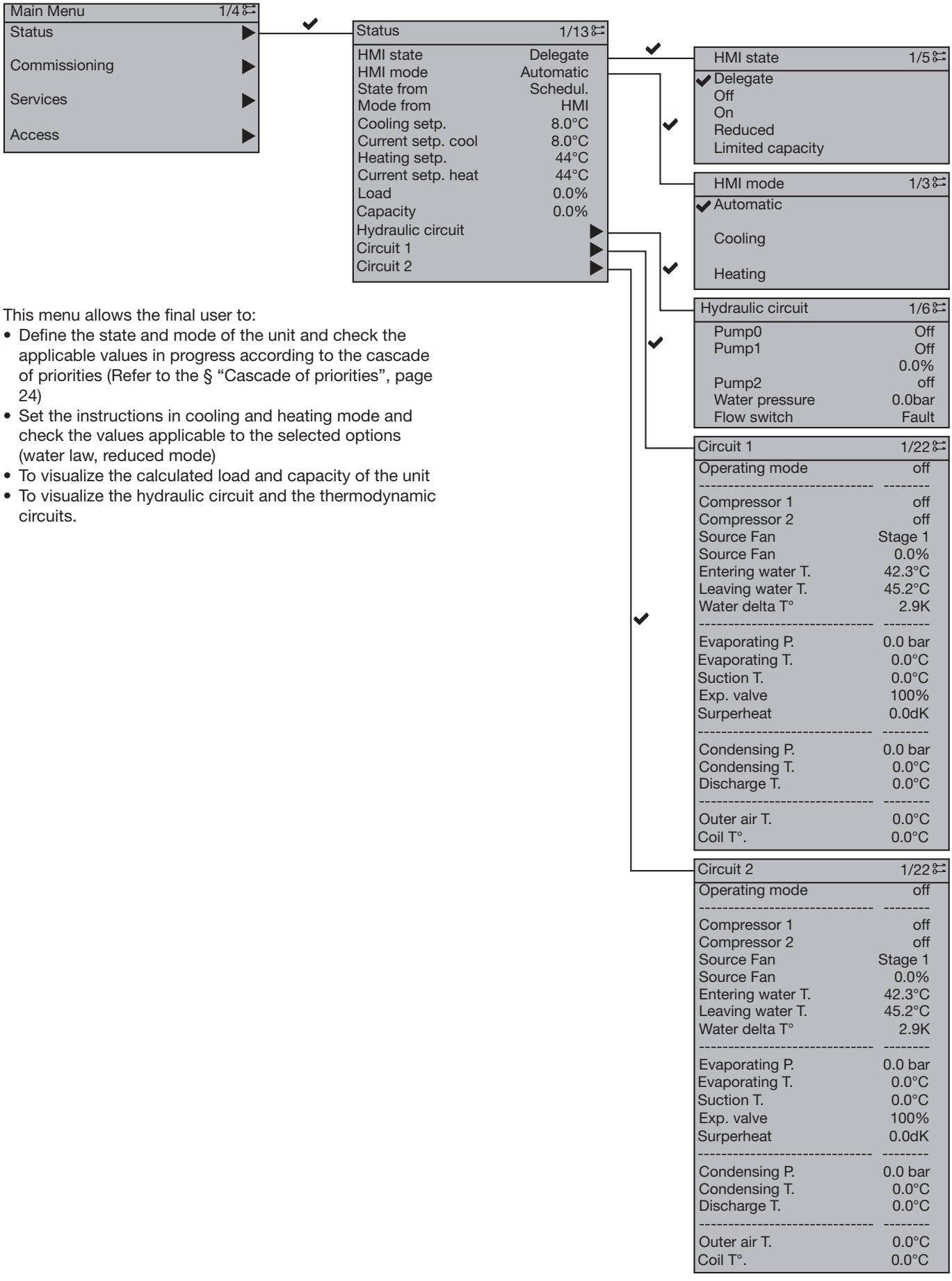
The “Access” menu enables entry of the password corresponding to the desired level. A pictogram then shows the level of access.

| Access level | Final user | Installer | Maintenance |
|---|---|---|---|
| **Password** | 0000 | 0534 | 3260 |
| **Pictogram** | | | |

**CAUTION** When the maintenance or installation phase is finished, set the access level to that of the “Final user” so as not to leave access to the information that are restricted.

INFORMATION The access level is automatically reset to “Final user” level after a few minutes of inactivity.

## 9.4. Status menu

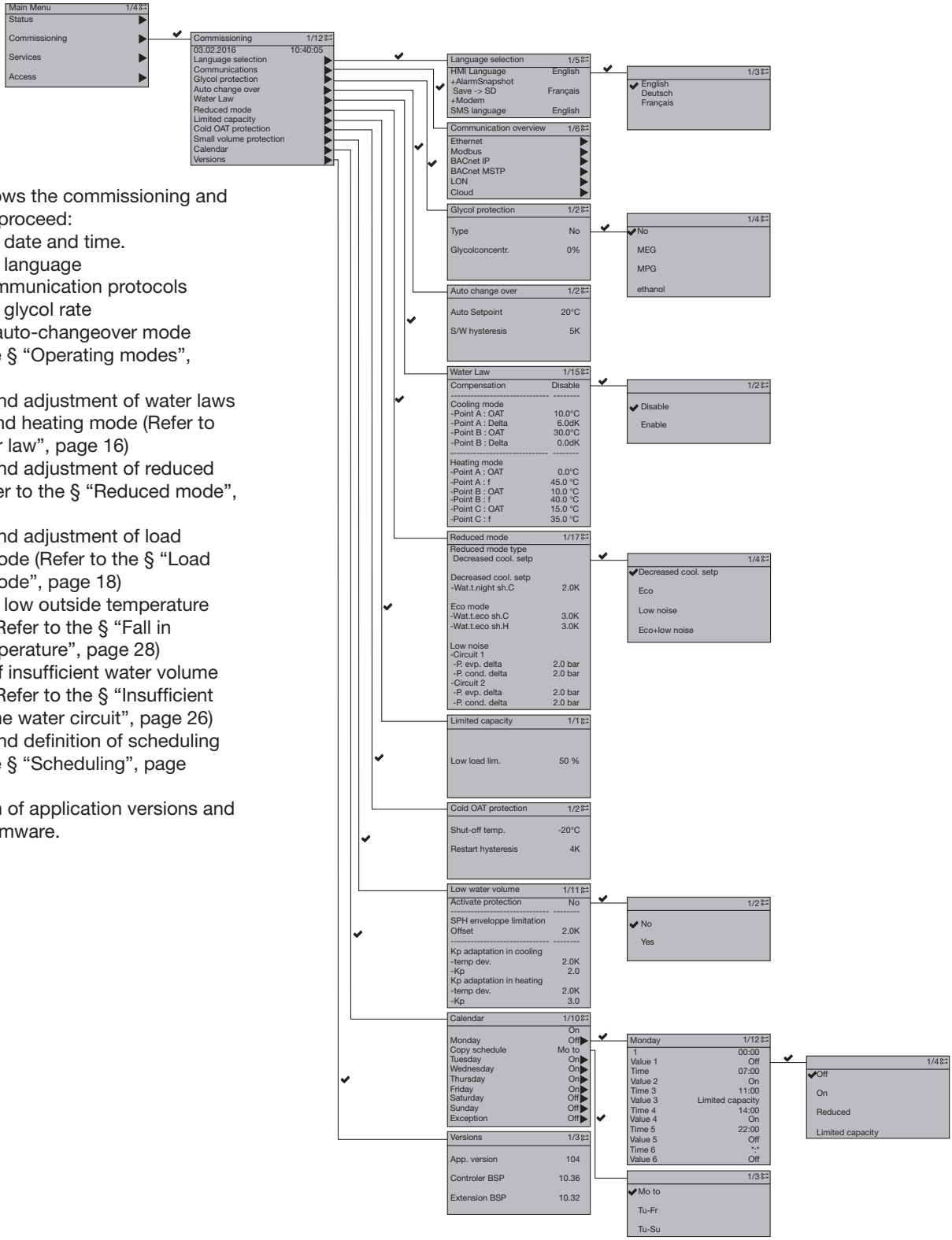



This menu allows the final user to:

- Define the state and mode of the unit and check the applicable values in progress according to the cascade of priorities (Refer to the § “Cascade of priorities”, page 24)
- Set the instructions in cooling and heating mode and check the values applicable to the selected options (water law, reduced mode)
- To visualize the calculated load and capacity of the unit
- To visualize the hydraulic circuit and the thermodynamic circuits.

## 9.5. Installation menu

Limited access for “Installer” or “Maintenance” profiles only.

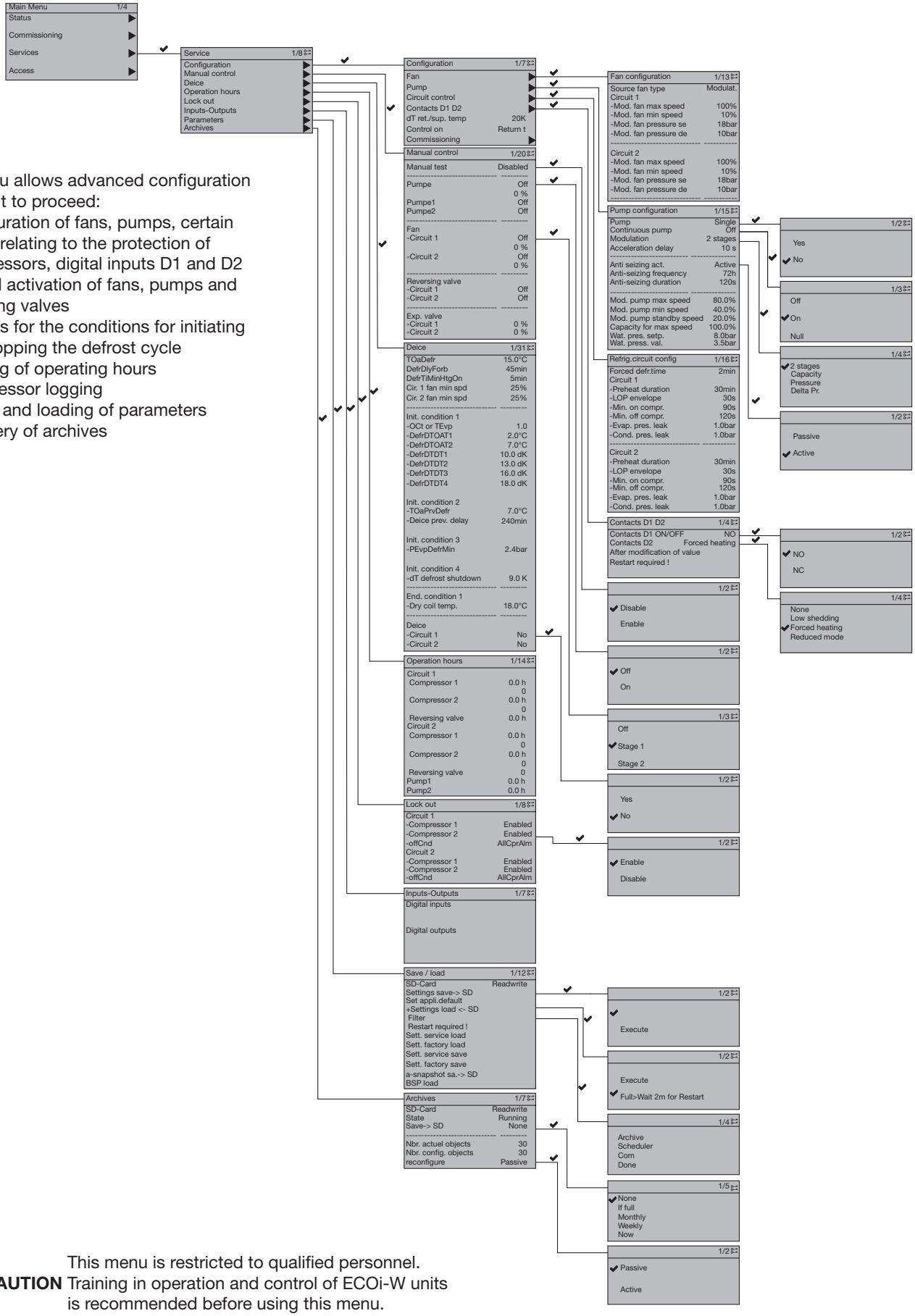



This menu allows the commissioning and installation to proceed:

- Defining the date and time.
- Defining the language
- Defining communication protocols
- Defining the glycol rate
- Regulating auto-changeover mode (Refer to the § “Operating modes”, page 12)
- Activation and adjustment of water laws in cooling and heating mode (Refer to the § “Water law”, page 16)
- Activation and adjustment of reduced modes (Refer to the § “Reduced mode”, page 17)
- Activation and adjustment of load shedding mode (Refer to the § “Load shedding mode”, page 18)
- Definition of low outside temperature protection (Refer to the § “Fall in outside temperature”, page 28)
- Activation of insufficient water volume protection (Refer to the § “Insufficient volume of the water circuit”, page 26)
- Activation and definition of scheduling (Refer to the § “Scheduling”, page 22)
- Visualization of application versions and controller firmware.

## 9.6. Maintenance menu

Limited access for “Maintenance” profile only.



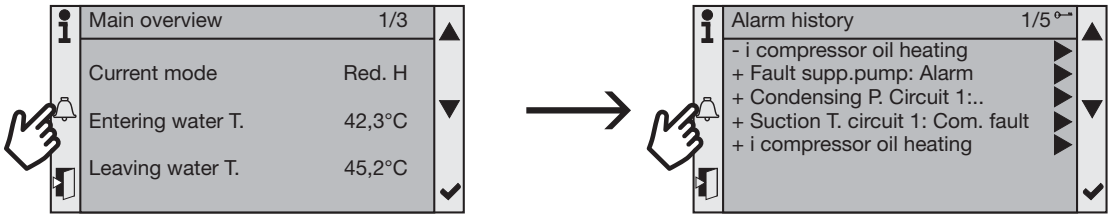

This menu allows advanced configuration of the unit to proceed:

- Configuration of fans, pumps, certain delays relating to the protection of compressors, digital inputs D1 and D2
- Manual activation of fans, pumps and reversing valves
- Settings for the conditions for initiating and stopping the defrost cycle
- Reading of operating hours
- Compressor logging
- Saving and loading of parameters
- Recovery of archives

**CAUTION** This menu is restricted to qualified personnel. Training in operation and control of ECOi-W units is recommended before using this menu.

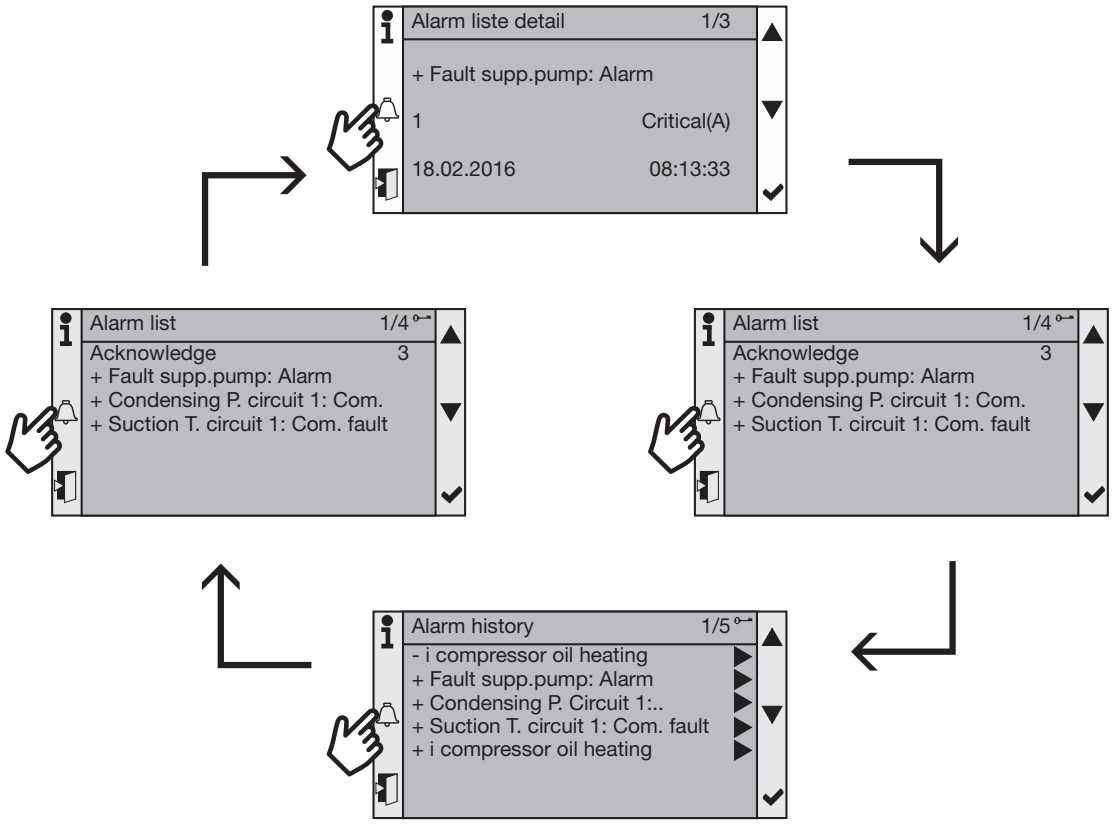
## 9.7. Alarms menu

If no alarm is active, pressing the “Alarm” button takes you to the alarm history




If at least one alarm or warning is active, the alarm button flashes. Pressing the “alarm” button, will display successively:

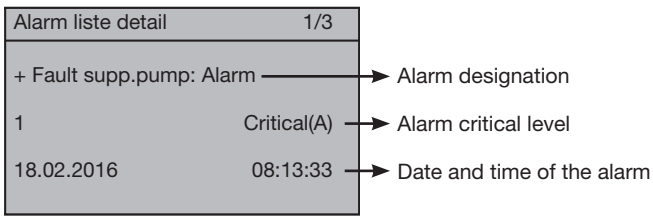
- The last active alarm
- The list of active alarms
- The alarms history
- The Alarms menu




### 9.7.1. Alarm details

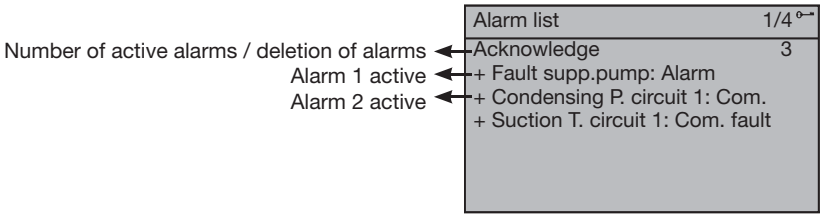
This page displays:

- Details of the last active alarm
- Details of an alarm in the list of active alarms
- Details of an alarm in the alarms history

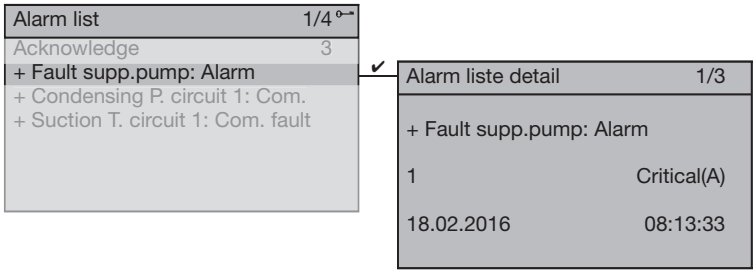


### 9.7.2. The list of active alarms

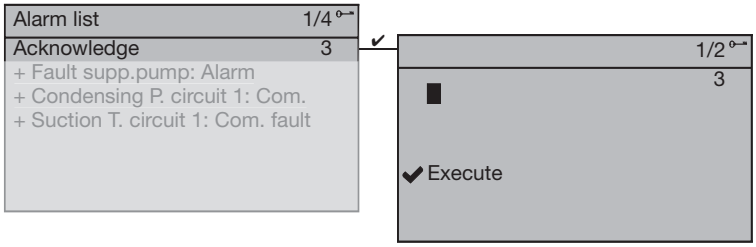
The list of active alarms allows visualization of current alarms
The first line shows the number of active alarms (3 in the example below)




You can access the alarm details by selecting an alarm and pressing the "Enter" button ✔.



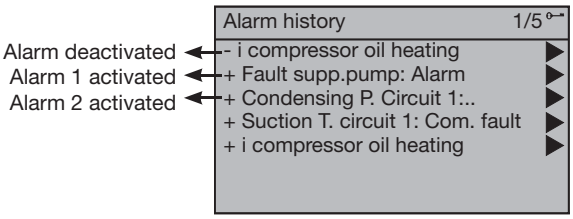

With installation or maintenance level access, you can acknowledge active blocking alarms. To do this select delete, confirm and select "Execute". Only the alarms that are no longer active will be deleted from the list.




### 9.7.5. Alarms history

This history reports the 50 most recent activation and deactivation of alarms:

- Activation of an alarm will be indicated by “+”
- Deactivation of an alarm will be indicated by “-”




For the activation and deactivation time of an alarm, select the alarm and press the "enter" button ✔.

### 9.7.3. Alerts history

This history allows visualization of the alerts that placed the unit in safeguard. It has the same structure as the alarms history.

### 9.7.4. Alarms menu

The information displayed in the alarms menu depend on the access level.

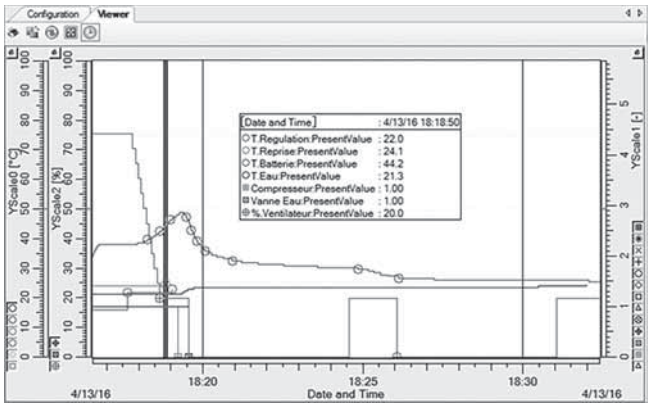
| User | Installer | Maintenance | Alarms | | |
|---|---|---|---|---|---|
| | | ✘ | EventHistory | 0 | Display the events history |
| | ✘ | ✘ | AlarmSnapshot | 12 | Display unit state in the case of alarms |
| ✘ | ✘ | ✘ | +Alarm list: | 11 | Access the list of active alarms |
| | ✘ | ✘ | Sort order 1 | Time | Primary classification of active alarms |
| | ✘ | ✘ | Sort order 2 | Time | Secondary classification of active alarms |
| | ✘ | ✘ | Descending order | Passive | Classification direction of active alarms |
| ✘ | ✘ | ✘ | +Alarm history | | Access the alarms history |
| | | ✘ | Reset | 50 | Reset the alarms history |
| | ✘ | ✘ | Sort order 1 | Time | Primary classification of the alarms history |
| | ✘ | ✘ | Sort order 2 | Time | Secondary classification of the alarms history |
| | ✘ | ✘ | Descending order | Passive | Classification direction of the alarms history |
| | | ✘ | +Eventhistory | | Access the events history |
| | | ✘ | Reset | 0 | Reset the events history |
| | | ✘ | Sort order 1 | Time | Primary classification of the events history |
| | | ✘ | Sort order 2 | Time | Secondary classification of the events history |
| | | ✘ | Descending order | Active | Classification direction of the events history |

# 10. Automatic archiving

## 10.1. Saving archives

The controller registers the main variables of the unit.
The values are recorded according to the principle of the circular buffer.
The SIEMENS software “SCOPE Light” allows recovery of the records, to display them in graphical form and to export them in csv format.

To maximize the duration of the archived period, variables are recorded separately and only when their value changes by a certain amount (shown below as VOC - Change Of Value).




The variable saved are:

| Variable | Unit | COV | Archive filename | ObjectID | |
|---|---|---|---|---|---|
| | | | | 20 to 125 | 140 to 210 |
| Number of active alarms | - | 1 | AlarmList-CountEntries.csv | | 0x0025 0x00000002 |
| Alarms report:<br>Alarm<br>bit 1: time invalid<br>bit 2: flowswitch & pumps circuit beaker<br>bit 5: frost protection<br>Lock-out<br>bit 6: flowswitch | enum | 1 | AlmUnit-PresentValue.csv | | - |
| Alarms report:<br>Alarm<br>bit 1: time invalid<br>bit 2: flowswitch<br>bit 3: pump 1 circuit breaker<br>bit 4: pump 2 circuit breaker<br>bit 5: frost protection<br>Lock-out<br>bit 6: flowswitch | enum | 1 | AlmUnit-PresentValue.csv | - | 0x230A 0x028CAE77 |
| Digital input D1:<br>0 = OFF<br>1 = ON | enum | 1 | Cmn.SwiMn-PresentValue.csv | | 0x2204 0x89288CAA |
| Digital input D2:<br>0 = OFF<br>1 = ON | enum | 1 | Cmn.SwiHtg-PresentValue.csv | | 0x2204 0x8928E10D |
| HMI operating status:<br>0 = auto<br>1 = OFF<br>2 = ON<br>3 = Reduced mode<br>4 = Load shedding | enum | 1 | OpModHMI-PresentValue.csv | | 0x2302 0x028C18D0 |
| HMI operating mode:<br>0 = auto-changeover<br>1 = cooling<br>2 = heating | enum | 1 | ChoHMI-PresentValue.csv | | 0x2302 0x028C7307 |
| BMS operating status:<br>0 = auto<br>1 = OFF<br>2 = ON<br>3 = Reduced mode<br>4 = Load shedding | enum | 1 | OpModCom-PresentValue.csv | | 0x2302 0x028CEC43 |
| BMS operating mode:<br>0 = auto-changeover<br>1 = cooling<br>2 = heating | enum | 1 | ChoCom-PresentValue.csv | | 0x2302 0x028C8794 |
| control of operating status:<br>0 = time scheduler program<br>1 = HMI emergency OFF<br>2 = D1 input<br>3 = D2 reduced mode<br>4 = D2 load shedding<br>5 = HMI<br>6 = BMS | enum | 1 | OpModRsn-PresentValue.csv | | 0x230B 0x028CEE6D |
| control of operating mode:<br>0 = time scheduler program<br>1 = D2 input<br>2 = HMI<br>3 = BMS | enum | 1 | ChoRsn-PresentValue.csv | | 0x230B 0x028C85BA |

| Variable | Unit | COV | Archive filename | ObjectID | |
|---|---|---|---|---|---|
| | | | | 20 to 125 | 140 to 210 |
| actual operating status:<br>0 = auto<br>1 = OFF<br>2 = ON<br>3 = Reduced mode<br>4 = Load shedding | enum | 1 | CapCtl.OpMCmd-PresentValue.csv | | 0x230B 0x549F00A5 |
| actual operating mode:<br>0 = OFF<br>1 = cooling<br>2 = cooling reduced mode<br>3 = cooling load shedding<br>4 = heating<br>5 = heating reduced mode<br>6 = heating load shedding | enum | 1 | CmnOpMod-PresentValue.csv | | 0x230B 0x028C88A7 |
| Preheat phase:<br>0 = over<br>1 = on-going | | | Dsp.Htr-PresentValue.csv | | 0x2207 0x89285092 |
| Load | % | 10 | CapCtl.Req-PresentValue.csv | | 0x230A 0x549F42E2 |
| Capacity | % | 10 | PdcMgmt.PrCap-PresentValue.csv | | 0x230A 0x549F1E45 |
| **Unit** | | | | | |
| Outer Air Temperature | °C | 2 | Cmn.TOa-PresentValue.csv | | 0x2203 0x8928D53C |
| Entering Water Temperature | °C | 1 | Dsp.TRt-PresentValue.csv | | 0x2203 0x8928AA16 |
| Leaving Water Temperature | °C | 1 | Dsp.TSu-PresentValue.csv | | 0x2203 0x89288906 |
| Cooling mode setpoint | °C | 1 | CapCtlSet.TSuC-PresentValue.csv | | 0x2301 0x028CF3B4 |
| Heating mode setpoint | °C | 1 | CapCtlSet.TSuH-PresentValue.csv | | 0x2301 0x028C42DF |
| Flowswitch state:<br>0 = NOK<br>1 = OK | enum | 1 | Dsp.FlDet(Cnt)-PresentValue.csv | | 0x2204 0x8928AD74 |
| **Circuit 1** | | | | | |
| Alarms report:<br>Alarm<br>bit 0: refrigerant leakage<br>bit 1: comp.1 circuit breaker<br>bit 2: comp.2 circuit breaker<br>bit 3: fans circuit breaker<br>bit 4: HP switch<br>Lock-out<br>bit 5: fans circuit breaker<br>bit 6: LOP<br>bit 7: MOP<br>bit 8: HPmin<br>bit 9: PRmin<br>bit 10: PRmax<br>bit 11: deice for low BP<br>bit 12: discharge temp. | enum | 1 | AlmPdc-PresentValue.csv | | 0x230A 0x028C4FBD |
| Mode:<br>1 = OFF<br>2 = cooling<br>3 = heating<br>4 = deice | enum | 1 | RfCrt.OpMCmd-PresentValue.csv | | 0x230B 0x738A0BB3 |
| Transition:<br>0 = inactive<br>1 = startup<br>2 = shutdown<br>3 = rapid shutdown<br>4 = capacity increase<br>5 = capacity decrease<br>6 = auto-changeover switch<br>7 = deice cycle start<br>8 = deice cycle end | enum | 1 | RfCrt.TraCmd-PresentValue.csv | | 0x230B 0x738AEE6A |
| Priority:<br>2 = OFF<br>5 = protection, deice<br>15 = normal operation | enum | 1 | RfCrt.OpMCmdPrio-PresentValue.csv | | 0x230C 0x738A5618 |
| Compressor 1 state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc.Cpr1-PresentValue.csv | | 0x2207 0x8928E4DA |
| Compressor 2 state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc.Cpr2-PresentValue.csv | | 0x2207 0x8928D4B9 |
| EEV position | % | 5 | Pdc.ExpsVlv.PrVal-PresentValue.csv | | 0x2203 0x89287D3E |
| Crankcase heater state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc.OilHtr-PresentValue.csv | | 0x2207 0x892874A8 |
| Condensing pressure | bar | 2 | Pdc.PCdn-PresentValue.csv | | 0x2203 0x8928FA9B |
| Evaporating pressure | bar | 0.5 | Pdc.PEvp-PresentValue.csv | | 0x2203 0x8928DED5 |

| Variable | Unit | COV | Archive filename | ObjectID | |
|---|---|---|---|---|---|
| | | | | 20 to 125 | 140 to 210 |
| Reverse valve state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc.RvrVlv-PresentValue.csv | | 0x2207 0x89286A0D |
| Superheat | K | 2 | Pdc.SHFil-PresentValue.csv | | 0x2203 0x8928F983 |
| Fan state:<br>1 = OFF<br>2 = Stage 1<br>3 = Stage 2 | enum | 1 | Pdc.SrcFan-PresentValue.csv | | 0x2208 0x89286DBE |
| Condensing temperature | °C | 2 | Pdc.TCdn-PresentValue.csv | | 0x2203 0x8928306A |
| Discharge temperature | °C | 2 | Pdc.TDcrgGas-PresentValue.csv | | 0x2203 0x8928C81A |
| Evaporating temperature | °C | 2 | Pdc.TEvp-PresentValue.csv | | 0x2203 0x89281424 |
| Coil temperature | °C | 2 | Pdc.TSrcExg-PresentValue.csv | | 0x2203 0x8928A075 |
| Suction temperature | °C | 2 | Pdc.TSuctGas-PresentValue.csv | | 0x2203 0x89285F30 |
| **Circuit 2** | | | | | |
| Alarms report:<br>Alarm<br>bit 0: refrigerant leakage<br>bit 1: comp.1 circuit breaker<br>bit 2: comp.2 circuit breaker<br>bit 3: fans circuit breaker<br>bit 4: HP switch<br>Lock-out<br>bit 5: fans circuit breaker<br>bit 6: LOP<br>bit 7: MOP<br>bit 8: HPmin<br>bit 9: PRmin<br>bit 10: PRmax<br>bit 11: deice for low BP<br>bit 12: discharge temp. | enum | 1 | AlmPdc2-PresentValue.csv | | 0x230A 0x028C123A |
| Mode:<br>1 = OFF<br>2 = cooling<br>3 = heating<br>4 = deice | enum | 1 | RfCrt.OpMCmd-PresentValue.csv | N.A. | 0x230B 0xD2E50BB3 |
| Transition:<br>0 = inactive<br>1 = startup<br>2 = shutdown<br>3 = rapid shutdown<br>4 = capacity increase<br>5 = capacity decrease<br>6 = switch<br>7 = deice cycle start<br>8 = deice cycle end | enum | 1 | RfCrt.TraCmd-PresentValue.csv | N.A. | 0x230B 0xD2E5EE6A |
| Priority:<br>2 = OFF<br>5 = protection, deice<br>15 = normal operation | enum | 1 | RfCrt.OpMCmdPrio-PresentValue.csv | N.A. | 0x230C 0xD2E55618 |
| Compressor 1 state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc2.Cpr1-PresentValue.csv | N.A. | 0x2207 0x8928E9D3 |
| Compressor 2 state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc2.Cpr2-PresentValue.csv | N.A. | 0x2207 0x8928D9B0 |
| EEV position | % | 5 | Pdc2.ExpsVlv.PrVal-PresentValue.csv | N.A. | 0x2203 0x89287A04 |
| Crankcase heater state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc2.OilHtr-PhysicalValue.csv | N.A. | 0x2207 0x892893DD |
| Condensing pressure | bar | 2 | Pdc2.PCdn-PresentValue.csv | N.A. | 0x2203 0x8928F792 |
| Evaporating pressure | bar | 0.5 | Pdc2.PEvp-PresentValue.csv | N.A. | 0x2203 0x8928D3DC |
| Reverse valve state:<br>0 = OFF<br>1 = ON | enum | 1 | Pdc2.RvrVlv-PresentValue.csv | N.A. | 0x2207 0x89288D78 |
| Superheat | K | 2 | Pdc2.SHFil-PresentValue.csv | N.A. | 0x2203 0x8928212E |
| Fan state:<br>1 = OFF<br>2 = Stage 1<br>3 = Stage 2 | enum | 1 | Pdc2.SrcFan-PresentValue.csv | N.A. | 0x2208 0x89288ACB |
| Condensing temperature | °C | 2 | Pdc2.TCdn-PresentValue.csv | N.A. | 0x2203 0x89283D63 |
| Discharge temperature | °C | 2 | Pdc2.TDcrgGas-PresentValue.csv | N.A. | 0x2203 0x89286F0D |
| Evaporating temperature | °C | 2 | Pdc2.TEvp-PresentValue.csv | N.A. | 0x2203 0x8928192D |
| Coil temperature | °C | 2 | Pdc2.TSrcExg-PresentValue.csv | N.A. | 0x2203 0x892858BC |
| Suction temperature | °C | 2 | Pdc2.TSuctGas-PresentValue.csv | N.A. | 0x2203 0x8928F827 |

## 10.2. Format of CSV archive files

CSV archive files are of ASCII type and use the ";" as separator.
The first line of the file contains the characteristics of the saved file:

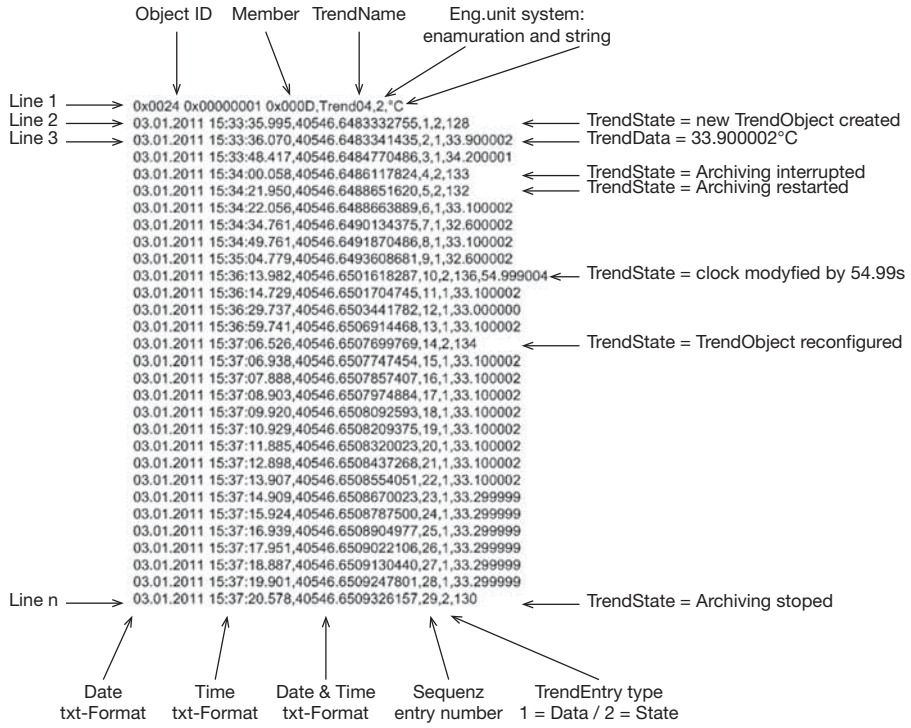
| Field | Description |
|---|---|
| **1** | Internal variable of the record |
| **2** | Internal name of the record |
| **3** | Engineering unit system enumeration: 2 = Metric, 3 = Imperial |
| **4** | Engineering unit system string |

The following lines contain the values:

| Field | Description |
|---|---|
| **1** | Time in the format YYYY-MM-DD HH: MM: SS, mmm |
| **2** | Time in the format OLE |
| **3** | Record number (starts at 1) |
| **4** | Record type: 1 = TrendData, 2 = TrendState |
| **5** | Value of the record |

If the record is of type 1 (TrendData), field 5 contains a decimal value expressed in the specified unit system.
If the record is of type 2 (TrendState), field 5 contains coded information:

| Value | Description |
|---|---|
| **128** | Creation of a new Trend object |
| **129** | Start of archiving |
| **130** | End of archiving |
| **131** | Deletion of archives |
| **132** | Re-start of the controller following interruption (recommencement of archiving) |
| **133** | Stoppage of archiving due to a power failure or reset of the controller |
| **134** | Archiving reconfigured |
| **135** | Invalid input |
| **136** | Controller clock was modified. The value indicates the offset in seconds |

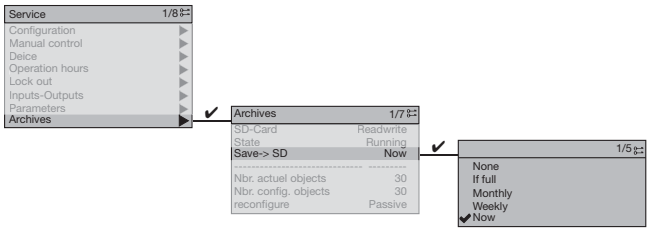


## 10.3. Recovery of archives with SD card

The saved archives can be recovered with a standard SD card. The procedure is:

1. Put the SD card in Read/Write mode
2. Insert the SD card into the controller

3. Access “Maintenance” then go to the menu “Maintenance ➤ Archives ➤ Save -> SD”
4. Press on “Now”
5. During the archive recovery, the message “Now” is displayed.
6. When the recovery has finished, the message “Now” is no longer displayed.
7. Recover the SD card




The archive files are in .csv format. The files are arranged in a chronological tree:

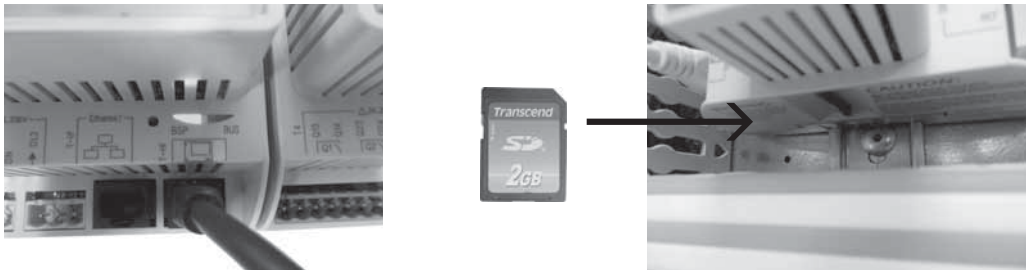
# 11. Management of site and application parameters

## 11.1. Saving parameters on an SD card

The unit parameters can be recovered with a standard SD card. This conserves a copy of the settings made during commissioning or after an intervention. The procedure is specific according to the controller type.

### 11.1.1. 20 to 125 models

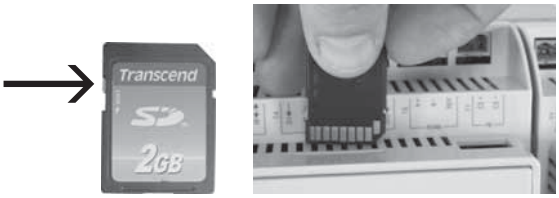
1. Prepare an SD card in Read/Write mode
2. With the controller in operation (LED BSP lit continuously in green) insert the SD card, remove it and reinsert it (wait 1s between each movement and less than 5s for the whole procedure)



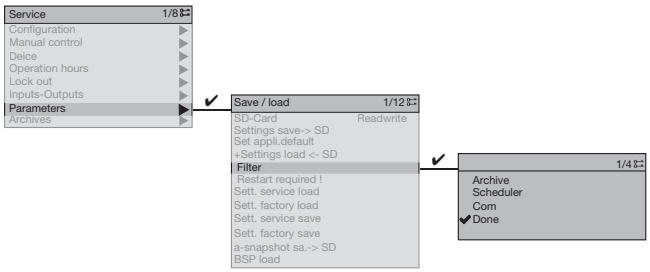

3. Wait 5s and recover the SD card. The parameter file is on the SD card

### 11.1.2. 140 to 210 models

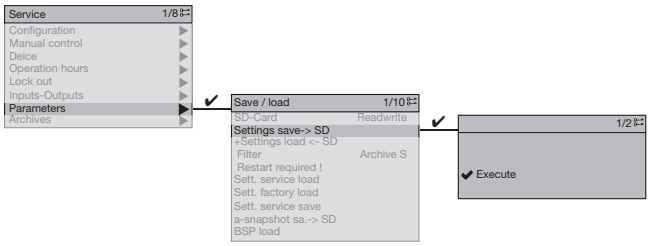
1. Insert the SD card (in Read/Write mode), into the controller



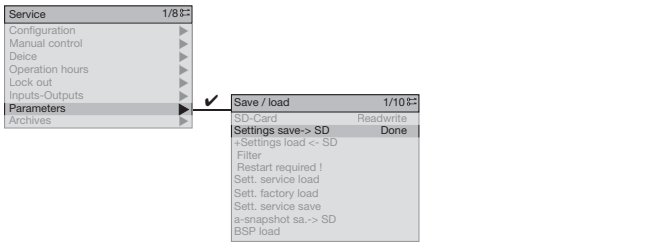

2. Access “Maintenance” then go to the menu “Service” ➤ Parameters ➤ Filter”. Select the archives, the scheduling and the communication and press Done

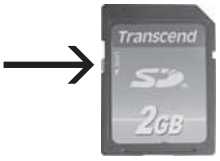



3. Select “Settings save -> SD”
4. Press “Execute”




5. When the save is completed, the message “Done” is displayed
6. Recover the SD card
7. Put the SD card in read only mode



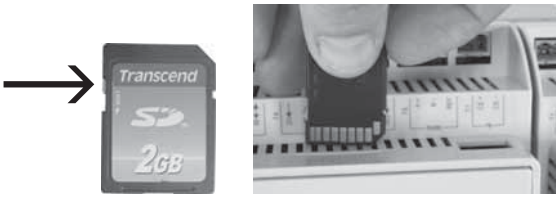



## 11.2. Reloading parameters from an SD card

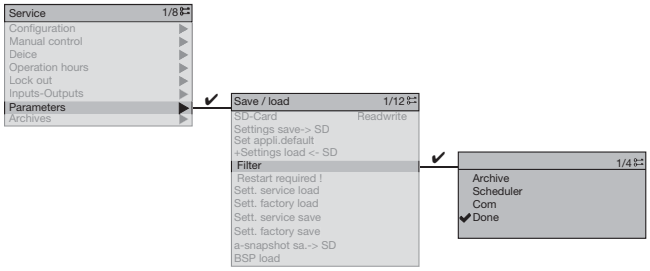
The unit parameters contained on an SD card can be applied to a controller.

**CAUTION** The SD card must contain only one parameter file.

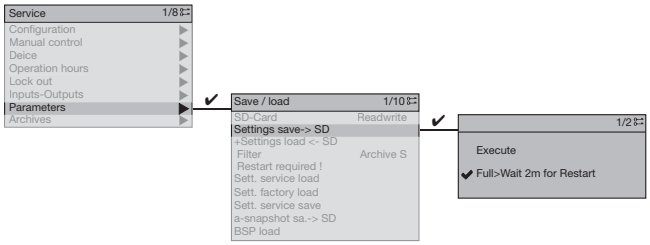
1. Insert the Read Only SD card into the controller



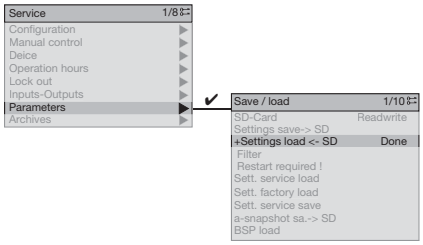

2. Access “Maintenance” then go to the menu “Maintenance” ➤ Parameters ➤ Filter”. Select the archives, the scheduling and the communication and press Done



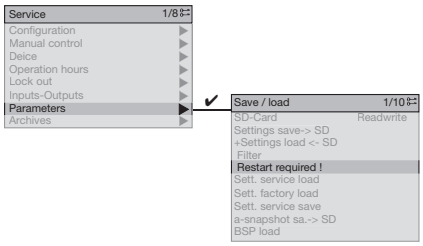

3. Access “Maintenance” then go to the menu “Maintenance” ➤ Save / load ➤ Setting Load <- “
4. Press “Full>Wait 2m for Restart”




5. When the loading is completed, the message “Done” is displayed




6. Wait 2min then press “Restart required”
7. Recover the SD card



## 11.3. Reprogramming the controller with an SD card

It is possible to re-program all or part of the controller using an SD card. It should contain the following files depending on the intended reprogramming:

| Reprogramming | File |
|---|---|
| **Heat control (principal program)** | MBRTcomp.ucf |
| **Languages dictionary and network variables** | OBHcomp.ucf |
| **Loaded and remote display** | HMIcomp.ucf |
| **Display web version** | HMI4Web.ucf |
| **Projet ScopeLight** | ScopeConfig.ucf |

**CAUTION** It is recommended to use 2 SD cards:

- Card SD N°1: in Read/Write, intended for reprogramming
- Card SD N°2: in Read Only, intended for reloading parameters

**CAUTION** Reprogramming overwrites the previous configuration. Prior to reprogramming it is recommended to save the parameter settings on an SD card (Refer to the § “Saving parameters on an SD card”, page 41

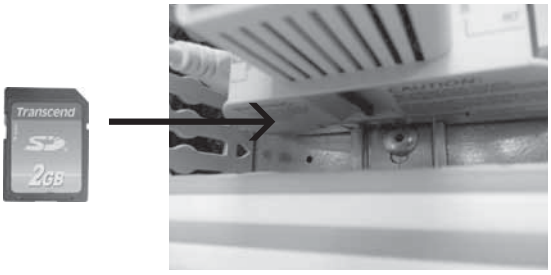
The procedure is specific according to the controller type.

### 11.3.1. 20 to 125 models

The reprogramming procedure:

1. Put the SD card SD N°1 in Read/Write mode
2. Switch on the controller and wait until the LED is green

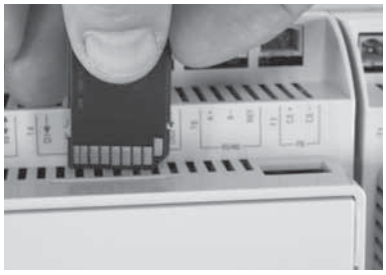
3. Insert the SD card N°1 for 1sec, remove it, then insert it again. The red / green flashing indicates that the controller is reprogramming
4. Wait until the LED is orange then switch off the controller
5. Switch on the controller again and recover the SD card N°1
6. Insert the SD card N°2 and load the parameters using the password 6000 (Refer to the § “Reloading parameters from an SD card”, page 42)



**11.3.2. 140 to 210 models**

The reprogramming procedure:

1. Put the SD card SD N°1 in Read/Write mode
2. Switch on the controller and insert the SD card N°1



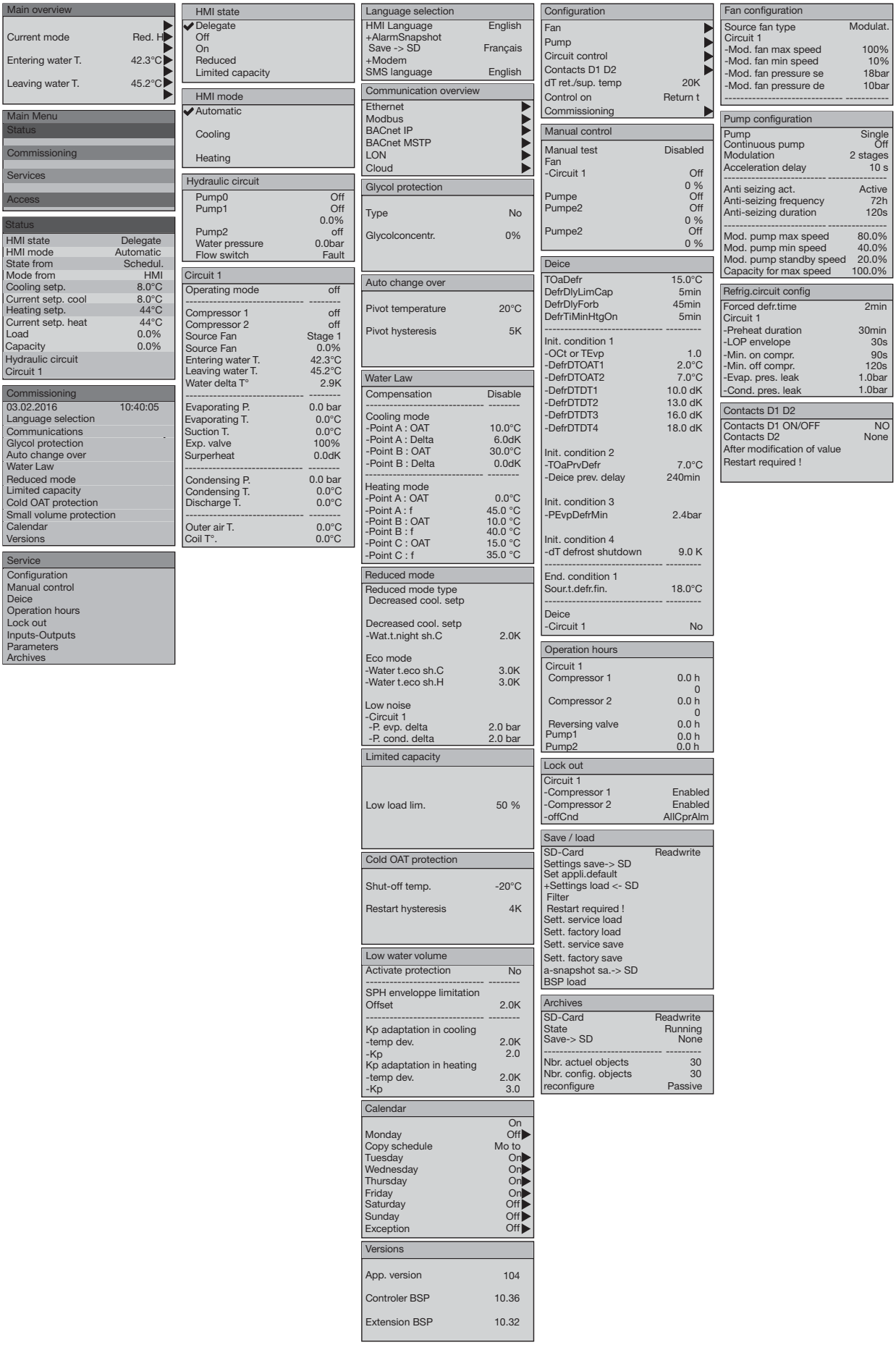

3. Press the reset button with a thin rod

4. Keep the reset button depressed and turn on the controller. The red / green flashing indicates that the controller is reprogramming. The reset button can be released

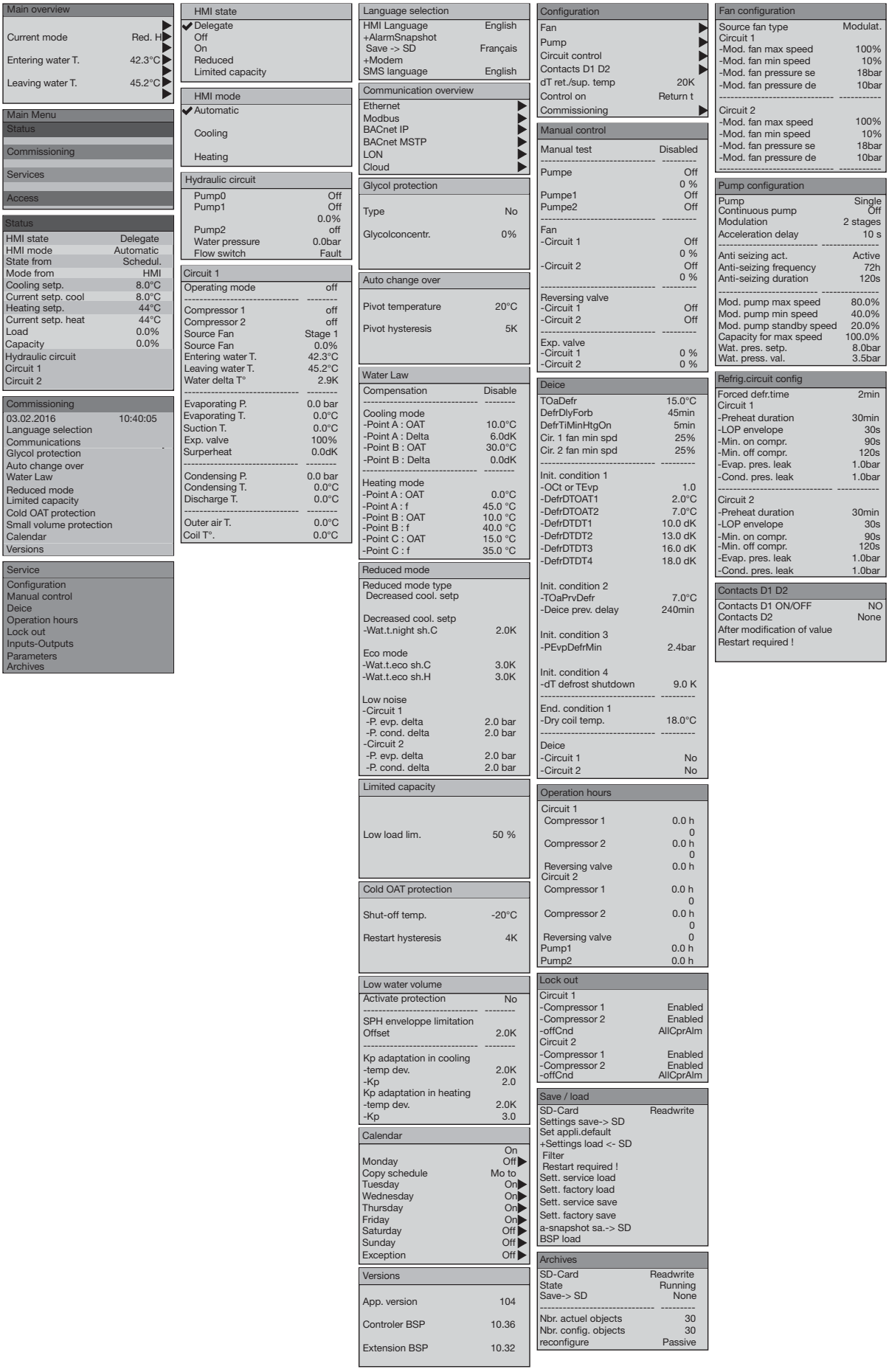
5. Wait until the LED is orange then switch off the controller
6. Switch on the controller and recover the SD card N°1
7. Insert the SD card N°2 and load the parameters using the password 6000 (Refer to the § “Reloading parameters from an SD card”, page 42)

# 12. Overview of the HMI

## 12.1. 20 to 125 models



## 12.2. 140 to 210 models



# 13. List of warning and alarms

| Message | Type | Definition | Desc. |
|---|---|---|---|
| 3phdet | alarm | Phase controller | §8,7 |
| Cpr1.inAlarm | alarm | Fault in the digital output of compressor 1 | §8,7 |
| Cpr2.inAlarm | alarm | Fault in the digital output of compressor 2 | §8,7 |
| DefrDTReq | warning | Defrosting by delta T | §8,10 |
| DefrDTShdnReq | warning | Defrosting prior to circuit stop | §8,10 |
| DefrFnsTSu | warning | Defrosting stopped due to cold water temperature | §8,10 |
| DefrPEvpReq | warning | Defrosting by low evaporation pressure | §8,10 |
| DefrPEvpReqCnt | lock-out | Defrosting by low evaporation pressure | §8,10 |
| DefrTiOut | warning | Defrosting stopped because overlong | §8,10 |
| ExpsVlv.inAlarm | alarm | Fault of the analog output of the controller | §8,7 |
| FlDet/FlDet1/FlDet2 | alarm | Flowswitch | §8,2 |
| FlDetCnt | lock-out | Flowswitch | §8,2 |
| FltCpr1 | alarm | Compressor 1 circuit breaker | §8,3 |
| FltCpr2 | alarm | Compressor 2 circuit breaker | §8,3 |
| FltDeltaT | warning | Offset (LWT-EWT) | §8,2 |
| FltSrcFan | alarm | Fan circuit breaker | §8,4 |
| FltSrcFanCnt | lock-out | Fan | §8,4 |
| FltSuPu | alarm | Single pump circuit breaker | §8,5 |
| FltSuPu1 | alarm | Dual pump n°1 circuit breaker | §8,5 |
| FltSuPu2 | alarm | Dual pump n°2 circuit breaker | §8,5 |
| FrPrt | alarm | Anti-freeze protection | §8,2 |
| FrPrtWarn | warning | Anti-freeze protection | §8,2 |
| HPDet | alarm | HP pressure switch | §8,3 |
| HPMax | warning | Max. condensation pressure | §8,3 |
| HPmaxPrt | warning | Max. condensation pressure protection | §8,3 |
| HPMin | warning | Min. condensation pressure | §8,3 |
| HPMinCnt | lock-out | Min. condensation pressure | §8,3 |
| LOP | warning | Min. evaporation pressure | §8,3 |
| LOPCnt | lock-out | Min. evaporation pressure | §8,3 |
| LOPPrt | warning | Min. evaporation pressure | §8,3 |
| MOP | warning | Max. evaporation pressure | §8,3 |
| MOPCnt | lock-out | Max. evaporation pressure | §8,3 |
| NoCprAvl | warning | No compressor available | |
| OilHtr.inAlarm | alarm | Fault of the digital output of the carter resistors | §8,7 |
| OilHtrStup | warning | Unit preheating | §5,7 |
| PCdn.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| PCdn.openLoop | alarm | Sensor in open loop | §8,6 |
| PCdn.shortedLoop | alarm | Sensor shorted | §8,6 |
| PEvp.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| PEvp.openLoop | alarm | Sensor in open loop | §8,6 |
| PEvp.shortedLoop | alarm | Sensor shorted | §8,6 |
| PRmax | warning | Max. pressure ratio | §8,3 |
| PRMaxCnt | lock-out | Max. pressure ratio | §8,3 |
| PRmin | warning | Min. pressure ratio | §8,3 |
| PRMinCnt | lock-out | Min. pressure ratio | §8,3 |
| RfgLoLvl | alarm | Coolant leak | §8,7 |
| RvrVlv.inAlarm | alarm | Fault in the analog output of the inverter valve | §8,7 |
| SH.LowLim | warning | Low overheating | §8,3 |
| SrcFan.inAlarm | alarm | Fault of the digital output of the fans | §8,7 |

| Message | Type | Definition | Desc. |
|---|---|---|---|
| TDcrgGas.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| TDcrgGas.openloop | alarm | Sensor in open loop | §8,6 |
| TDcrgGas.shortedloop | alarm | Sensor shorted | §8,6 |
| TDcrHiAlmCnt | lock-out | Backflow temperature | §8,3 |
| TiInvld | warning | Invalid time | §8,1 |
| TOa.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| TOa.openloop | alarm | Sensor in open loop | §8,6 |
| TOa.shortedLoop | alarm | Sensor shorted | §8,6 |
| TOAPrevDefrReq | warning | Delayed defrosting | §8,10 |
| TRt.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| TRt.openloop | alarm | Sensor in open loop | §8,7 |
| TRt.shortedLoop | alarm | Sensor shorted | §8,6 |
| TSrcExg.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| TSrcExg.openloop | alarm | Sensor in open loop | §8,6 |
| TSrcExg.shortedloop | alarm | Sensor shorted | §8,6 |
| TSu.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| TSu. openloop | alarm | Sensor in open loop | §8,6 |
| TSu.shortedLoop | alarm | Sensor shorted | §8,6 |
| TSuctGas.inAlarm | alarm | Fault in the sensor analog input | §8,6 |
| TSuctGas.openloop | alarm | Sensor in open loop | §8,6 |
| TSuctGas.shortedloop | alarm | Sensor shorted | §8,6 |
| FltHyCrt | alarm | Hydraulic | |
| FltHyCrtCnt | lock-out | Hydraulic | |

## Notes

## Notes

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