MAKING MODERN LIVING POSSIBLE

MCX Residential Heat Pump Controller user manual

Achieve the highest efficiency of your Residential Heat Pump with minimal effort

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1.0 Introduction

The algorithm here below described allows the management of Air/Water, Water/Water, Brine/Water residential heat pumps.

The main algorithm's functions are as follows:

- 3 heating circuits (prepared for maximum 6);
- DHW preparation with optional flange heater management;
- DHW disinfection;
- auxiliary tank heater;
- graphic time programs for rooms and DHW control;
- return flow temperature regulation;
- setpoint of circuits water flow defined by heating curves or fixed;
- frost protection;
- balanced compressors management;
- history of alarms with time and date of set and reset.

Because of the algorithm capability to manually assign inputs and outputs according to the unit's features to control, it is suitable to be executed in all MCX electronic controllers.

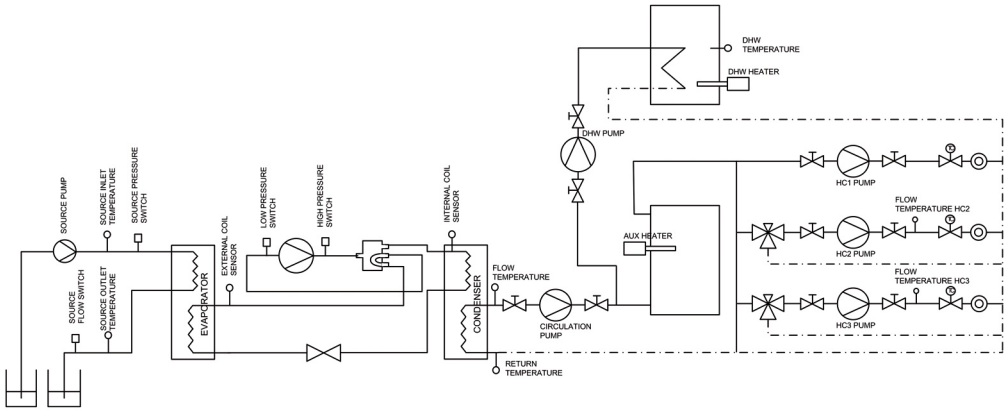


Fig 1 [Introduction - Heat pump]

2.0 User interface

2.1 Power up

Parameters

GEN			General
	POU		Power up
		Log	Logo
		vEr	Parameters version
		rst	Restart mode after power-OFF
		OdL	Actuators delay from power-ON

Tab 1 [User interface - Power up - Parameters]

At power up the following information are shown for 5 second:

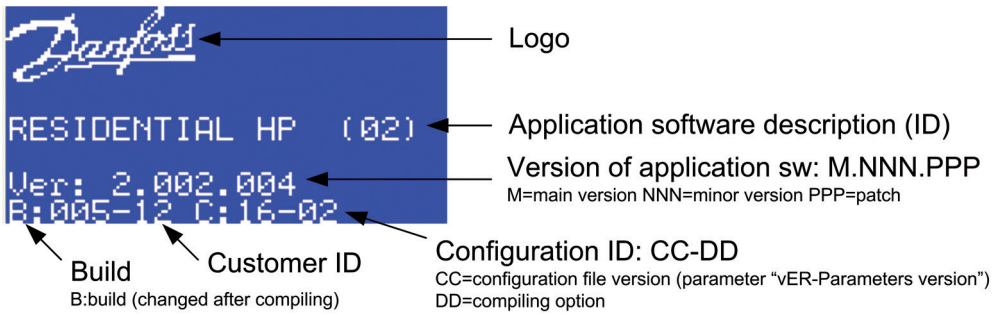


Fig 2 [User interface - Power up]

With parameter "Log-Logo" is possible to define the logo to be shown on the screen at power up. Possible selections are:

NO: no logo is shown
1. logo "StartLogoDX_1.bmp" inside the folder "BIN\Graph" is shown.
2. logo "StartLogoDX_2.bmp" inside the folder "BIN\Graph" is shown.
3. logo "StartLogoDX_3.bmp" inside the folder "BIN\Graph" is shown.

The unit status at power up is defined with parameter "rst- Restart mode after power-OFF". Possible selections are:

OFF, ON, EQUA.
If rst=EQUA then the unit will start in the same mode as it was before powering OFF.

The delay of output activation after power up is set with "OdL- Actuators delay from power-ON".

2.2 Turning ON and OFF

Parameters

GEN			General
	StU		Setup
		y01	System ON/OFF

Tab 2 [User interface - Turning ON and OFF - Parameters]

Input/Output
Digital Input

ONO	Main Switch

Unit turning ON and OFF can be done as follow:

- by menu: Start -> Turn ON and Turn OFF, (see 2.5 "Menu navigation");
- by parameter y01;
- by "Main Switch" digital input, if present;

Note

all the above ways can turn OFF the unit. To turn it ON the digital input must be closed.
If the digital input has been configured to have "Polarity=Close" (default setting), it means that the input is in the OFF state when it is open;

- by supervisor.

Turning OFF
When the controller has been turned OFF, then all the output are deactivated (respecting all the protection times).
OFF condition is evident through "OFF" sign on the display A or "IOFF" if the "Main Switch" digital input is active; display B keeps the value it was already showing, (see 3.0 "Unit configuration").

In case of OFF condition, the following functions are active by default (you can define through the MCXShape software configurator tool which alarms are active in the OFF state):

- frost protection;
- fault probe alarm management.

Turning ON
Turning ON the unit you get access to the main screen.

2.3 Heat/cool selection

Parameters

GEN			General
	StU		Setup
		y03	System heat/cool

rEV			Reversing valve
	CFV		Configuration
		rE2	Enable changeover from keyboard
		rE3	Enable changeover from out temp
		rE4	Changeover differential

Tab 3 [Heat/cool selection - Heat/cool selection - Parameters]

Input/Output

Digital Input

HC	Heat/Cool

Digital Output

HC1	Reverse Valve

Analog Input

OUt	Outdoor Temperature

On heat pump units fitted with a 4 way changeover valve on the gas circuit, the selection between heating and cooling mode is performed in the following ways:

- from menu Start -> Heat/Cool, if enabled by rE2;
- from **y03** parameter, if enabled by rE2;
- from "Heat/Cool" digital input, if present;

Note

if the digital input has been configured to have "Polarity=Close" (default setting), it means that the input is in cooling mode when it is closed;

- from "Outdoor Temperature" analog input, if enabled by rE3, comparing the outdoor temperature with a setpoint of reference **rE3**.

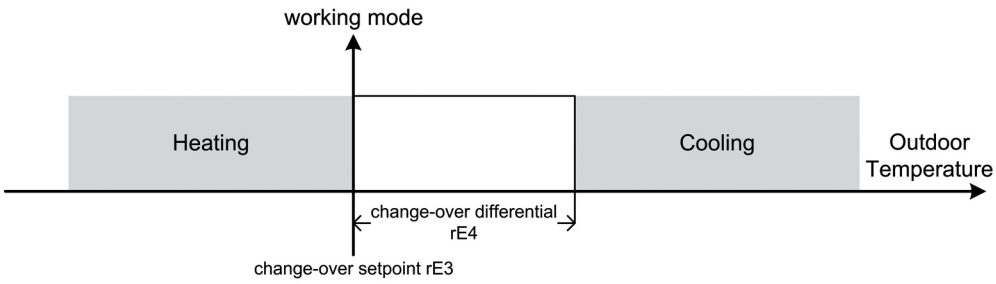


Fig 3 [User interface - Input/Output]

The priority order, from the higher to the lower level, is the following:

1. Automatic via outdoor temperature measurement.
2. Manual via the keyboard (via menu or y03 parameter).
3. Manual via the "Heat/Cool" digital input.

A request of automatic changeover has the priority on all the others.

Whatever the selected mode is, it is always shown on display with the corresponding icon; the ice icon, if unit is in heating mode, or the sun icon if it is in cooling mode.

2.4 Main screen

Parameters

GEN			General
	dSP		Display
		dSA	Display A value
		dSb	Display B value
		rOL	Show rolling text
		LBr	Low brightness
		Hbr	High brightness

Tab 4 [Heat/cool selection - Main screen - Parameters]

From the main screen, pressing the key you go to the menu described in the next chapter.

The main screen is different for the LED version and for LCD version.

2.4.1 LED display

Fig 4 [User interface - LED display]

The measures displayed on A and B displays are selectable by parameter dSA and dSb. Selectable values are:

- OFF: no values;
- IdOF: status of the "ON/OFF" digital input;
- SEt: active setpoint;
- rEG: analog input used for temperature regulation.
  (See 5.2 "Heat pump controlled temperature definition").

The value of the probe used for temperature regulation and the active setpoint are shown by default.

The meaning of all the icons is explained in the above figure.
An icon associated to an actuator follows its request status. The icon blinks when the actuator can't change its status because of protection times (fast blinking means a request to turn it OFF; slow blinking means a request to turn it ON).

The alarm and warning icon are associated to the alarm and warning output.

2.4.2 LCD display

On the main screen the following data are displayed:

- the main analog inputs measurements or other information, (see display A and display B on the LED display version);
- the ice icon, if unit is in heating mode, or the sun icon if it is in cooling mode together with the icons of the main active elements: from left to right:
  - source pump or fan;
  - 1 compressor running;
  - 2 compressors running;
  - DHW heater;
  - DHW pump;
  - circulating pump;
  - circuit 1pump;
  - circuit 2 pump;
  - circuit 3 pump;
- the alarm or service icon;
- the status mode icons, (see 2.5.2 “Set working mode”).

The icon blinks when the actuator can’t change its status because of protection times.

Display brightness
Is possible to define the brightness of LCD display when it is in use (parameter “Hbr-High brightness”) and after 5s without pressing any key (parameter “LBr-Low brightness”).

2.4.3 Rolling text

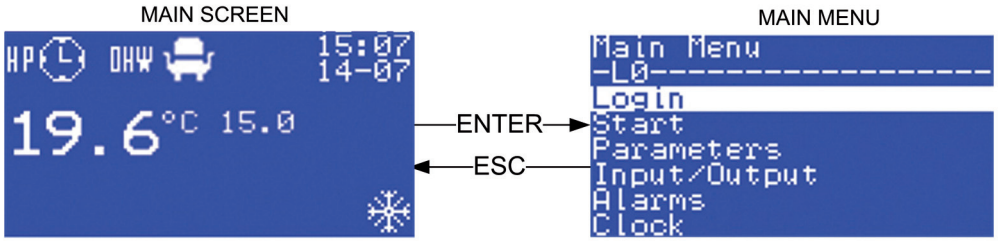
With parameter "rOL- Show rolling text" is possible to show on the main screen a rolling text displaying some information about the delays that compressors are waiting before being able to start. Information is shown in the format.

Cx/CP/SP-YYY where.
Cx=C1 or C2 signalling the compressor that is waiting to start/stop; CP=circulation pump; SP=source pump.
YYY=code of the parameter defining the delay that is waited for:

e.g.
C1-CT4 means that Compressor1 is waiting for the time CT4 to be elapsed.
CP-P02 means that Circulation Pump is waiting for the time P02 to be elapsed.

2.5 Menu navigation

Pressing the key while displaying the main screen, you go to the menu described in the following table.



Each menu line has an access level, (see 2.5.1 "Login").
You cannot access menu lines having a greater level than yours.

Note

The menu hierarchy, levels and texts here described are that provided by default but they can be changed with the software configuration tool.

Menu code (LED - LCD)	Sub-menu code (LED - LCD)	Sub-menu code (LED - LCD)	Level	Function
MOD – Set Mode			0	Set working mode
	UNI – Unit		0	Whole Unit working mode
		AUT – Auto	0	Automatic, by weekly timer
		COM – Comfort	0	Comfort setpoint, defined by heating curve

Menu code (LED - LCD)	Sub-menu code (LED - LCD)	Sub-menu code (LED - LCD)	Level	Function
		ECO – Economy	0	Economy setpoint (offset from comfort)
		FRS – Frost Protection	0	Frost protection only
		HOL – Holiday	0	Holiday mode\
		HWO- DHW Only		DHW production only
		bSt – Party	0	Party (boost) function
	DHW		0	
		AUT – Auto	0	Automatic, by weekly timer
		COM – Comfort	0	Comfort setpoint, dS1
		ECO – Economy	0	Economy setpoint, dS2
		FRS – Frost Protection	0	Frost protection setpoint, dS4
LOG			0	Defines the access level to menus and parameters. Password is defined with L01, L02 and L03 parameters
Str - Start			0	Start functions
	ON - Turn ON		0	Turn ON the unit
	OFF - Turn OFF		0	Turn OFF the unit
	HC - Heat/Cool		0	Heat/cool switch
	DFP – Load Default		2	Load default parameters
PAR - Parameters			0	Access to menu of parameters. You need to login first.
I-O - Input/ Output			0	Access to input/output menu (display values and configuration)
	IOD - I/O Display		0	Display input and output values
ALA - Alarms			0	Access to alarm menu
	AAL - Active Alarms		0	List of the active alarms
	ALR - Reset Alarms		0	Alarms manual reset
	AHS – Alarm History		0	
	AHC - Clear AL History		3	
EXD - Config EXD316			1	Access to menu of EXD316, driver for electronic expansion valve
	EX1 - EXD 316 #1		1	EXD316, address 1

Menu code (LED - LCD)	Sub-menu code (LED - LCD)	Sub-menu code (LED - LCD)	Level	Function
		CFG - Config EXD1	1	Access to configuration parameters of EXD316 #1
		DEB - Test EXD1	1	Access to information coming from EXD316 #1
		DEF - Load Default	1	Load factory values into EXD316 #1
CLK - Clock			0	Set time and date
DIA - Commissioning			0	Commissioning info
SER - Service			0	Access to service information
	INF - Software info		0	Information on application software
	DEV - Device info		0	Information on device
HRS - Hour Counters			0	Access to hour counters menu
	COH - Compressors		0	Compressors hour counters
	EPH - Circulating Pump		0	Circulating pumps hour counters
	SPH - Source Pump		0	Source pumps hour counters
	CLR - Reset Counters		2	Reset hour counters

Tab 5 [User interface - Menu navigation]

To navigate inside menus use the and keys. The key allows you to go down to the next level, if present; the key allows you to go up to the previous level, up to the main screen.

To change the value of the selected parameters use the following keys:

- key, to enter in changing mode (the value is highlighted in reverse);
- and keys to change value;
- key again to confirm changes or key for not confirming them.

2.5.1 Login

Parameters

GEN			General
	PAS		Password
		L01	Level 1 password
		L02	Level 2 password
		L03	Level 3 password

Tab 6 [User interface - Login - Parameters]

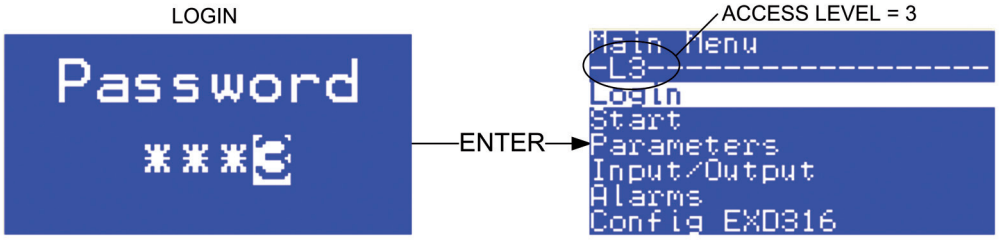
From menu LOGIN you can insert the 4 digit password defining the access level to menus and parameters.

Press ↑ and ↓ keys to change the value of the selected digit.

Press ↵ key to confirm the value and skip to the next digit, if present, or to login.

The → and ← keys, if present, allow you to move the cursor on the desired digit.

The current access level is then shown on the second raw of the main menu screen.



Password for the access levels from 1 to 3 are defined with parameters L01 (default=1), L02 (default=2), L03 (default=3).
Without logging in, you get access level 0.
You can't see parameters or menu entries belonging to a higher level then yours. What is the level of each parameter and menu is defined with MCXShape software configurator tool.

If the inserted password is not correct you stays inside the login screen. Otherwise you get back to the main menu.

2.5.2 Set working mode

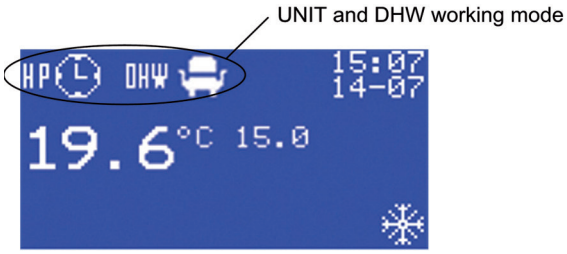
From menu SET MODE -> UNIT you can select the working mode of the whole unit (circuits and DHW control).
From menu SET MODE -> DHW you can select the working mode of DHW control.

Possible selections are:

Function	Icon	Description
Auto	HP e DHW	Automatic mode, by weekly timer (See 2.6.1 "Circuit setup and weekly setting")
Comfort	HP e DHW	Comfort setpoint, defined by heating curve (See 8.0 "Heating curves")
Economy	HP e DHW	Economy setpoint (offset from comfort setpoint) (See 9.2 "Circuits control strategy")
Frost Protection	HP e DHW	Frost protection only. The unit is OFF but frost protection procedures are active
Holiday	HP	Holiday mode. Set the number of vacation days, during which the unit is in frost protection mode. After these days the unit will resume its previous working mode
DHW Only	HP	DHW production only (summer mode)
Party	HP	Party (boost) function. Set the number of hours during which the unit is in comfort mode

Tab 7 [User interface - Set working mode]

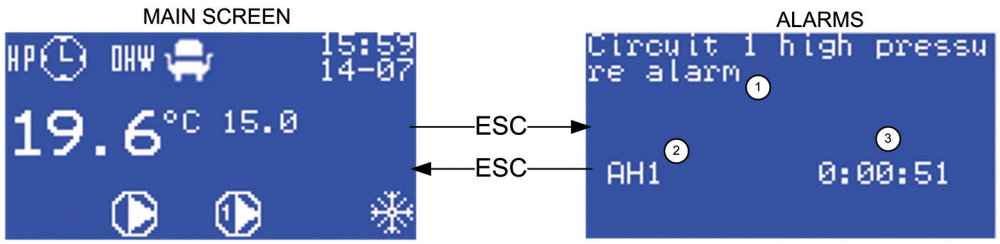
The selected mode is displayed on the top right corner of the main display.



2.5.3 Displaying alarms

To access the list of alarm there are 2 ways: one is from menu ALARMS - > ACTIVE ALARMS;

the second is pressing the key while displaying the main screen.



Each screen is dedicated to an alarm. You can scroll among them using the ↑ and ↓ keys.

Each alarm is described through:

- alarm description (1) (for LCD display only);
- alarm code (2);
- time since its activation (3) in the format hours:minutes:seconds (seconds for LCD display only).

Both alarm description and code can be changed using MCXShape software configurator tool.

2.5.4 Resetting alarms

To manually reset an alarm there are 2 ways: one is from menu ALARMS - > RESET ALARMS; the second is keeping pressed the ✕ key for 3 seconds while displaying the alarms screen.

2.5.5 Alarms history

The menu ALARMS -> ALARM HISTORY shows you in sequence the history of alarms.

The following information are displayed for each alarm, in order from top to bottom:

- description of the alarm;
- date and time of activation;
- date and time of deactivation (if any);
- record number (in reverse): #1 is the last activated alarm;
- code of the alarm.

Use the ↑ and ↓ keys sto scroll the list of alarms. ↑ key to go back and ↓ key to go forward.

The menu ALARMS -> CLEAR AL HISTORY, clear history of alarms. The “CLR - LOG CLEARED” event is inserted in the history list.

2.5.6 Input and output display

LED Display

The menu INPUT/OUTPUT -> I/O DISPLAY shows you in sequence (using the ↑ and ↓ keys) all the input and output values, showing the I/O code on display A (“AI” for analog input; “AO” for analog output; “dI” for digital input and “dO” for digital output) and its value on display B (analog input that are not present or in alarm are shown with “----“).

LCD display

You have access to three screens showing all the input and output values; each screen shows a group of 8 I/O. Use ↑ and ↓ keys to scroll them. The second and third screen are used with MCX15 and MCX20 only.

Below example shows the first screen.

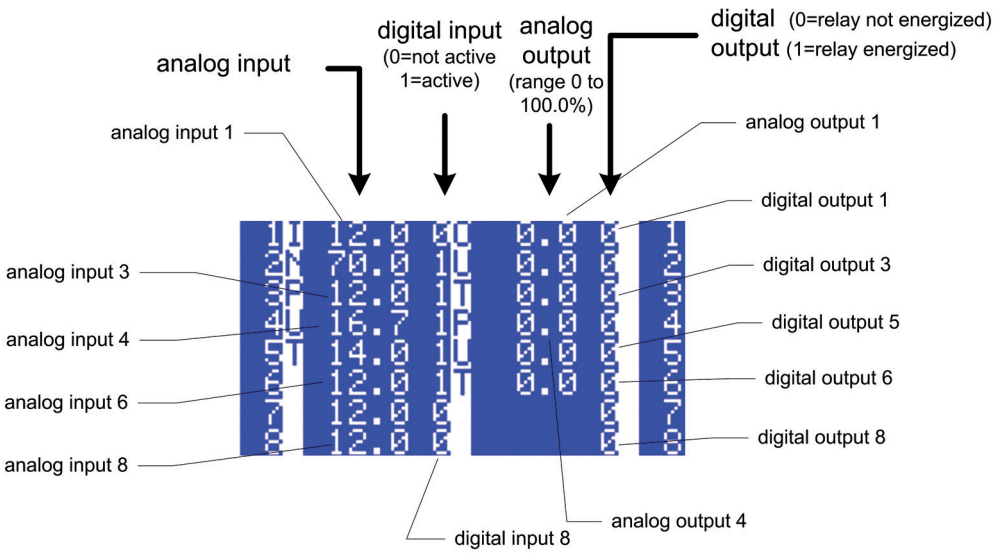


Fig 5 [User interface - LCD display]

2.5.7 EXD (Electronic Expansion Valve Driver) configuration

Parameters

Exd			EXD Parameters
	Add		Can Address
		ex1	First EXD Add.

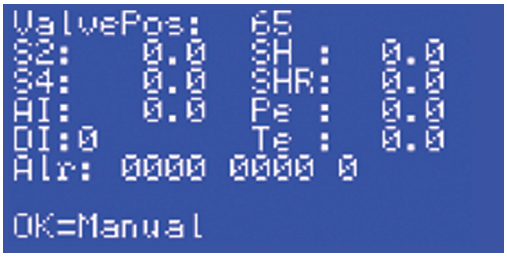
Tab 8 [User interface - EXD configuration - Parameters]

From menu CONFIG EXD316 -> EX316 #1 you have access to configuration of the driver for electronic expansion valve EXD316. It is connected via CANbus to the MCX.

The CAN address of EXD316 is set by parameter EX1 and must be different from 0 to be enabled.

Menu CONFIG EXD1
Access to parameters of first EXD316. Refer to list of parameters of EXD316.

Menu TEST EXD1
Access to data for testing EXD316.



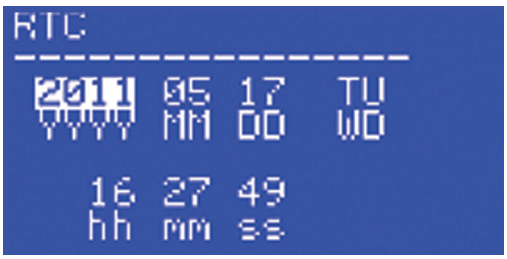
- ValvePos: valve opening degree;
- S2: value of S2 temperature sensor at evaporator outlet;
- S4: value of S4 temperature sensor for measuring air temperature;
- AI: value of external reference;
- DI: status of ON/OFF digital input;
- SH: superheat;
- SHR: uperheat reference;
- Pe: evaporating pressure;
- Te: evaporating temperature;
- Alr: alarm status; one bit for each alarm from left to right, (see EXD316 documentation):
  - fault in controller;
  - S2 sensor error;
  - S4 sensor error;
  - the input signal on terminals 17-19 is outside the range;
  - the input signal on terminals 21-22 is outside the range;
  - no refrigerant has been selected;
  - check the supply voltage to the step motor;
  - battery alarm;
  - CAN driver.

Press key to go to manual mode. Use and keys to set the valve opening degree.

Press key to go back to automatic mode.

Menu: LOAD DEFAULT
Load factory parameters on EXD316.

2.5.8 Clock configuration

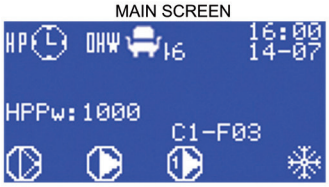


From menu CLOCK you access the configuration of date and hour of the internal real time clock.

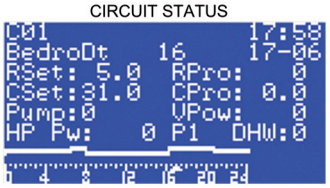
Use the and keys to change the field to be edited (marked with a cursor). Use the key to enter into the edit mode (the field to be edited is highlighted in reverse). and keys again to change the value. key to confirm and key to abandon.

2.5.9 Commissioning info

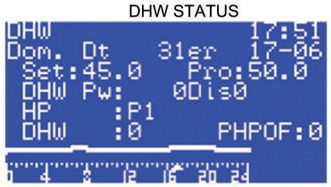
MAIN SCREEN



CIRCUIT STATUS



DHW STATUS



From menu CLOCK you access the configuration of date and hour of the internal real time clock.

Use the and keys to change the field to be edited (marked with a cursor). Use the key to enter into the edit mode (the field to be edited is highlighted in reverse). and keys again to change the value. key to confirm and key to abandon.

From menu COMMISSIONING you add more data to the main screen and to the status screens of circuits and DHW, useful in the commissioning phase.

You can exit from the commissioning mode pressing the key or selecting again the menu COMMISSIONING.

Main Screen information
HPPw: Heat Pump power request (0=0%, 1000=100,0%).

Circuit/Room status:

- RSet: Room Air Setpoint;
- CSet: Circuit Water Setpoint;
- Pump: Pump status (0=OFF, 1=ON);
- RPro: Room Probe (Roomx Temperature);
- CPro: Circuit Probe (Flow Temperature HCx);
- VPow: Mixing Valve Power;
- HPPw: Heat Pump power request (0=0%, 1000=100,0%);
- P0, P1, P2, P3: heat pump status. (P0=Compressors OFF, P1=C1 ON, P2=C1,C2 ON, P3=C1,C2,STH ON);
- DHW: DHW request (0=NO, 1=ON, 2=ON but serving circuits request).

DHW status

- Set: DHW setpoint;
- DHW Pw: DHW power request (0=0%, 1000=100,0%);
- PRO: DHW temperature probe;
- DIS: Disinfection status;
- PHPOF: OFF request to the circulation pump.

2.6 Circuit and DHW status

From the main screen, pressing the ↑ and ↓ keys you can scroll the status of the existing heating circuits and of the DHW preparation. Press the ✕ key to go back to the main screen.

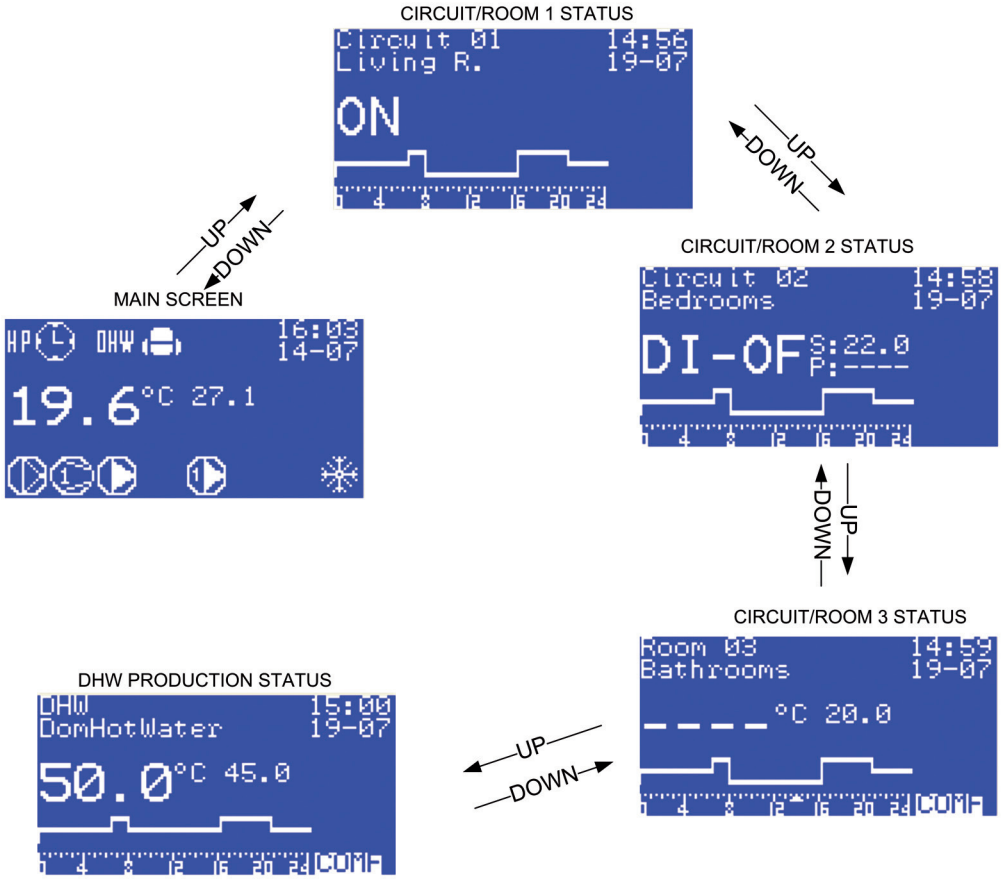


Fig 6 [User interface - Circuit and DHW status]

If the room request is signalled by a digital input (R10, R20, R30 = DIG), each screen shows the following info:

- OFF: the circuit pump is OFF due to the weekly timer;
- DI-OF: the circuit pump is OFF because there's no request from the room (the digital input "Room thermostat x" is not active);
- ON: the circuit pump is ON (the circuit pump is ON and the mixing valve is controlled according to flow temperature and heating curves).

In the upper left corner of the display, (see Circuit 01, 02 or 03).

If the room request is obtained by the comparison between a room probe and a room setpoint (R10, R20, R30 different from DIG) on display is shown:

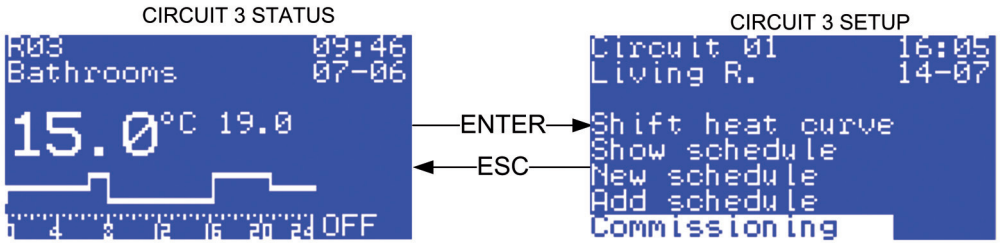
- the room temperature on display A and the room setpoint on display B;
- the status set by the weekly timer or by menu; it is displayed in reverse on the bottom right corner on larger displays and below the setpoint on smaller displays.

In the upper left corner of the display, (see Room 01, 02 or 03).

The last screen is showing the status of DHW preparation. As above you can see the request from digital input "DHW thermostat" if d01=DIG or the temperature measured by the DHW probe and DHW setpoint.
The string describing the room/circuit on the second line of the screen is changeable using the MCXShape software configurator tool.

2.6.1 Circuit setup and weekly setting

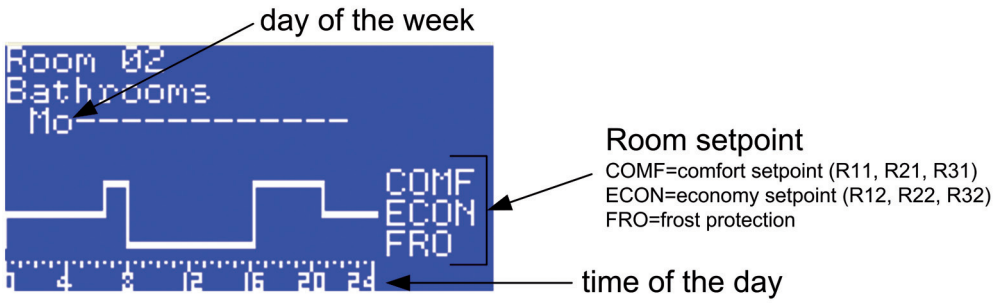
Pressing key while displaying the status screen of a circuit you access the circuit setup menu.



Room setpoint
(visible only if there is a room probe: R10, R20, R30 different from DIG): change the room setpoint temporarily overriding the setpoint defined by the timer up to the next event. The setpoint is shown in revers while it is overwritten.

Shift heat curve
parallel displacement of the heating curve, (see 8.0 “Heating curves”).

Show schedule
shows the weekly timer in a graphic way.
For each day of the week you can see the time settings. You can change the day of the week by pressing the and keys.



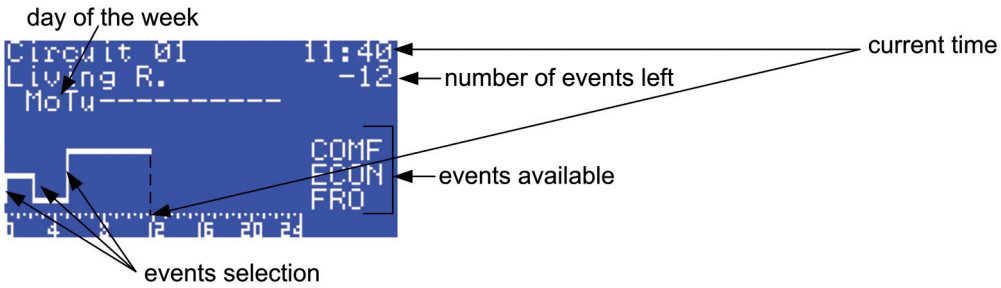
If the room is controlled by a thermostat (R10, R20, R30 = DIG), then COMF and ECON are replaced by ON.

New schedule
set a new weekly timer.

First you have to set the days in the week affected by the weekly timer. Add a day of the week by pressing the key or the key. Press key to disable it and key to re enable it.

At the end of the day selection process, press key to confirm days selection and move to the selection of setpoint used during the day.

Pressing the and keys you select an event among OFF, economy (ECON), comfort (COMF) mode and pressing the and keys you increase the time, drawing the line which describes the weekly setting. The current time is displayed in the upper right corner. Below it you see the remaining number of events you can set: an event is intended to be a selection.



At the end press key to confirm or key to exit without saving.

Add schedule: same as "New schedule" but the new settings will be added to the existing ones.

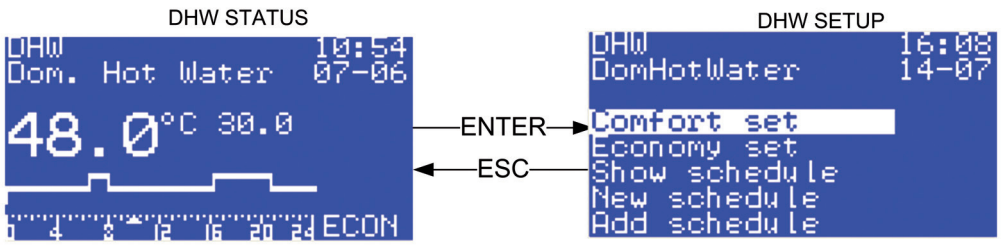
Commissioning: display more information useful in commissioning phase, (see 2.5.9 "Commissioning info"). Enabling commissioning from this local menu is temporary and you abandon it by going back to the main screen.

2.6.2 DHW setup and weekly settings

Pressing key while displaying the status screen of DHW preparation you access the DHW setup menu.

It's similar to the circuit setup, (see 2.6.1 "Circuit setup and weekly setting").
The only difference is in the setpoint definition.

You can define directly the comfort setpoint and the economy setpoint. Changes are permanent.



2.7 General parameters for unit setup

Parameters

GEN			General
	StU		Setup
		y05	Temperature measurement unit
		y07	Force default values

Tab 9 [User interface - General parameters for unit setup - Parameters]

2.7.1 Unit of measure

Through the y05 parameter you set the temperature unit of measurement used by the device on the main screens between °C and °F.

Note

The MMI remote user interface must be restarted.

2.7.2 Force default values

There are two ways for resetting parameters to their default values.

One is through the y07 parameter.

The other one is from menu “Start” –> “Load Default”.

3.0 Unit configuration

3.1 Input/output configuration

To make the most of the hardware controller resources, you can manually assign the function performed by each controller's input and output or through the user interface, or through the MCXShape software configurator tool.

Follow below the complete list of the available functions that can be independently assigned to each input and output.

3.1.1 Analog input

Code	Description
ECS	External Coil Sensor
OUt	Outdoor Temperature
ICS	Internal Coil Sensor
SIT	Source Inlet Temperature
SOT	Source Outlet Temperature
RET	Return Temperature
SUP	Flow Temperature
DHW	DHW Temperature
STT	Auxiliary Tank Temperature
Rt1	Room 1 Temperature
Rt2	Room 2 Temperature
Rt3	Room 3 Temperature
Mx2	Flow Temperature HC2
Mx3	Flow Temperature HC3

Tab 10 [Unit configuration - Analog input]

3.1.2 Digital input

Code	Description
OC1	Comp1 Overload
OC2	Comp2 Overload
OFC1	Source Pump/Fan1 Ovld
OFC2	Source Fan2 Ovld

Code	Description
HP	HP
LP	LP
FPE	Circuit Flow Switch
OPE	Circulation Pump Ovld
FPC	Source Flow Switch
ONO	Main Switch
SET2	Offset from DI
OVL	General Overload
ALR	General Alarm
DEF	Defrost
HC	Heat/Cool
SLP	Source Pressure Switch
RT1	Room Thermostat 1
RT2	Room Thermostat 2
RT3	Room Thermostat 3
RT6	Presence Switch
DHW	DHW Thermostat

Tab 11 [Unit configuration - Digital input]

3.1.3 Digital output

Code	Description
C1	Compressor1
C2	Compressor2
CP1	Circulation Pump 1
CP2	Circulation Pump 2
FC1	Source Fan1
FC2	Source Fan2
SP1	Source Pump 1
SP2	Source Pump 2
FI1	Inverter Fan1
ALR	Alarm
WAR	Warning

Code	Description
HC1	Reverse Valve
LV1	Liquid Valve
DWP	DHW Pump
DWH	DHW Heater
STH	Auxiliary Heater
RP1	HC1 Pump
V2O	HC2 Mixing Valve Open
V2C	HC2 Mixing Valve Close
RP2	HC2 Pump
V3O	HC3 Mixing Valve Open
V3C	HC3 Mixing Valve Close
RP3	HC3 Pump

Tab 12 [Unit configuration - Digital output]

3.1.4 Analog output

Code	Description
Fc1	Inverter Fan1
VA2	HC2 Mixing Valve
VA3	HC3 Mixing Valve

Tab 13 [Unit configuration - Analog output]

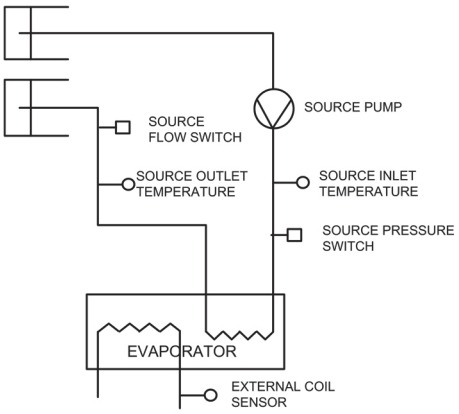
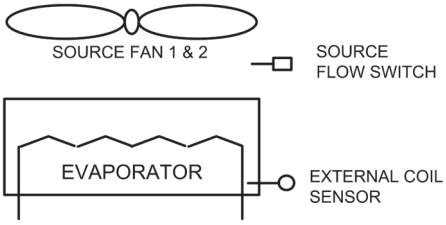
4.0 Heat source control

4.1 Heat source configuration

Parameters

EVA			Heat Source
	CFG		Configuration
		H1	Heat Pump source type
		H2	Number of fans

Tab 14 [Heat source control - Heat source configuration - Parameters]

Water or Brine Source Heat Pump	Air Source Heat Pump
H1 = 1 (H2O)	H1 = 0 (AIR) H2 = 1 or 2
	

Tab 15 [Heat source control - Heat source configuration]

4.2 Input/output

4.2.1 Analog input

Code	Description
SIT	Source Inlet Temperature
SOT	Source Outlet Temperature
ECS	External Coil Sensor

Tab 16 [Heat source control - Analog input]

4.2.2 Digital input

Code	Description
OFC1	Source Pump/Fan1 Ovld
OFC2	Source Fan2 Ovld
FPC	Source Flow Switch
SLP	Source Pressure Switch

Tab 17 [Heat source control - Digital input]

4.2.3 Digital output

Code	Description
SP1	Source Pump 1
FC1	Source Fan1
FC2	Source Fan2
FI1	Inverter Fan1

Tab 18 [Heat source control - Digital output]

4.2.4 Analog output

Code	Description
Fc1	Inverter Fan1

Tab 19 [Heat source control - Analog output]

4.3 Source water pump/fan control

Parameters

EVA			Heat Source
	EPC		Pump/Fan Control
		F01	Control type
		F02	OFF with compressors OFF
		F03	Pump after-run time
		F04	Pump pre-run time

EVA			Heat Source
	FSt		Fan Setpoint
		FHS	Heating setpoint
		FHd	Heating differential
		FCS	Cooling setpoint
		FCd	Cooling differential

EVA			Heat Source
	FSr		Fan Speed Ctrl
		F10	Inverter enable
		F11	Minimum speed
		F12	Maximum speed
		F14	Burst time at startup
		F15	Triac impulse ON time

EVA			Heat Source
	FHr		Run hours
		F16	Maximum limit

Tab 20 [Heat source control - Source water pump/fan control - Parameters]

The water pump is driven by the digital output “Source Pump 1”.
The fans are driven by the digital output “Source Fan1” and “Source Fan2”. Their number is set by the parameter H2-Number of fans.

According to F01 parameters these are the possible ways for controlling the pump/fans (hereafter pump):

- F01=OFF — No control, pump is always OFF.
- F01=ON — Pump always ON. It is switched OFF only when the unit is OFF.
- F01=ON_C — Pump status is connected to compressors functioning.
  All compressors OFF = pump OFF after time F03.
  At least one compressor ON = pump ON.
- F01=Prb — Regulation connected to the “ECS-External Coil Sensor” (Air to Water units).
  The fan functioning is subordinated to the ECS values (typically pressure) and eventually to the compressors functioning. When compressors are switched OFF, with F02 parameter is possible to define if the fans will be or not switched OFF after F03 time, independently from the ECS value.
  The regulation can be by steps or continuous.

Step control
Fans are driven in ON/OFF, depending on FHS setpoint and FHd band or differential: that band is equally split among the fans.

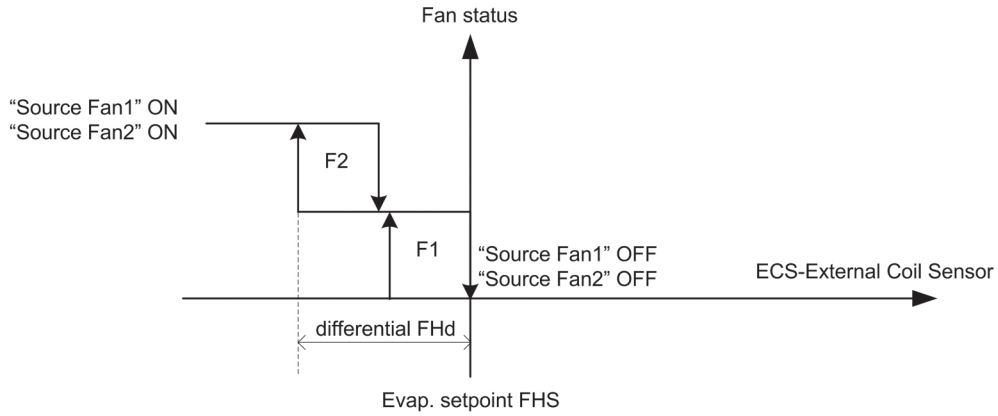


Fig 7 [Heat source control - Step control]

Speed control
If enabled through F10 parameter, fan speed control is activated through the 0/10V or PWM/PPM (width/pulse modulation synchronous with the line) analog output proportional to the request of ECS sensor. The output will drive an external inverter or phase-cutting device. Hereby we'll talk about inverter only.
The analog output "Inverter Fan1" is used to drive the inverter. The associated digital output "Inverter Fan1" is used to eventually switch ON and OFF the inverter.

It's possible to define the minimum F11 and maximum F12 inverter speed in percentage; between these two values is calculated the proportional action of the modulating output as described in figure.
In case of a PPM output, it has to be set up even the pulse duration F15, which must be applied to the triac.
The inverter output is activated when the requested power is greater or equal than the power obtained with the inverter at its minimum speed. The start speed is equal to the minimum speed if F14=0; otherwise through F14 the burst time at start up is defined. During that time the inverter drives fans at their maximum speed.

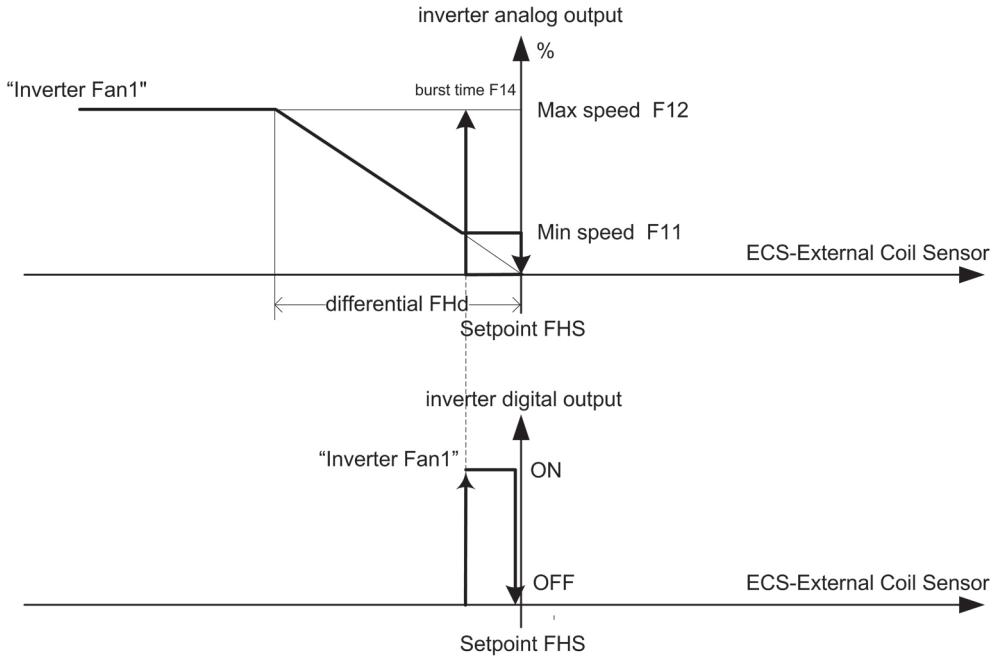


Fig 8 [Heat source control - Speed control]

The following delays are managed:

- F03-Pump after run time: it's an OFF time after switching off compressors, when the source pump continues to run.
- F04-Pump pre run time: it's an ON time before switching on compressors, when the source pump starts to run (pre-ventilation in case of fans).

Fans in cooling mode
The management of fans in cooling mode is analogous to the one in heating mode. Fans are activated when the value measured by the "ECS-External Coil Senso"r on the external heat exchange increases in respect to the setpoint FCS and differential FCd.

4.4 Source protections

Parameters

ALA			Alarms
	FLO		Flow
		AFr	Reset type
		AF1	Delay from pump starting
		AF2	Delay in steady operation
		AF3	Time to restart

EVA			Heat Source
	hsp		Frost Protection
		SP1	Frost protection limit
		SP2	Heat pump stop delay
		SP3	Hysteresis
		SPr	Reset type
		SPd	Delay from pump start

EVA			Heat Source
	FHr		Run hours
		F16	Maximum limit

Tab 21 [Heat source control - Source protections - Parameters]

Water temperatures
This function prevents the heat pump from operating at too low source temperatures.
If, during operation, the source outlet or inlet temperature drops below the frost limit SP1:

- in case of 2 compressors running, 1 compressor is switched off and the warning “A09-Source protection Warning” is generated; if after the time SP2 the alarm condition is still valid then the second compressor is switched off and the alarm “A10-Source frost alarm” is generated;
- in case of 1 compressor running, the compressor is switched off and the alarm “A10-Source frost alarm” is generated;
- in case of unit off, the source pump is turned on and the alarm “A10-Source frost alarm” is generated.

For resetting the alarm a SP3 hysteresis is considered.
Type of reset and start up delay are set by SPr, SPd, parameters.

Source Flow Switch
If this digital input is active the heat pump is shut down and the alarm “Source flow switch alarm” is generated.
Type of reset, start up delay and steady delay are set by AF1, AF2 and AFr parameters.
In case of automatic or semiautomatic reset, on completion of AF3, Time to restart, the heat pump is switched on again.

Source Pressure Switch
If this digital input is active then the heat pump is shut down and the alarm “A08-Source pressure switch” is generated.
Start up delay, steady delay and type of reset are set by MCXShape software configurator tool.

Source Pump/Fan Overload
Overload of source pump/fan alarms are generated by the activation of the related digital input. "OFC1-Source Pump/Fan1 Ovld" and "OFC2- Source Fan2 Ovld" digital input generate the alarms "A05-Source fan/pump 1 overload" and "A06- Source fan 2 overload", switching off the related pump/fan. When both alarms are activated then is generate the alarm "A04-General source fan/pump overload" switching OFF the unit.

Hour counter
To evaluate pump condition, the control monitors the run hours of the pump. If the pump hour counter exceeds the limit F16 (multiplied by 1000), then the control will generate the "A07- Source pump run hours exceeded" warning, indicating the need for pump maintenance.
To see the pump running hours go to menu HOUR COUNTERS -> SOURCE PUMP
To reset all the hour counters go to menu HOUR COUNTERS -> RESET COUNTERS

5.0 Heat pump control

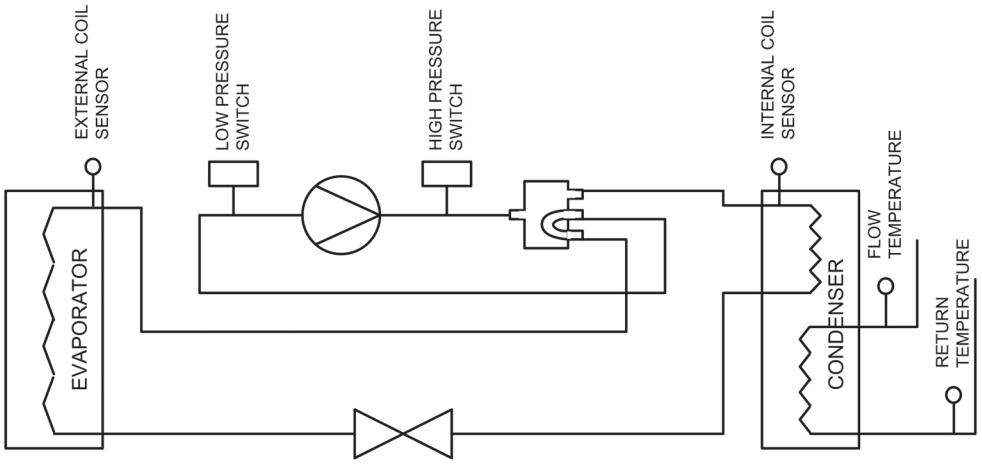


Fig 9 [Heat pump control - Description]

5.1 Heat pump setpoint definition

The heat pump active water setpoint is calculated through the heating curve of an unmixed circuit.
(See 8.0 "Heating curves").

5.2 Heat pump controlled temperature definition

Parameters

rEG			HP Regulation
	RhP		Power Control
		rEG	Analog inp. for temp. regulation

Tab 22 [Heat pump control - Heat pump controlled temperature definition - Parameters]

Controlled temperature
The sensor used for controlling the water temperature is defined by the REG parameter. It can assume the following values:

Parameters	Value	Description
SIT	0	Source Inlet Temperature
SOT	1	Source Outlet Temperature
GPT	2	Gas Pipe Temperature
RET	3	**Return Temperature**
SUP	4	Flow Temperature
OUT	5	Outdoor Temperature
DHW	6	DHW Temperature
STT	7	Storage Tank Temperature

Tab 23 [Heat pump control - Controlled temperature]

5.3 Heat pump activation

Parameters

rEG			HP Regulation
	RhP		Power Control
		Rh0	Heating dead zone
		Rh1	Cooling dead zone

Tab 24 [Heat pump control - Heat pump activation - Parameters]

Compressors are switched ON when:

- the monitored temperature (set by REG parameter) is below the active set point - hysteresis Rh0 (more heat request), OR;

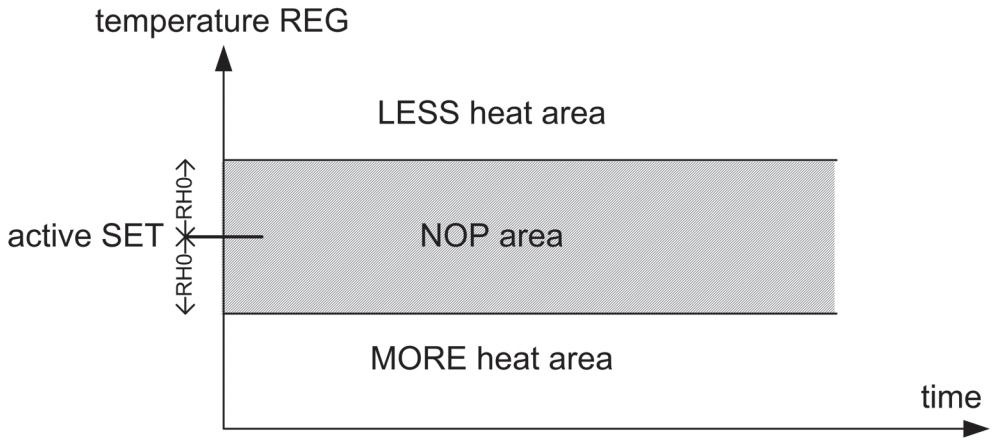


Fig 10 [Heat pump control - Heat pump activation]

- there is a request for domestic hot water.

Compressors are switched OFF when there is no more request for heat.

Note

The regulation temperature is monitored only when the circulation pump is running and after a pre-run time, (see 6.0 "Heat Circulation Pump").

5.3.1 Compressor and auxiliary heater control strategy

Parameters

rEG			HP Regulation
	RhP		Power Control
		Rh2	Compressor 2 ON delay
		Rh3	STH ON delay
		Rh4	Compressor 2 OFF delay
		Rh5	Compressor 1 OFF delay
		Rh6	Time enable STH
		Rh7	Out Temperature to enable STH

Tab 25 [Heat pump control - Heater control strategy - Parameters]

Input/output

Digital output

Code	Description
C1	Compressor1
C2	Compressor2
STH	Auxiliary Heater

Tab 26 [Heat source control - Digital output]

Strategy

Max 2 compressors and 1 auxiliary heater in a buffer tank are managed according to the regulated temperature (hereafter TReg) defined by REG parameter.

They are activated in the following way:

- compressor 1 is activated if TReg goes into the More Heat Area (Stage 1);
- compressor 2 is added if TReg stays into the More Heat Area for more than Rh2 seconds (Stage 2);
- auxiliary Heater is added after Rh3 seconds but only if the outside temperature is less than Rh7 for more than Rh6 (Stage 3).

Starting from Stage 3, elements are deactivated in the following way:

- auxiliary Heater is switched OFF if TReg goes into the Less Heat Area;
- compressor 2 is switched OFF after Rh4 seconds into the Less Heat Area;
- compressor 1 is switched OFF after Rh5 seconds into the Less Heat Area.

Power stages are zeroed after power off.

5.3.2 Compressors management

Parameters

CMP			Compressors
	CFG		Configuration
		C00	Number of compressors
		C01	Rotation type
		C02	Compressor 1 enable
		C03	Compressor 2 enable
		C04	Run hours limit

CMP			Compressors
	TIM		Times
		CT0	Min ON interval different comp.
		CT1	Min OFF interval different comp
		CT2	Minimum OFF time
		CT3	Minimum ON time
		CT4	Min time between 2 ON same comp
		CT5	Max difference on running hours
		CT6	Delay from circulating pump

Tab 27 [Heat pump control - Compressor management - Parameters]

Input/output

Digital output

Code	Description
C1	Compressor1
C2	Compressor2

Tab 28 [Heat source control - Digital output]

Digital input

Code	Description
OC1	Comp1 Overload
OC2	Comp2 Overload
DC1	Comp1 Oil Press.
DC2	Comp2 Oil Press.

Tab 29 [Heat source control - Digital input]

The number of compressors is set with C00 parameter.
Compressors are driven by the digital output “Compressor 1” and “Compressor 2”.

Compressor Rotation
Compressors are rotated in order to balance the number of compressor run hours and start-stop among the units.

The available rotation types are defined by C01 and are the following:

- C01=LIFO (LastInFirstOut) or not enabled rotation; it means that the first compressor to start will be the last to stop.
  start: C1, C2.
  stop: C2, C1.
- C01=FIFO (FirstInFirstOut); it means that the first compressor to start will be the first to stop.
  start: C1, C2.
  stop: C1, C2.
- C01=tIME. Running hours control; the compressor to start is the one with the lowest number of run hours; the compressor to stop is the one with the highest number of run hours.

The resolution of one second is used for the measurement of the running time. The storage of this time in non volatile memory takes place every 5 minutes. To reset the hour counter parameter, go to menu HOUR COUNTERS -> COMPRESSORS.

If a compressor stops due to an alarm, another compressor will immediately start.
It is possible, through C02, C03 parameters, to temporary disable each compressor. It’s useful in case of service.

Compressor Safety Timers

CT0 - Minimum time between 2 ON of different compressors
It sets the minimum time that must elapse between two starts of different compressors, in order to reduce the peak of current drawn at power up.

CT1 - Minimum time between two OFF of different compressors
It sets the minimum time that must elapse between two stops of different compressors, in order to reduce the number of stops per hour.

CT2 - Minimum OFF time
It sets the minimum OFF time of a compressor. Compressor will not be able to start till the configured minimum time since the last OFF has elapsed.

CT3 - Minimum ON time
It sets the minimum ON time of a compressor that, once activated, must stay ON for the configured time even if it is no more requested. It’s useful, for instance, to avoid lubrication problems.

CT4 - Minimum time between two ON of the same compressor
It sets the minimum time that must elapse between two successive starts of the same compressor. This parameter allows to limit the number of compressor starts per hour. For instance, if the maximum number of starts per hour allowed is equal to 10, it is enough to set CT4=360 seconds (6 minutes) to guarantee the limit respect.
If it is lower than the sum of the minimum ON and OFF time, it will be ignored.

CT5 - Maximum difference on running hours
It sets the maximum ON time of a compressor, but calculated from when there is another one OFF. The purpose is to avoid that one of the compressors could run more than the configured time while another one is OFF. Elapsed this time, the running compressor is switched off even if it should go on running and it is substituted by one of the compressors being previously OFF having the lowest number of running hours.
It takes effect only if rotation type is based on running hours (C01=tIME).

Hour counter
To evaluate the compressor condition, the control monitors its run hours. The limit to be monitored is defined in C04 (multiplied by 1000); if the compressor running time exceeds it, then the control will generate the Ac3, Ac4 warnings indicating the need for compressor 1 or 2 maintenance.
To see the compressors running hours go to menu HOUR COUNTERS -> COMPRESSORS.
To reset all the hour counters go to menu HOUR COUNTERS -> RESET COUNTERS.

Compressor Alarms
Compressor alarms are generated by the activation of the related digital input.
"Comp1 Overload" and "Comp2 Overload" digital input generate the alarms "Compressor 1 overload alarm" and "Compressor 2 overload alarm", switching off the related compressor. When both alarms are activated then is generate the alarm "General compressors overload" switching OFF the unit.
Digital input polarity and all the alarms attributes (such as description, delay at startup and in normal working, type of reset and gravity) are configurable through the MCXShape software configurator tool.

5.3.3 Pressure alarms

Parameters

ALA			Alarms
	HP		High Pressure
		AHr	Reset type
		AHE	Enable High Press alarm from AI
		AHS	Setpoint in heating
		Aht	Setpoint in cooling

ALA			Alarms
	LP		Low Pressure
		ALr	Reset type
		AL1	Delay from compressor starting
		AL2	Enable when compressors OFF
		ALE	Enable LowP alarm from AI
		ALS	Setpoint in heating
		ALt	Setpoint in cooling

Tab 30 [Heat pump control - Pressure alarms - Parameters]

Input/output

Digital input

Code	Description
HP	HP
LP	LP

Tab 31 [Heat source control - Digital input]

Analog input

Code	Description
SP1	External Coil Probe
DP1	Internal Coil Probe

Tab 32 [Heat source control - Analog input]

High pressure alarm

The high pressure alarm can be caused both from a pressure switch (digital input "HP") and from a transducer/temperature probe (analog input "Internal Coil Probe" in heating and "External Coil Probe" in cooling).
Alarm from analog input must be enabled by AHE and is revealed even if compressors are OFF. If you are using a transducer, you have to set a setpoint AHS (differential is 1.0 constant).
In case of alarm, compressors are immediately switched OFF without waiting for any safety timer.
Reset type is defined through AHr.

Low pressure alarm

The low pressure alarm can be caused both from a pressure switch (digital input "LP") and from a transducer/temperature probe (analog input "External Coil Probe" in heating and "Internal Coil Probe" in cooling).
Reset type is defined through ALr. By default it is semi automatic: if the alarm happens 5 times within 90 minutes, from automatic becomes manual.
According to AL2 value, it can be detected even when compressors are OFF (AL2=YES) or only when compressors are ON (AL2=NO). In this case, alarm is delayed at compressors start up of AL1 seconds.
In normal functioning is immediate.

Alarm from analog input must be enabled by ALE. If you are using a transducer, you have to set a setpoint ALt (differential is 1.0 constant).
In case of alarm, compressors are immediately switched OFF without waiting for any safety timer.

5.4 Reverse valve

Parameters

rEV			Reversing valve
	CFg		Configuration
		rE1	Changeover delay
		rE2	Enable changeover from keyboard
		rE3	Enable changeover from out temp
		rE4	Changeover differential

Tab 33 [Heat pump control - Reverse valve - Parameters]

Input/output
Digital output

Code	Description
HC1	Reverse Valve

Tab 34 [Heat source control - Digital output]

For Heat/Cool selection, (see 2.3 “Heat/cool selection”).

According to the heat/cool selection, the “Reverse Valve” digital output, driving the reversing valve of the gas circuit, is opportunely controlled. The output working logic between Normally Close (N.C.) and Normally Open (N.O.) is defined at the physical output configuration phase with MCXShape software configurator tool. If polarity is set to “Open” (as by default) it means that relay is energized in heating mode.
Times for cycle reversing are defined by the rE1 parameter (Changeover delay) that forces compressors OFF before cycle reversion. This time is waited also after the valve reversion before turning ON compressors again.

If it is equal to 0, compressors are not stopped and the reversing valve is immediately reversed.

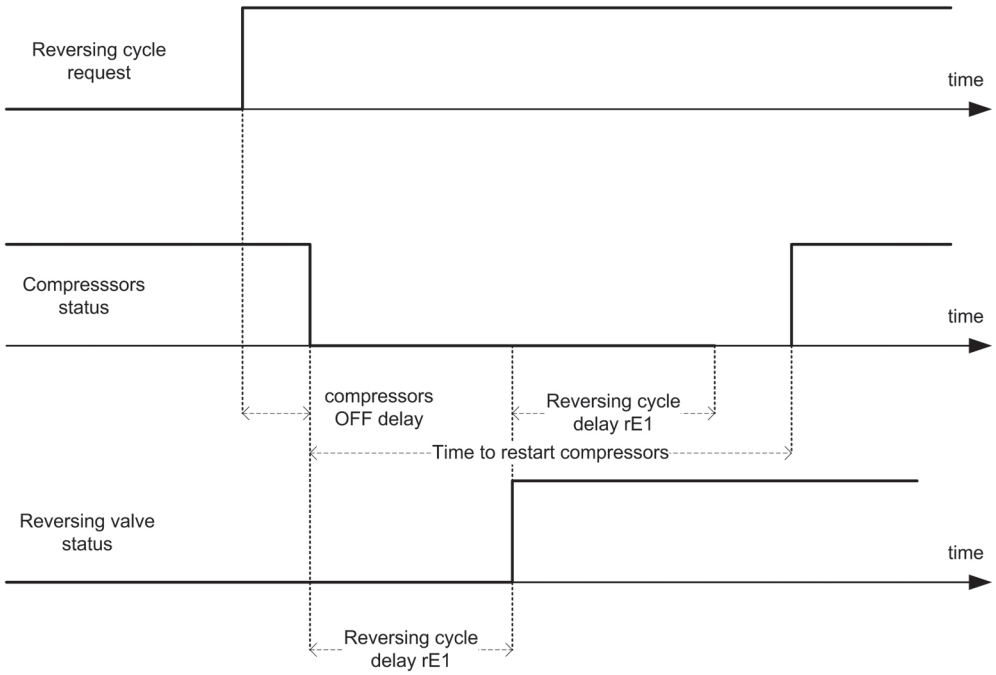


Fig 11 [Heat pump control - Reverse valve]

5.5 Defrost

Parameters

DEF			Defrost
	CFg		Configuration
		d01	Defrost enable
		d02	Defrost type
		d03	Defrost digital input config
		d05	Fan management while defrosting
		d06	Fan only defrost
		d07	Enable LowP alarm in defrost

DEF			Defrost
	Std		Start/stop set
		d09	Defrost start setpoint
		d10	Defrost stop setpoint

DEF			Defrost
	For		Forced defrost
		d21	Start verifying time
		d22	Start setpoint

DEF			Defrost
	Tim		Times
		d13	Defrost start verifying time
		d14	Defost minimum time
		d15	Defost maximum time
		d16	Min time between defrost
		d20	Waiting time after defrosting

Tab 35 [Heat pump control - Defrost - Parameters]

Input/output

Analog input

Code	Description
SP1	Low Pressure Transmitter
OUt	Outdoor Temperature

Tab 36 [Heat source control - Analog input]

Digital input

Code	Description
DEF	Defrost

Tab 37 [Heat source control - Digital input]

5.5.1 Description

On air cooled heat pumps, it is possible to activate the defrosting procedure of the outdoor heat exchanger in heating mode.

Defrost can be executed if enabled through d01, unit is in heating mode, at least one compressor is turned ON and the probe on the external heat exchanger "LowPressureTransmitter" or the "Defrost" digital input is present.

Defrost is signaled by turning ON the corresponding icon  on display and can be executed in the following 2 ways:

1. Reversing the cycle of the involved circuit. In this case:
   - cycle is reversed through a 4 ways valve;
   - the system cooling power is brought at its maximum;
   - the way of working of the involved fan is managed by d05 parameter, (see 5.5.3 "Fans management").
2. If the outdoor temperature allows to do it (parameter d06 "Fan only defrost"), defrost can be performed only turning OFF compressors and turning ON fans at their maximum speed.

Defrost is prior to the compressors timers. Compressors timers are thus ignored while defrosting and compressors ON and OFF are immediate. But to avoid contemporaneous activations and to assure a gradual insertion of the cooling power only the minimum time between the activation of two compressors CT0 is respected.

5.5.2 Defrost trigger condition

Parameter d02 allows to select the way of starting and stopping defrost among:

- d02=SpEp. Start and stop on the basis of the value measured by the temperature or pressure probe "LowPressureTransmitter" used for controlling the outdoor heat exchanger.
  Defrost starts when temperature or pressure goes under a defined limit d09 for a cumulative time defined in d13 "Defrost start verifying time", (see the following figure).
  Defrost is stopped when temperature or pressure goes beyond a second limit d10 or if defrost probe is defect;
- d02=SpEt. As before but defrost stops only after the defrost maximum time d15 has elapsed;
- d02=Comb. Start on pressure but with a confirmation of a value measured by a further temperature probe "TComboDefrost" located on the coils (combined defrost).
  Defrost can start only if the value measured by this probe is under the limit d11, combined defrost temperature start setpoint, after the defrost start verifying time d13 has elapsed. Otherwise unit goes on working normally as far as this limit is exceeded
  Combined defrost stops when the temperature probe goes beyond a further limit d12, combined defrost temperature stop setpoint, but only if the pressure limit d10 is reached as well.

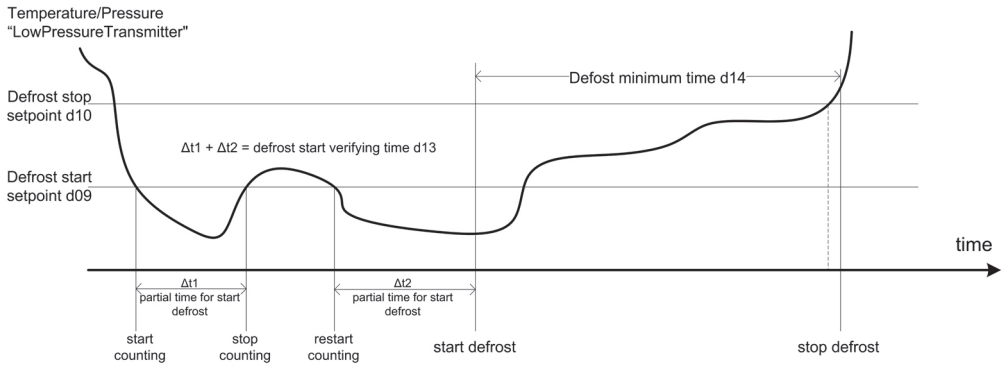


Fig 12 [Heat pump control - Defrost trigger condition]

d03 - Defrost di gital input configuration
If the "Defrost" digital input is present, it can be used to start or to stop defrost.

The input logic is defined at the physical input configuration phase. If polarity is set to "Close" (as by default) it means that input is active when open. Herby we refer to the input configured in this way:

- d03=NO. Digital input not used;
- d03=Strt. When the contact is open, it makes defrost start. When the contact is closed, the digital input is ignored and defrost starts or stops according to the way selected with d02;
- d03=End. When the contact is open, it makes defrost stop. When the contact is closed, the digital input is ignored and defrost starts or stops according to the way selected with d02;
- d03=StEn. The digital input is used for both starting defrost (when it toggles from close to open) and stopping defrost (when it toggles from open to close).

Note

If the stop defrost condition is on the basis of the value measured by the temperature or pressure probe, starting defrost from digital input is possible only if the stop condition is not already verified.

5.5.3 Fans management

Parameter d05 - Fans management while defrosting - defines the way fans on external heat exchanger are managed while defrosting. The following choices are available:

- d05=OFF. Fans are always OFF;
- d05=EqUA. Fans are managed as in cooling mode;
- d05=ONdr. Fans are OFF until the stop defrost condition; after that fan are turned ON at their maximum speed for the d20 time, waiting time after defrosting (dripping time). After this time has elapsed, the cycle goes back to the heating mode and to its normal fans management.

Note

If the unit is Fan Defrost mode (see d06 parameter), fan management as it is here described is disabled.

5.5.4 Fan only defrost

This function allows to take advantage of the outdoor temperature when it is adequate to defrost the outdoor coil.

In this mode, the unit turns OFF compressors and drives fans at their maximum speed, without reversing cycle.

Defrost start and stop conditions stay unchanged, as described above.

If **d06**=0, the function is disabled. Otherwise it represents the minimum outdoor temperature to be reached for enabling the function. Fan defrost will be then executed when the start defrost condition is verified.

5.5.5 Defrost timers

d13 - Defrost start verifying time
It sets the time during which the condensing temperature/pressure must stay under the defrost start setpoint d09, together with compressors ON, to activate defrost. Counting is stopped but it is not reset when temperature/pressure goes beyond that limit d09. Counter is reset at power ON or when the defrost cycle starts.

d14 - Defrost minimum time
If this time has not elapsed, defrost goes on even if the stop defrost condition is already reached.
It is ignored in case of defrost from digital input.

d15 - Defrost maximum time
If the time ended defrost is enabled (d02=spEt), it sets the defrost endurance.
Otherwise it represents its maximum endurance, beyond which defrost is stopped and the A13 warning occurs. This warning is reset after a correct defrost cycle.

d16 - Minimum time between defrost
It is the minimum delay between the end of one defrost cycle and the start of the following one. If it is not higher than d13, defrost start verifying time, it is ignored.
It is ignored also in case of defrost from digital input.

d20 - Waiting time after defrosting
At the end of the defrost cycle, compressor is stopped for all this time if it is higher than the double of the changeover delay rE1, (see the following figure); otherwise the last one is valid. The 4 ways valve is reversed anyhow after the changeover delay; this delay allows pressures equalization after the defrost cycle and an eventual dripping of the outdoor heat exchanger, (see d05 for fans management during this phase).

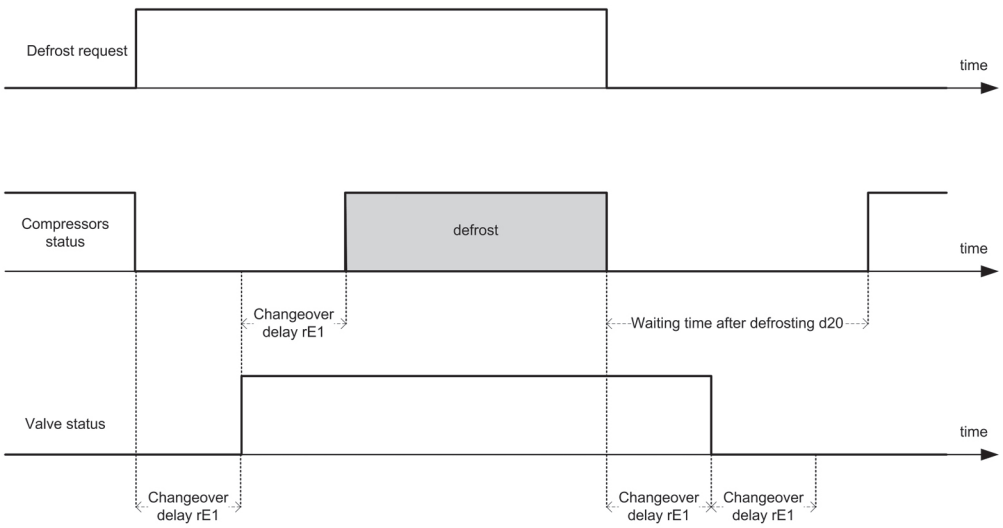


Fig 13 [Heat pump control - Defrost timers]

5.5.6 Forced defrost

If this function is enabled, the minimum time between 2 defrost cycles is cancelled when temperature/pressure goes under d22 setpoint for d21 period of time. Counting is reset if temperature/pressure goes beyond the normal defrost setpoint while counting this time.

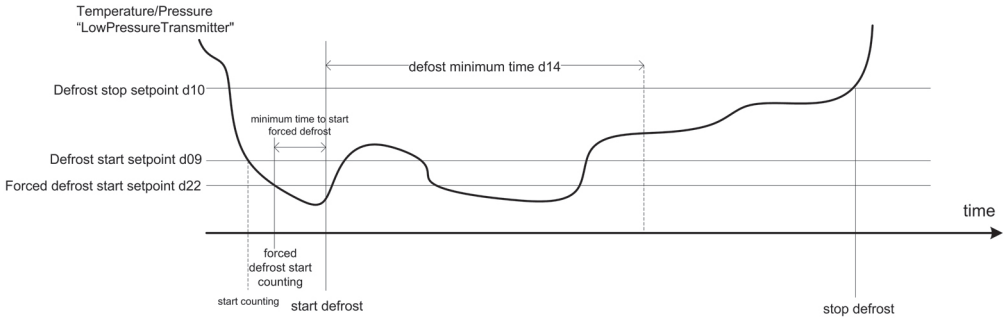


Fig 14 [Heat pump control - Forced defrost]

5.5.7 Low pressure during defrost

d07 – Enable low pressure alarm during defrost
allows you to disable (d07=NO) the low pressure switch control during all the defrost cycle.

6.0 Heat circulation pump

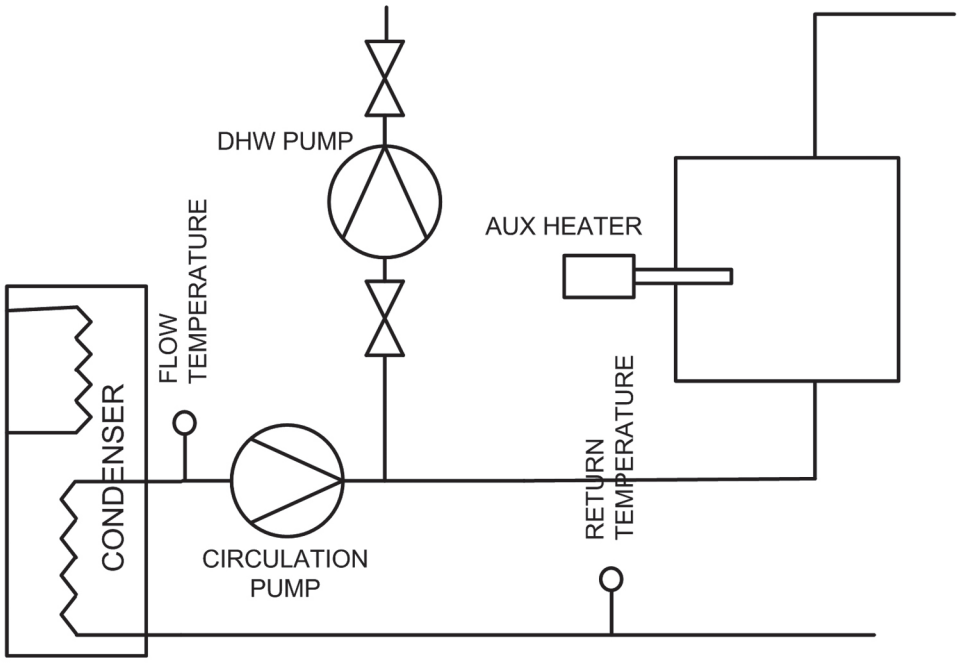


Fig 15 [Heat circulation pump - Description]

Parameters

CNd			Heat Sink
	CPC		Pump Control
		P01	Control type
		P02	Pump after-run time
		P03	Pump pre-run time
		P04	Pump OFF time

Tab 38 [Heat circulation pump - Parameters]

Input/output

Digital output

Code	Description
CP1	Circulation Pump 1

Tab 39 [Heat circulation pump - Digital output]

Digital input

Code	Description
FPE	Circuit Flow Switch
OPE	Circulation Pump Ovld

Tab 40 [Heat circulation pum - Digital input]

6.1 Control strategy

"Circulation Pump 1" digital output is used to drive the circulation pump.

It's managed:

- a pre-run time P03, to activate the pump before compressors ensuring that water passes through the heat exchanger, enabling the sensors to acquire the correct temperature;
- an after-run time P02, to switch OFF the pump after compressors.

According to P01 parameters these are the possible pump way of working:

- P01=OFF. No pump control.
- P01=ON. Pump always ON.
  It is switched OFF only when the unit is OFF after a programmable delay P02 from the compressors.
- P01=ON_C. The pump functioning is ON/OFF and it's only subordinate to the compressors functioning:
  pump is switched ON when heating is requested;
  pump is switched OFF when all compressors are OFF after a programmable delay P02.
- P01=brSt. As P01=ON_C but with intermittent working when compressors are OFF.
  When heating isn't requested, the pump is activated with regular intervals P04, independently from compressors.

Note

The regulation temperature is acquired only after the pre-run time P03 has elapsed.

Generally, the pump will be never switched OFF if all the compressors won't first.

6.2 DHW request

In case of request for domestic hot water, the circulating pump is switched OFF immediately.

(See the chapter "7 DHW preparation" for a detailed description).

6.3 Frost protection

Parameters

CNd			Heat Sink
	FRp		Frost Protection
		P51	Return temperature activation
		P52	Outdoor temperature activation
		P53	Heat Pump start delay
		P54	Frost alarm abs limit
		P55	Differential
		P5r	Reset type
		P5d	Delay from pump start

Tab 41 [Heat circulation pump - Frost protection - Parameters]

The heating circulation pump operates continuously at external temperatures lower than P52 AND at return temperatures lower than P51. The warning "A23- Sink protection warning" is generated.
If this condition lasts for more than P53 time (and temperature goes below P51-differential) then the heatpump is started.

Moreover, below the P54 limit of the return or flow temperature the "A24-Sink frost alarm" is generated. Pump is always on but compressors are stopped.
Start up delay, type of reset and hysteresis for reset are set by P5d, P5r and P55 parameters.

6.4 Pump and flow alarms

Parameters

ALA			Alarms
	FLO		Flow
		AFr	Reset type
		AF1	Delay from pump starting
		AF2	Delay in steady operation
		AF3	Time to restart

Tab 42 [Heat circulation pump - Pump and flow alarm - Parameters]

Pump and flow alarms are generated by the activation of the related digital input.The “Circulation Pump Ovld” digital input generates the alarm “Circulation pump overload alarm”, switching off the pump.
Digital input polarity and all the alarms attributes (such as description, delay at startup and in normal working, type of reset and gravity) are configurable through the MCXShape software configurator tool.

The “Circuit Flow Switch” digital input generates the alarm “Circuit flow switch alarm”.
Start up delay, steady delay and type of reset are set by AF1, AF2 and AFr parameters.
In case of automatic or semiautomatic reset, on completion of AF3-Time to restart, the heat pump is switched on again.

6.5 Hour counter

Parameters

CNd			Heat Sink
	PHr		Run hours
		P50	Maximum limit

Tab 43 [Heat circulation pump - Hour counter - Parameters]

To evaluate pump condition, the control monitors the run hours of the pump. If the pump hour counter exceeds the limit P50 (multiplied by 1000), then the control will generate the A10 warning, indicating the need for pump maintenance.

To see the pump running hours go to menu HOUR COUNTERS -> SOURCE PUMP.

To reset all the hour counters go to menu HOUR COUNTERS -> RESET COUNTERS.

7.0 DHW preparation

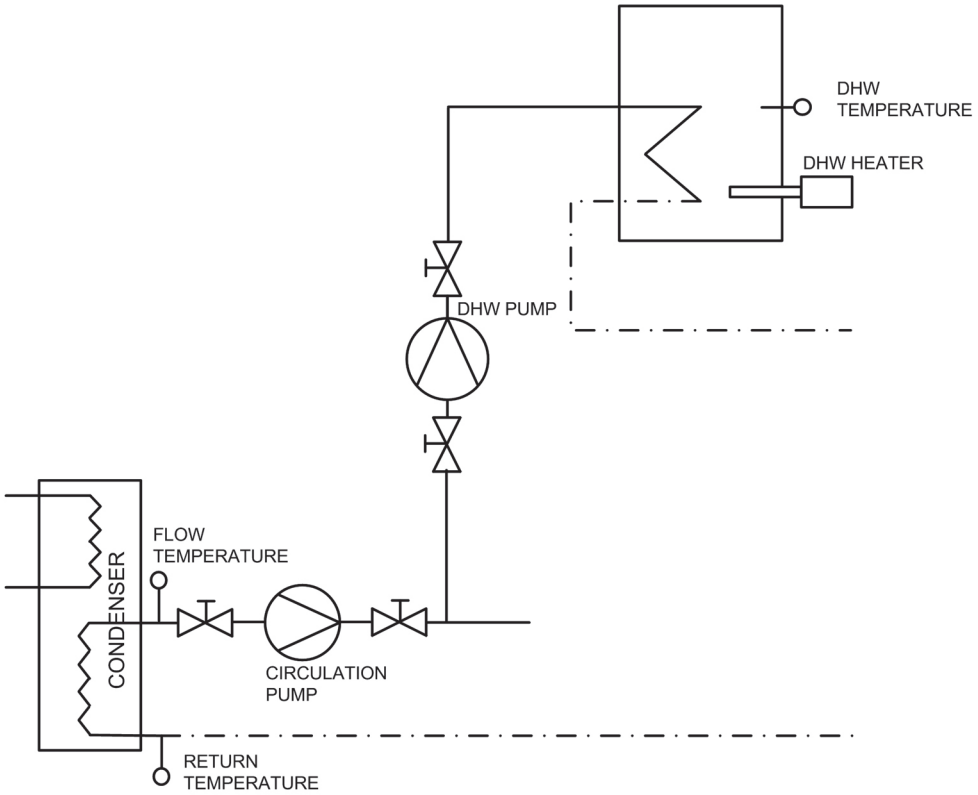


Fig 16 [DHW preparation - Description]

Parameters

DHW			DHW preparation
	CFG		Configuration
		dH1	DHW Enable
		dH2	Enable DHW heater
		dH5	Hp max temperature
		dH6	Outside temp. Comp. 2 enabling

DHW			DHW preparation
	SEt		Setpoint
		ds1	Comfort setpoint
		ds2	Economy setpoint
		ds3	Activation differential
		ds4	Frost protection set
		ds5	Max DHW setpoint

Tab 44 [Heat circulation pump - Parameters]

Input/output

Analog input

Code	Description
DHW	DHW Temperature

Tab 45 [DHW preparation - Analog input]

Digital input

Code	Description
DHW	DHW Thermostat

Tab 46 [DHW preparation - Digital input]

Digital output

Code	Description
DWP	DHW Pump
DWH	DHW Heater

Tab 47 [DHW preparation - Digital output]

7.1 Control strategy

If enabled by dH1, regulation is carried out according to parameters dH1 using:

- a thermostat “DHW Thermostat”, if dH1=DIG (1);
- a temperature sensor “DHW Temperature”, if dH1=PRB (1).

Installed in the hot water cylinder.

DHW setpoint is set with ds1 (comfort mode) or ds2 (economy mode).
The active setpoint is set:

- by user interface main menu SET MODE -> DHW;
- by scheduler, (see 2.6.2 “DHW setup and weekly setting”);
- by the digital input “Presence switch”. When the digital input is active then the comfort setpoint is selected.

Frost protection setpoint ds4 is used when DHW heating is switched OFF.
A request for domestic hot water is recognised if
DHW temperature < (setpoint ds1 or ds2) – activation differential (ds3).
A request for domestic hot water is ended if
DHW temperature > (setpoint ds1 or ds2) + activation differential (ds3).

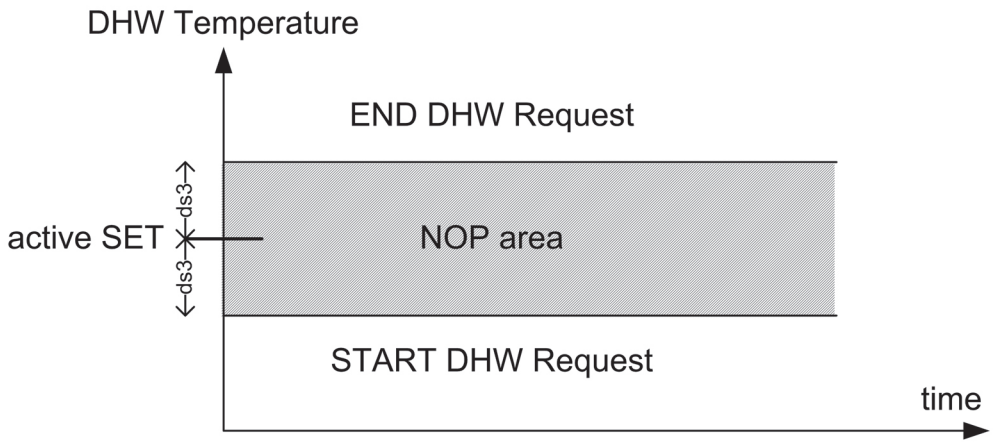


Fig 17 [DHW preparation - Control strategy]

If the flange DHW heater is not enabled (dH2=OFF), only the heat pump is activated and 1 compressor is started.
For heat pumps with 2 compressors, parameter dH6 sets the external temperature below which DHW preparation is carried out with 2 compressors.
If DHW heater is enabled (dH2=ON), then it is activated when the DHW actual temperature overcomes the heat pump maximum temperature (set through dH5). DHW pump is stopped and compressors are used again for heat operation. It is deactivated when temperature goes below dH5-ds3.

7.2 DHW pump

The hot water circulating pump "DHW pump" operates during DHW production performed with compressors. It is stopped when DHW heater is started.
If there is a request for domestic hot water during heating operation, the heat circulating pump is switched OFF and the DHW pump is switched ON (priority to DHW preparation).

7.3 Thermal disinfection

Parameters

DHW			DHW preparation
	Dis		Disinfection
		tH1	Temperature
		tH2	Starting time
		tH3	Duration
		tH4	Period

Tab 48 [Heat circulation pump - Thermal disinfection - Parameters]

The thermal disinfection procedure consists in bringing the water temperature at a high temperature, defined with tH1, for the time tH3.
If enabled (tH3 different from 0), the procedure starts at tH2 hour of the day and is executed again after tH4 days.

8.0 Heating curves

Parameters

HC0			Heating Curve
	Hc1		Heat Curve Type1
		T11	Start point
		T12	Tout at start point
		T13	End point
		T14	Tout at end point
		T15	Max. flow temperature

HC0			Heating Curve
	Hc2		Heat Curve Type2
		T21	Start point
		T22	Tout at start point
		T23	End point
		T24	Tout at end point
		T25	Max. flow temperature

HC0			Heating Curve
	Hc3		Heat Curve Type2
		T31	Start point
		T32	Tout at start point
		T33	End point
		T34	Tout at end point
		T35	Max. flow temperature

Tab 49 [Heating curves - Parameters]

Input/output

Analog input

Code	Description
OUt	Outdoor Temperature

Tab 50 [Heating curves - Analog input]

The heating curve establishes the flow temperature setpoint according to the value of the outside temperature.

Is possible to define 3 types of heating curve, typically for low, medium and high temperature circuits. For each type of heating curve you have then to define the following parameters:

- "Start Point": setpoint at external temperature of "Tout at start point";
- "End point": setpoint at external temperature of "Tout at end point";
- "Max flow temperature": maximum flow temperature of the circuit according to the design of the heating system. Setpoint cannot exceed this value.

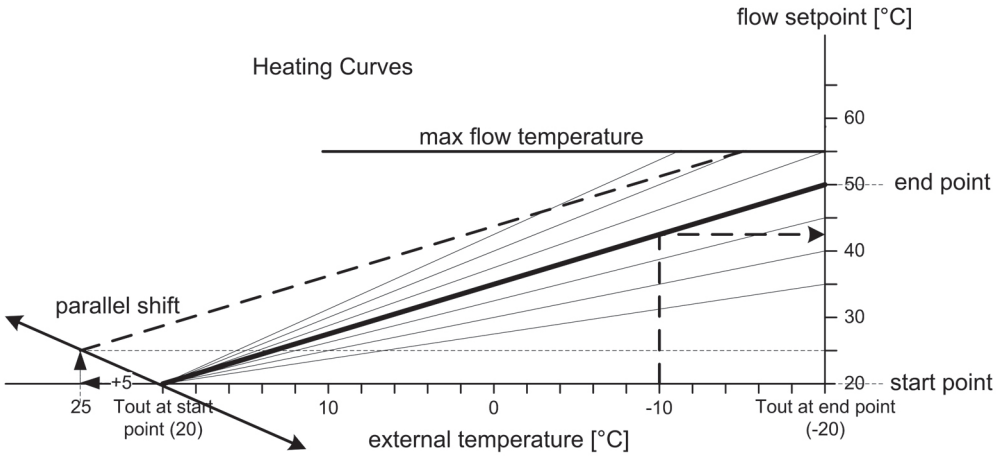


Fig 18 [Heating curves - Diagram]

Example

1. *if the end point of the heating curve is set to 50°C at external temperature of -20°C, and the start point is set to 20°C at external temperature of 20°C, then at external temperature of -10°C, the flow setpoint is 42,5.*
2. *if the parallel shift is set to +5°C, the heating curve becomes the dotted line in figure.*

9.0 Circuit temperature control

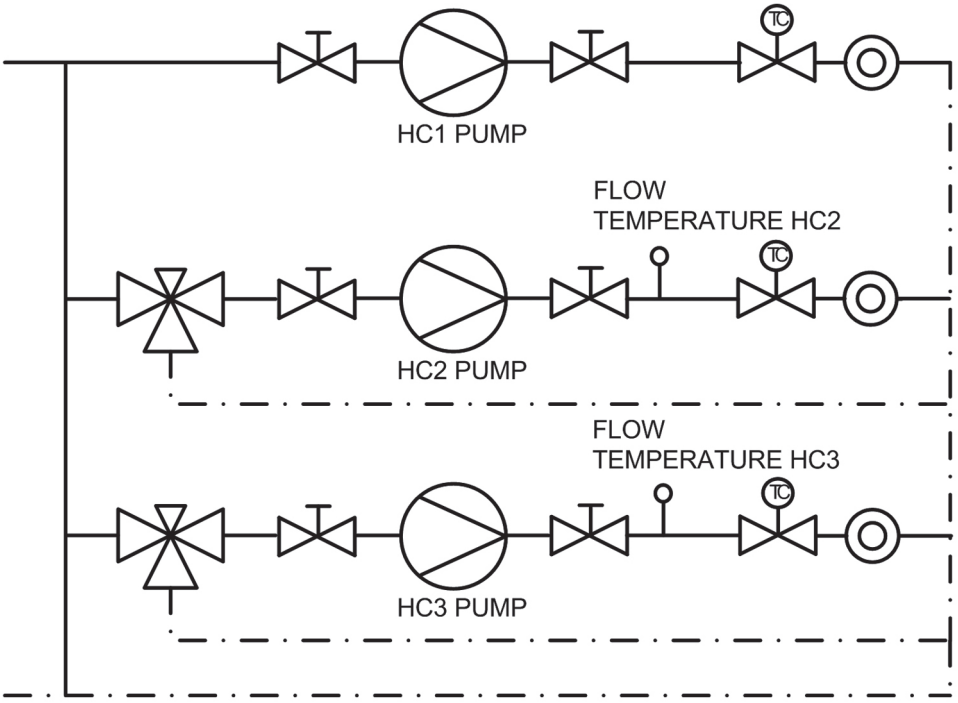


Fig 19 [Circuit temperature control - Description]

Parameters

CIR			Circuit Control
	Crg		General
		Cr0	Circuit differential
		Cr1	ECO offset

CIR			Circuit Control
	Cr1		Circuit 1
		C10	Circuit description
		C17	Heat curve type
		C18	Parallel shift heating curve

CIR			Circuit Control
	Cr2		Circuit 2
		C20	Circuit description
		C21	Valve type
		C22	Valve full excursion time
		C23	Valve minimum variation

CIR			Circuit Control
	Cr2		Circuit 2
		C24	Valve forcing period
		C25	Valve range
		C27	Heat curve type
		C28	Parallel shift heating curve

CIR			Circuit Control
	Cr3		Circuit 3
		C30	Circuit description
		C31	Valve type
		C32	Valve full excursion time
		C33	Valve minimum variation
		C34	Valve forcing period
		C35	Valve range
		C37	Heat curve type
		C38	Parallel shift heating curve

Tab 51 [Circuit temperature control - Parameters]

Input/output

Analog input

Code	Description
Mx2	Flow Temperature HC2
Mx3	Flow Temperature HC3

Tab 52 [Circuit temperature control - Analog input]

Digital output

Code	Description
V2O	HC2 Mixing Valve Open
V2C	HC2 Mixing Valve Close
V3O	HC3 Mixing Valve Open
V3C	HC3 Mixing Valve Close

Tab 53 [Circuit temperature control - Digital output]

Analog output

Code	Description
VA2	HC2 Mixing Valve
VA3	HC3 Mixing Valve

Tab 54 [Circuit temperature control - Analog output]

9.1 Customization

Using parameters C10, C20, C30 is possible to enable circuit management and to set a description for each circuit among six predefined texts.

Texts are customizable via MCXShape software configurator tool.

The circuit description is then displayed on the user interface screen, when showing the data of the correspondent circuit.

9.2 Circuits control strategy

The flow circuit setpoint is calculated via the selected heating curve.

For each circuit you can:

- select the desired type of heating curve with C17, C27, C37 parameters among the three types available, (see 8.0 “Heating curves”);
- set a parallel shift of the selected heating curve to change the flow temperature across the entire outside temperature range with C18, C28, C38 parameters.

For all the circuit you can define the offset “Cr1-ECO offset” to define the heating curve shift when the economy mode is set by menu (a positive value means a lower setpoint in heating).

9.2.1 Unmixed circuit 1

The unmixed heating circuit is controlled with the sensor defined with REG parameter. For the load demand, (see 5.0 “Heat pump control”).

The unmixed circuit pump is activated when there is a request from the room associated to that circuit.

If there is no room control then the pump is in parallel to the circulating pump.

9.2.2 Mixed circuit

Each mixed heating circuit is controlled with its flow sensor “Flow Temperature HCx” and related setpoint acting on a mixing valve with proportional control.

The load demand is proportional to the difference between the calculated setpoint and the “Flow Temperature HCx” sensors, as described in figure. The control band is defined in Cr0.

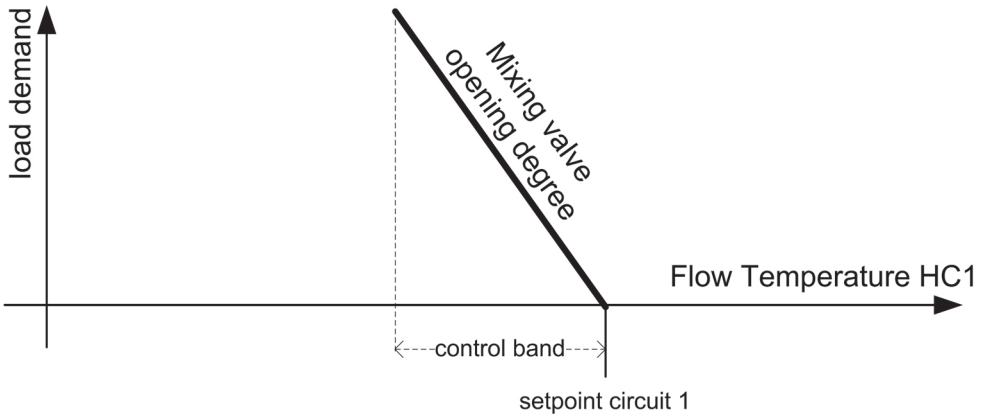


Fig 20 [Circuit temperature control - Mixed circuit]

9.2.3 Mixing valve

The mixing valve can be a ON/OFF, 0/10V modulating or 3 points valve. The type of valve is defined by C21, C31, for each circuit (hereafter only C21).

- C21=NO: no valve;
- C21=2P: ON/OFF valve; the valve is open when the digital output is energized;
- C21=3P: 3 points valve.

Note

There’s no need to define the 0/10V modulating valve, since it is always managed if the analog output is present.

Depending on the type of valve to be operated, the following outputs are used:

Circuit	Type of valve	Type of output	Output used	
Circuit2	ON/OFF	digital output	V2O	HC2 Mixing Valve Open
	0/10V	analog output	VA2	HC2 Mixing Valve
	3-points	digital output	V2O	HC2 Mixing Valve Open
			V2C	HC2 Mixing Valve Close

Circuit	Type of valve	Type of output	Output used	
Circuit3	ON/OFF	digital output	V3O	HC3 Mixing Valve Open
	0/10V	analog output	VA3	HC3 Mixing Valve
	3-points	digital output	V3O	HC3 Mixing Valve Open
			V3C	HC1 Mixing Valve Close

Tab 55 [Circuit temperature control - Mixing valve]

ON/OFF and 0/10V valve control

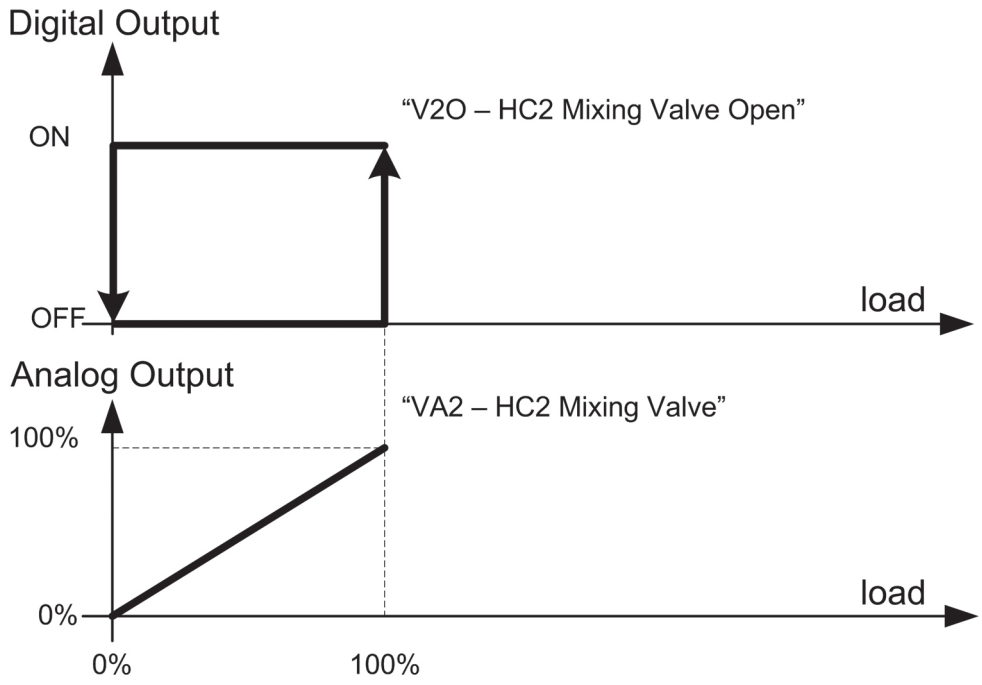


Fig 21 [Circuit temperature control - Valve control]

3-point valve control
This is a valve with 3 electrical contacts plus the power supply: common, open and close.
The following parameters are used to configure a 3 point valve.

C22, C32 – Valve full excursion time
Indicates the time the valve takes to go from fully closed to fully open. The valve control algorithm uses this time to calculate the activation time for the outputs "HC2,3 Mixing Valve Open" and "HC2,3 Mixing Valve Close".
Depending on the length of time the contact is activated, the extent to which the valve is opened varies from 0% to 100% of the excursion time. The relays are never activated simultaneously, thus the valves either open, or close, or remain still.

To obviate the lack of feedback that provides exact information on the valve opening step, the following rules apply:

- when the instrument is turned on, the valve is closed or open all the way for an amount of time equal to the excursion time + 25%, and the position of the valve is realigned before regulation is started;
- whenever the temperature regulation requires opening or closing a valve all the way, the program increases the opening or closing relay activation time by 25% to ensure that the valve opens or closes all the way.

C23, C33 – Valve minimum variation
This is the minimum shift performed with the valve. Useful for not stressing the valve.

C24, C34 - Valve forcing period
If the valve is fully open or fully closed, the opening or closing command is periodically sent for a time equal to 25% of the full excursion time. The frequency of this command is defined in this parameter.

C25, C35 – Valve range
If the valve is commanded to a position lower than this parameter (as a percentage of the fully open or fully closed position), the valve will open or close all the way.

Example

C25=5% means that a request for a 4% position will cause the valve to fully close and a request for 96% will cause it to open all the way.

9.2.4 Mixed circuit pump

The pump is activated when there is a request from the room associated to that circuit.
If there is no room control then the pump is in parallel to the circulating pump.

10.0 Room control

Parameters

RCT			Room Control
	GEN		General
		R00	Room differential
		R01	Frost protection set
		R02	Max room setpoint

RCT			Room Control
	R01		Room 1
		R10	Room regulation type
		R11	Room set COMF in heating
		R12	Room set ECO in heating
		R13	Room set COMF in cooling
		R14	Room set ECO in cooling
		R15	Start compens. set ECO
		R16	End compens. set ECO

RCT			Room Control
	R02		Room 2
		R20	Room regulation type
		R21	Room set COMF in heating
		R22	Room set ECO in heating
		R23	Room set COMF in cooling
		R24	Room set ECO in cooling
		R25	Start compens. set ECO
		R26	End compens. set ECO

RCT			Room Control
	R03		Room 3
		R30	Room regulation type
		R31	Room set COMF in heating
		R32	Room set ECO in heating
		R33	Room set COMF in cooling
		R34	Room set ECO in cooling
		R35	Start compens. set ECO
		R36	End compens. set ECO

RCT			Room Control
	RST		Remote stations
		Rr1	Room 1 MMI CanID
		Rr2	Room 2 MMI CanID
		Rr3	Room 3 MMI CanID

Tab 56 [Room control - Parameters]

Input/output

Digital Output

Code	Description
RP1	HC1 Pump
RP2	HC2 Pump
RP3	HC3 Pump

Tab 57 [Circuit temperature control - Digital output]

Analog Input

Code	Description
Rt1	Room 1 Temperature
Rt2	Room 2 Temperature
Rt3	Room 3 Temperature

Tab 58 [Circuit temperature control - Analog input]

Digital Input

Code	Description
RT1	Room thermostat 1
RT2	Room thermostat 2
RT3	Room thermostat 3
RT6	Presence Switch

Tab 59 [Circuit temperature control - Digital input]

10.1 Room regulation types

According to parameters R10, R20, R30, each room can be controlled by:

- a thermostat, if R10=DIG (0);
- a temperature sensor, if R10=ANALOG (1);
- a remote station, if R10=REMOTE (2).

When a heat request is generated from a room then the pump of the associated circuit is activated and the mixing valve is controlled.

- A request from Room 1 activate the Circuit 1.
- A request from Room 2 activate the Circuit 2.
- A request from Room 3 activate the Circuit 3.

10.1.1 Room thermostat regulation

The heat request is generated by a thermostat.

The thermostat digital output must be connected to the digital input “Room Thermostat X” of the heating circuit serving that room.

When the digital input is active, the appropriate room pump “HCX Pump” is activated and the mixing valve is controlled.

10.1.2 Room temperature regulation

The heat request is generated by the comparison between the room temperature and setpoint.
The room temperature is measured connecting a temperature sensor directly to the MCX controller analog input “Room 1 Temperature”, “Room 2 Temperature”, “Room 3 Temperature”
For each room is possible to define 2 setpoints in heating (comfort R11 and economy R12) and 2 in cooling (R13 and R14).

The ECO setpoint can be weather compensated as described in the following figure.

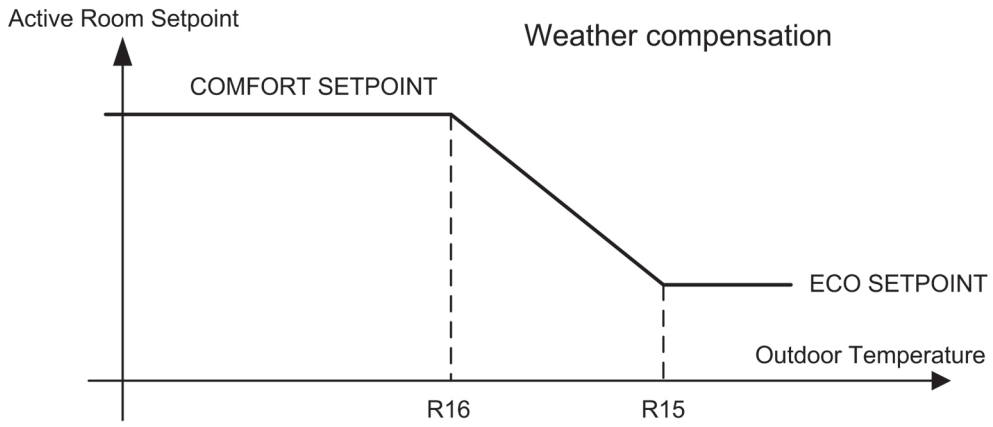


Fig 22 [Room control - Room temperature regulationl]

The selection between the ECO or COMFORT setpoint is made:

- by user interface main menu SET MODE -> UNIT;
- by scheduler, (see 2.6.1 “Circuit setup and weekly setting”);
- by the digital input “Presence switch”. When the digital input is active then the comfort setpoint is selected.

When the room temperature is below the active setpoint minus the control band R00, the appropriate room pump “HCX Pump” is activated and the mixing valve is controlled.

Then there is the frost protection setpoint R01 equal for all the rooms. The frost check is on the room probe “Room X Temperature” if present or on the circuit probe “Flow Temperature HCx”.

10.1.3 Room climatic station

Similar to the previous one but the temperature is transmitted via CANbus to the MCX controller by a “Room Station”, whose network NodeID is defined by Rr1, Rr2 and Rr3 respectively for the 3 managed rooms.

11.0 Parameters

Parameters are divided in groups, depending on the function type.

For each parameters are defined the following features (these features could be a numeric value or could depend from the value of another parameter which is specified by an acronym).

All the described features can be modified through MCXShape software configurator tool.

- **Code**: acronym to identify the parameter. It clearly identifies the parameter and it is showed on the display.
- **Description**: parameter description to display on a LCD display.
- **K**: K indicates a not adjustable parameter (constant value equal to the default value); it isn't showed on the display.
- **Min**: minimum value.
- **Max**: maximum value.
- **Default**: factory setting value. To force parameters to get their factory setting values go to menu START -> LOAD DEFAULT.
- **U.M.**: indicates the unit of measurement.
- **Decimals**: number of decimal digits.
- Visibility requirements: specifies if the parameter visibility is depending on the value of another parameter.
- **Level**: the parameters are organized on 4 levels. Levels from 1 to 3 are linked to a password. It is not allowed the access to parameters when they are on a higher level than the entering level:
    - Level 0 is accessible without password.
    - Level 1 is easily accessible (password L01). It contains all the parameters that are not critical for the unit functioning. They are frequently modified.
    - Level 2 contains all the parameter that are useful to set the unit (password L02).
    - Level 3 contains all the parameters reserved to the unit manufacturer (password L03).
- **Text Values**: list of mnemonic values that parameters can assume.

The entering to the parameters visualization and modification mode is possible from menu.

For a complete user interface description, (see 2.0 "User interface").

11.1 Parameters table

(See MCXShape software configurator tool).

12.0 Alarms

12.1 Alarm actions

When an alarm happens generally the following actions are executed.

- Buzzer activation, if present and enabled and if required by the active alarm, (see 12.3 "Alarms table"). The BUZ parameter sets the buzzer activation time in case of alarm; 0 is always OFF, 1..14 the buzzer is automatically muted after the related value in minutes, 15 is always ON.
- Alarm or warning relay activation (if present) according to what is required by the active alarm, (see 12.3 "Alarms table"). The relay working logic between Normally Close (N.C.) and Normally Open (N.O.) is defined at the physical output configuration phase. If polarity is set to "Open" (as by default) it means that relay is energized in case of alarm.
- Display of the alarm icon and alarm code on the LED display controllers, together with the time since its activation.
- Display of the active alarms list and of the related description on the LCD controllers. For a more detailed description of the user interface in case of alarms, (see 3.0 "User interface").

12.2 Reset types

Alarms can be of manual, automatic or semi-automatic reset type.

- If they are of manual reset type, they requires an acknowledgement to be reset; the user must press the ✕ key for 3 seconds within the alarm screens to reset the alarm, if the alarm condition doesn't occur anymore. Or he can reset it from menu ALARMS -> RESET ALARMS, (see 2.4.3 "Rolling text").
  With parameter "rOL- Show rolling text" is possible to show on the main screen a rolling text displaying some information about the delays that compressors are waiting before being able to start. Information is shown in the format.
  Cx/CP/SP-YYY where.
  Cx=C1 or C2 signalling the compressor that is waiting to start/stop; CP=circulation pump; SP=source pump.
  YYY=code of the parameter defining the delay that is waited for

Example

C1-CT4 means that Compressor1 is waiting for the time CT4 to be elapsed.

- CP-P02 means that Circulation Pump is waiting for the time P02 to be elapsed.

- Menu navigation".
- If they are of automatic reset type, the alarm is reset as soon as the alarm condition disappear. The display icon stays active till it is manually reset, (see the point above).
- There are alarms with automatic reset but that becomes of manual reset type after a configurable amount of activations: they are the so called semi-automatic alarms.

Buzzer is muted pressing any key even if the alarm condition is still present and stays muted till a new alarm occurs.

12.3 Alarm table

Each alarm is characterized by the following attributes that can be all set by MCXShape software configurator tool or by parameters, if present, (in this case in the table you can see the parameter code in place of the value):

- **code**: acronym to identify the alarm and that is showed on the display.
- **description**: display on a LCD display.
- **enable**.
- **reset type**: (-1=automatic, 0=manual, >0=number of occurrences for semi-automatic alarms).
- **semiautomatic period**: if semi-automatic alarms, the period for counting alarm occurrences; if during this time the alarm exceeds its maximum number of occurrences, it becomes a manual reset alarm.
- **startup delay**: delay from the start-up of the related element.
- **steady delay**: delay in normal functioning.
- **active with unit OFF**: if active even when the unit is OFF.
- **alarm relay**: action on the alarm relay.
- **warning relay**: action on the warning relay.

As described in the following table.

Code	Description	Enable	Reset type	Semiautomatic period (min)	Startup delay (s)	Steady delay (s)	Active with unit OFF	Alarm relay	Warning relay
A01	General alarm	1	-1	10	0	0	NO	ON	OFF
A02	General overload alarm	1	-1	10	0	0	NO	ON	OFF
A03	Source flow switch alarm	1	AFr	10	AF1	AF2	NO	ON	OFF
A04	General source fan/pump overload	1	-1	10	0	0	NO	ON	OFF
A05	Source fan/pump 1 overload	1	-1	10	0	0	NO	ON	OFF
A06	Source fan 2 overload	1	-1	10	0	0	NO	ON	OFF
A07	Source pump run hours exceeded	1	-1	10	0	0	NO	OFF	ON
A08	Source pressure switch	1	-1	10	0	0	NO	OFF	ON
A09	Source frost protection warning	1	-1	10	3	3	YES	OFF	ON
A10	Source frost alarm	1	SPr	10	0	0	YES	ON	OFF
A21	Circuit flow switch alarm	1	AFr	10	AF1	AF2	NO	ON	OFF
A22	Circulation pump overload alarm	1	-1	10	0	0	NO	ON	OFF
A23	Sink protection warning	1	-1	10	3	3	YES	OFF	ON
A24	Sink frost alarm	1	P5r	10	P5d	5	YES	ON	OFF
A25	Circulation pump hours exceeded	1	-1	10	0	0	NO	OFF	ON
AH1	High pressure alarm	1	AHr	90	0	0	NO	ON	OFF
AL1	Low pressure alarm	1	ALr	90	AL1	0	NO	ON	OFF
Ac0	General compressors overload	1	-1	10	0	0	NO	ON	OFF
Ac1	Compressor 1 overload alarm	1	-1	10	0	0	NO	ON	OFF
Ac2	Compressor 2 overload alarm	1	-1	10	0	0	NO	ON	OFF
Ac3	Compressor 1 run hours exceeded	1	-1	10	0	0	NO	OFF	ON
Ac4	Compressor 2 run hours exceeded	1	-1	10	0	0	NO	OFF	ON

Code	Description	Enable	Reset type	Semiautomatic period (min)	Startup delay (s)	Steady delay (s)	Active with unit OFF	Alarm relay	Warning relay
A71	External coil reg. probe	1	-1	10	0	0	YES	ON	OFF
A72	Outdoor Temperature Fault	1	-1	10	0	0	YES	ON	OFF
A73	Internal coil reg. probe	1	-1	10	0	0	YES	OFF	ON
A74	Source Inlet Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A75	Source Outlet Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A76	Return Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A77	Flow Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A78	DHW Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A79	Storage Tank Temperature Fault	1	-1	10	0	0	YES	ON	OFF
A80	Room 1 Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A81	Room 2 Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A82	Room 3 Temperature Fault	1	-1	10	0	0	YES	OFF	ON
A84	Flow Temperature HC2 Fault	1	-1	10	0	0	YES	OFF	ON
A86	Flow Temperature HC3 Fault	1	-1	10	0	0	YES	OFF	ON
AOF	Unit OFF	0	-1	10	0	0	NO	OFF	OFF
AdF	Defrost max time exceeded	1	-1	10	0	0	NO	OFF	ON
E10	EXD1 Connection	1	3	10	10	10	NO	ON	OFF
E11	EXD1 EKC Error	0	-1	10	10	10	NO	ON	OFF
E12	EXD1 S2 Error	1	-1	10	10	10	NO	ON	OFF
E13	EXD1 S4 Error	1	-1	10	10	10	NO	ON	OFF
E14	EXD1 Pe Error	1	-1	10	10	10	NO	ON	OFF
E15	EXD1 Ext Ref Error	0	-1	10	10	10	NO	ON	OFF
E16	EXD1 NO Refrig. Selected	1	-1	10	10	10	NO	ON	OFF
E17	EXD1 Valve Error	1	-1	10	10	10	NO	ON	OFF
E18	EXD1 Battery low	1	-1	10	10	10	NO	ON	OFF
E19	EXD1 CAN driver diagnostics	0	-1	10	10	10	NO	ON	OFF
AC1	Application Control Alarm	1	-1	10	10	10	NO	ON	OFF
EEV	EIM316 Alarm	1	-1	10	10	10	NO	ON	OFF
ACC	Modbus communication alarm	1	-1	10	10	10	NO	ON	OFF

Tab 60 [Alarms - Alarms table]

13.0 Modbus communication

Parameters

GEN			General
	SEr		Serial settings
		SEr	Serial address (Modbus and CAN)
		bAU	Serial baudrate (Modbus)
		COM	Serial settings (Modbus)

Tab 61 [Modbus communication - Parameters]

The supported protocol over the RS485 network is Modbus RTU slave.
Here follow the related parameters.

SEr - Serial address (Modbus and CAN)
Node serial address, valid for both CAN and Modbus network. Each node must have a unique serial address.

Note

SEr change the address after unit power up. SEr always overrule the BIOS setting.

bAU – Serial baud rate (Modbus)
- bAU=0. communication OFF
- bAU=12. baud rate=1200 baud
- bAU=24. baud rate=2400 baud
- bAU=48. baud rate=4800 baud
- bAU=96. baud rate=9600 baud
- bAU=144. baud rate=1440 baud
- bAU=192. baud rate=19200 baud (default value)
- bAU=288. baud rate=28800 baud
- bAU=384. baud rate=38400 baud

COM – Serial settings (Modbus)
- COM=8N1 8 bit data, no parity, 1 stop bit
- COM=8E1. 8 bit data, parity even, 1 stop bit
- COM=8N2. 8 bit data, no parity, 2 stop bit

All the variables are exported as Holding Registers.

13.1 Exported variables table

Note

Modbus Holding Register addresses are reported in the following table. You can calculate the corresponding message address subtracting 1 to each value.

	Code	Description	Decimals	Type	R/W	Address
Status Variables						
Regulation set	SET	Regulation set	1	short	R	16482
Regulation probe	REG	Regulation probe	1	long	R	16480
Power request	POWR	Power request	1	short	R	16484
Active power	POWA	Active power	1	short	R	16485
Digital IN 1-32	D-I	DI1 0000 0001 0000 0000 0000 0000 0000 0000 DI2 0000 0010 0000 0000 0000 0000 0000 0000 DI3 0000 0100 0000 0000 0000 0000 0000 0000 DI4 0000 1000 0000 0000 0000 0000 0000 0000 DI5 0001 0000 0000 0000 0000 0000 0000 0000 DI6 0010 0000 0000 0000 0000 0000 0000 0000 DI7 0100 0000 0000 0000 0000 0000 0000 0000 DI8 1000 0000 0000 0000 0000 0000 0000 0000 DI9 0000 0000 0000 0001 0000 0000 0000 0000 DI10 0000 0000 0000 0010 0000 0000 0000 0000 DI11 0000 0000 0000 0100 0000 0000 0000 0000 DI12 0000 0000 0000 1000 0000 0000 0000 0000 DI13 0000 0000 0001 0000 0000 0000 0000 0000 DI14 0000 0000 0010 0000 0000 0000 0000 0000 DI15 0000 0000 0100 0000 0000 0000 0000 0000 DI16 0000 0000 1000 0000 0000 0000 0000 0000 DI17 0000 0000 0000 0000 0000 0001 0000 0000 DI18 0000 0000 0000 0000 0000 0010 0000 0000 DI19 0000 0000 0000 0000 0000 0100 0000 0000 DI20 0000 0000 0000 0000 0000 1000 0000 0000 DI21 0000 0000 0000 0000 0001 0000 0000 0000 DI22 0000 0000 0000 0000 0010 0000 0000 0000 DI23 0000 0000 0000 0000 0100 0000 0000 0000 DI24 0000 0000 0000 0000 1000 0000 0000 0000 DI25 0000 0000 0000 0000 0000 0000 0000 0001 DI26 0000 0000 0000 0000 0000 0000 0000 0010 DI27 0000 0000 0000 0000 0000 0000 0000 0100 DI28 0000 0000 0000 0000 0000 0000 0000 1000 DI29 0000 0000 0000 0000 0000 0000 0001 0000 DI30 0000 0000 0000 0000 0000 0000 0010 0000 DI31 0000 0000 0000 0000 0000 0000 0100 0000 DI32 0000 0000 0000 0000 0000 0000 1000 0000	0	long	R	17665

	Code	Description	Decimals	Type	R/W	Address
Digital OUT	D-O	DO1 0000 0001 0000 0000 0000 0000 0000 0000 DO2 0000 0010 0000 0000 0000 0000 0000 0000 DO3 0000 0100 0000 0000 0000 0000 0000 0000 DO4 0000 1000 0000 0000 0000 0000 0000 0000 DO5 0001 0000 0000 0000 0000 0000 0000 0000 DO6 0010 0000 0000 0000 0000 0000 0000 0000 DO7 0100 0000 0000 0000 0000 0000 0000 0000 DO8 1000 0000 0000 0000 0000 0000 0000 0000 DO9 0000 0000 0000 0001 0000 0000 0000 0000 DO10 0000 0000 0000 0010 0000 0000 0000 0000 DO11 0000 0000 0000 0100 0000 0000 0000 0000 DO12 0000 0000 0000 1000 0000 0000 0000 0000 DO13 0000 0000 0001 0000 0000 0000 0000 0000 DO14 0000 0000 0010 0000 0000 0000 0000 0000 DO15 0000 0000 0100 0000 0000 0000 0000 0000 DO16 0000 0000 1000 0000 0000 0000 0000 0000 DO17 0000 0000 0000 0000 0000 0001 0000 0000 DO18 0000 0000 0000 0000 0000 0010 0000 0000 DO19 0000 0000 0000 0000 0000 0100 0000 0000 DO20 0000 0000 0000 0000 0000 1000 0000 0000 DO21 0000 0000 0000 0000 0001 0000 0000 0000 DO22 0000 0000 0000 0000 0010 0000 0000 0000 DO23 0000 0000 0000 0000 0100 0000 0000 0000 DO24 0000 0000 0000 0000 1000 0000 0000 0000 DO25 0000 0000 0000 0000 0000 0000 0000 0001 DO26 0000 0000 0000 0000 0000 0000 0000 0010 DO27 0000 0000 0000 0000 0000 0000 0000 0100 DO28 0000 0000 0000 0000 0000 0000 0000 1000 DO29 0000 0000 0000 0000 0000 0000 0001 0000 DO30 0000 0000 0000 0000 0000 0000 0010 0000 DO31 0000 0000 0000 0000 0000 0000 0100 0000 DO32 0000 0000 0000 0000 0000 0000 1000 0000	0	long	R	17667
Analog Input 1	AI1	Analog Input 1	1	short	R	17669
Analog Input 2	AI2	Analog Input 2	1	short	R	17670
Analog Input 3	AI3	Analog Input 3	1	short	R	17671
Analog Input 4	AI4	Analog Input 4	1	short	R	17672
Analog Input 5	AI5	Analog Input 5	1	short	R	17673
Analog Input 6	AI6	Analog Input 6	1	short	R	17674
Analog Input 7	AI7	Analog Input 7	1	short	R	17675
Analog Input 8	AI8	Analog Input 8	1	short	R	17676
Analog Input 9	AI9	Analog Input 9	1	short	R	17677
Analog Input 10	AI10	Analog Input 10	1	short	R	17678
Analog Input 11	AI11	Analog Input 11	1	short	R	17679
Analog Input 12	AI12	Analog Input 12	1	short	R	17680
Analog Input 13	AI13	Analog Input 13	1	short	R	17681
Analog Input 14	AI14	Analog Input 14	1	short	R	17682
Analog Input 15	AI15	Analog Input 15	1	short	R	17683
Analog Input 16	AI16	Analog Input 16	1	short	R	17684

	Code	Description	Decimals	Type	R/W	Address
Compressor 1 state	Cmp1	0=off bit0=1 -> waiting for circulation pump bit1=1 -> waiting for source pump bit2=1 -> waiting for CT0 bit3=1 -> waiting for CT1 bit4=1 -> waiting for CT2 bit5=1 -> waiting for CT3 bit6=1 -> waiting for CT4 bit8=1 -> ON bit10, 12=1 -> reserved	0	short	R	16417
Compressor 2 state	Cmp2	0=off bit0=1 -> waiting for circulation pump bit1=1 -> waiting for source pump bit2=1 -> waiting for CT0 bit3=1 -> waiting for CT1 bit4=1 -> waiting for CT2 bit5=1 -> waiting for CT3 bit6=1 -> waiting for CT4 bit8=1 -> ON bit10, 12=1 -> reserved	0	short	R	16418
PowerStage	Pge	0=P0 (off), 1=P1, 2=P2, 3=P3	1	short	R	20737
DHW_Status	Dus	0=off, 1=reqest for DHW	1	short	R	20738
RoomProbe_1	Re1	Room 1 Temperature	1	short	R	20739
RoomProbe_2	Re2	Room 2 Temperature	1	short	R	20740
RoomProbe_3	Re3	Room 3 Temperature	1	short	R	20741
RoomProbe_4	Re4	Room 4 Temperature	1	short	R	20742
RoomProbe_5	Re5	Room 5 Temperature	1	short	R	20743
RoomProbe_6	Re6	Room 6 Temperature	1	short	R	20744
RoomProbe_7	Re7	Room 7 Temperature	1	short	R	20745
RoomProbe_8	Re8	Room 8 Temperature	1	short	R	20746
RoomProbe_9	Re9	Room 9 Temperature	1	short	R	20747
RoomProbe_10	R10	Room 10 Temperature	1	short	R	20748
SetType_1	Se1	1=off (protection), 2=eco, 3=comfort	1	short	R	20759
SetType_2	Se2	1=off (protection), 2=eco, 3=comfort	1	short	R	20760
SetType_3	Se3	1=off (protection), 2=eco, 3=comfort	1	short	R	20761
SetType_4	Se4	1=off (protection), 2=eco, 3=comfort	1	short	R	20762
SetType_5	Se5	1=off (protection), 2=eco, 3=comfort	1	short	R	20763
SetType_6	Se6	1=off (protection), 2=eco, 3=comfort	1	short	R	20764
SetType_7	Se7	1=off (protection), 2=eco, 3=comfort	1	short	R	20765
SetType_8	Se8	1=off (protection), 2=eco, 3=comfort	1	short	R	20766
SetType_9	Se9	1=off (protection), 2=eco, 3=comfort	1	short	R	20767
SetType_10	S10	1=off (protection), 2=eco, 3=comfort	1	short	R	20768

	Code	Description	Decimals	Type	R/W	Address
DHW_HP_Request	Dest	0= NO DHW request 1=DHW request	1	short	R	20789
DHW_HeatingPump OFFRequest	Dest	0= circuits control 1=DHW control	1	short	R	20790
DHW_Set	DSet	DHW_Set	1	long	R	20791
DHW_PowReq	DReq	DHW_PowReq	1	short	R	20793
DHW_Set_Type	Dype	1=off (protection), 2=eco, 3=comfort	1	short	R	20794
CHS_Set	CSet	HP Setpoint	1	long	R	20795
CHS_PowerReq	Creq	HP Power	1	short	R	20797
PumpStatus_1	Ps1	Circuit 1 Pump Status: 0=OFF, 1=ON	1	short	R	20798
PumpStatus_2	Ps2	Circuit 2 Pump Status: 0=OFF, 1=ON	1	short	R	20799
PumpStatus_3	Ps3	Circuit 3 Pump Status: 0=OFF, 1=ON	1	short	R	20800
PumpStatus_4	Ps4	Circuit 4 Pump Status: 0=OFF, 1=ON	1	short	R	20801
PumpStatus_5	Ps5	Circuit 5 Pump Status: 0=OFF, 1=ON	1	short	R	20802
PumpStatus_6	Ps6	Circuit 6 Pump Status: 0=OFF, 1=ON	1	short	R	20803
PumpStatus_7	Ps7	Circuit 7 Pump Status: 0=OFF, 1=ON	1	short	R	20804
PumpStatus_8	Ps8	Circuit 8 Pump Status: 0=OFF, 1=ON	1	short	R	20805
PumpStatus_9	Ps9	Circuit 9 Pump Status: 0=OFF, 1=ON	1	short	R	20806
PumpStatus_10	P10	Circuit 10 Pump Status: 0=OFF, 1=ON	1	short	R	20807
ValveStatus_1	Vs1	not used	1	short	R	20808
ValveStatus_2	Vs2	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20809
ValveStatus_3	Vs3	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20810
ValveStatus_4	Vs4	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20811
ValveStatus_5	Vs5	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20812
ValveStatus_6	Vs6	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20813
ValveStatus_7	Vs7	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20814
ValveStatus_8	Vs8	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20815
ValveStatus_9	Vs9	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20816
ValveStatus_10	V10	Valve type 0=2P CLOSED, 1=2P OPEN, 2=3P CLOSED, 3=3P OPEN	1	short	R	20817
ValvePower_1	Vr1	ValvePower_1	1	short	R	20818

	Code	Description	Decimals	Type	R/W	Address
ValvePower_2	Vr2	ValvePower_2	1	short	R	20819
ValvePower_3	Vr3	ValvePower_3	1	short	R	20820
ValvePower_4	Vr4	ValvePower_4	1	short	R	20821
ValvePower_5	Vr5	ValvePower_5	1	short	R	20822
ValvePower_6	Vr6	ValvePower_6	1	short	R	20823
ValvePower_7	Vr7	ValvePower_7	1	short	R	20824
ValvePower_8	Vr8	ValvePower_8	1	short	R	20825
ValvePower_9	Vr9	ValvePower_9	1	short	R	20826
ValvePower_10	V10	ValvePower_10	1	short	R	20827
RHPStatus	Rtus	reserved	1	short	R	20848
DHW_Resistor_Out	DOut	0=OFF; 1=ON	1	short	R	20849
CircuitProbe_1	Ce1	not used	1	short	R	20850
CircuitProbe_2	Ce2	Flow Temperature HC2	1	short	R	20851
CircuitProbe_3	Ce3	Flow Temperature HC3	1	short	R	20852
CircuitProbe_4	Ce4	Flow Temperature HC4	1	short	R	20853
CircuitProbe_5	Ce5	Flow Temperature HC5	1	short	R	20854
CircuitProbe_6	Ce6	Flow Temperature HC6	1	short	R	20855
CircuitProbe_7	Ce7	Flow Temperature HC7	1	short	R	20856
CircuitProbe_8	Ce8	Flow Temperature HC8	1	short	R	20857
CircuitProbe_9	Ce9	Flow Temperature HC9	1	short	R	20858
CircuitProbe_10	C10	Flow Temperature HC10	1	short	R	20859
CircuitSet_1	Ct1	Circuit1 setpoint (function of the heating curve)	1	short	R	20860
CircuitSet_2	Ct2	Circuit2 setpoint (function of the heating curve)	1	short	R	20861
CircuitSet_3	Ct3	Circuit3 setpoint (function of the heating curve)	1	short	R	20862
CircuitSet_4	Ct4	Circuit4 setpoint (function of the heating curve)	1	short	R	20863
CircuitSet_5	Ct5	Circuit5 setpoint (function of the heating curve)	1	short	R	20864
CircuitSet_6	Ct6	Circuit6 setpoint (function of the heating curve)	1	short	R	20865
CircuitSet_7	Ct7	Circuit7 setpoint (function of the heating curve)	1	short	R	20866
CircuitSet_8	Ct8	Circuit8 setpoint (function of the heating curve)	1	short	R	20867
CircuitSet_9	Ct9	Circuit9 setpoint (function of the heating curve)	1	short	R	20868
CircuitSet_10	C10	Circuit10 setpoint (function of the heating curve)	1	short	R	20869
CompressorWaitiONc	CiON	Compressor waiting for circulation pump	1	short	R	20870
ChillerStageON	CeON	0= no capacity; 1=1st stage ;2=2nd stage...	1	short	R	20871

	Code	Description	Decimals	Type	R/W	Address
ChillerStatusSTH	CSTH	Auxiliary Heater status 0=OFF; 1=ON	1	short	R	20872
DHW_Probe	Dobe	DHW_Probe	1	short	R	20873
CHS_Probe	Cobe	CHS_Probe	1	short	R	20874
DHW_Dis_Status	Dtus	DHW_Dis_Status	1	short	R	20876
DHW_Pump	Dump	DHW_Pump	1	short	R	20877
RoomActualSet_1	Rt1	RoomActualSet_1	1	short	R	20887
RoomActualSet_2	Rt2	RoomActualSet_2	1	short	R	20888
RoomActualSet_3	Rt3	RoomActualSet_3	1	short	R	20889
RoomActualSet_4	Rt4	RoomActualSet_4	1	short	R	20890
RoomActualSet_5	Rt5	RoomActualSet_5	1	short	R	20891
RoomActualSet_6	Rt6	RoomActualSet_6	1	short	R	20892
RoomActualSet_7	Rt7	RoomActualSet_7	1	short	R	20893
RoomActualSet_8	Rt8	RoomActualSet_8	1	short	R	20894
RoomActualSet_9	Rt9	RoomActualSet_9	1	short	R	20895
RoomActualSet_10	R10	RoomActualSet_10	1	short	R	20896
P_Shift_1	Pt1	Parallel shift heating curve 1	1	short	R	20897
P_Shift_2	Pt2	Parallel shift heating curve 2	1	short	R	20898
P_Shift_3	Pt3	Parallel shift heating curve 3	1	short	R	20899
P_Shift_4	Pt4	Parallel shift heating curve 4	1	short	R	20900
P_Shift_5	Pt5	Parallel shift heating curve 5	1	short	R	20901
P_Shift_6	Pt6	Parallel shift heating curve 6	1	short	R	20902
P_Shift_7	Pt7	Parallel shift heating curve 7	1	short	R	20903
P_Shift_8	Pt8	Parallel shift heating curve 8	1	short	R	20904
P_Shift_9	Pt9	Parallel shift heating curve 9	1	short	R	20905
P_Shift_10	P10	Parallel shift heating curve 10	1	short	R	20906
Circ_Man_Set_1	Ct1		1	short	R	20927
Circ_Man_Set_2	Ct2		1	short	R	20928
Circ_Man_Set_3	Ct3		1	short	R	20929
Circ_Man_Set_4	Ct4		1	short	R	20930
Circ_Man_Set_5	Ct5		1	short	R	20931
Circ_Man_Set_6	Ct6		1	short	R	20932
Circ_Man_Set_7	Ct7		1	short	R	20933
Circ_Man_Set_8	Ct8		1	short	R	20934

	Code	Description	Decimals	Type	R/W	Address
Circ_Man_Set_9	Ct9		1	short	R	20935
Circ_Man_Set_10	C10		1	short	R	20936
HP_VAC_D_1	HD1	Vacation mode: 0=OFF 1=ON	1	short	R	20948
HP_BOOST_D_1	HD1	Party mode: 0=OFF 1=ON	1	short	R	20949
HP_Mode_Time	Hime	Elapsed time of a special function [sec] (vacation or party)	1	long	R	20950
Alarms					R	
General alarm	A01		0	short	R	17153
General overload alarm	A02		0	short	R	17154
Source flow switch alarm	A03		0	short	R	17155
General source fan/pump overload	A04		0	short	R	17156
Source fan/pump 1 overload	A05		0	short	R	17157
Source fan 2 overload	A06		0	short	R	17158
Source pump run hours exceeded	A07		0	short	R	17159
Source pressure switch	A08		0	short	R	17160
Source frost protection warning	A09		0	short	R	17161
Source frost alarm	A10		0	short	R	17162
Circuit flow switch alarm	A21		0	short	R	17163
Circulation pump overload alarm	A22		0	short	R	17164
Sink protection warning	A23		0	short	R	17165
Sink frost alarm	A24		0	short	R	17166
Circulation pump hours exceeded	A25		0	short	R	17167
High pressure alarm	AH1		0	short	R	17168
Low pressure alarm	AL1		0	short	R	17169
General compressors overload	Ac0		0	short	R	17170
Compressor 1 overload alarm	Ac1		0	short	R	17171
Compressor 2 overload alarm	Ac2		0	short	R	17172
Compressor 1 run hours exceeded	Ac3		0	short	R	17173
Compressor 2 run hours exceeded	Ac4		0	short	R	17174

	Code	Description	Decimals	Type	R/W	Address
External coil reg. probe	A71		0	short	R	17175
Outdoor Temperature Fault	A72		0	short	R	17176
Internal coil reg. probe	A73		0	short	R	17177
Source Inlet Temperature Fault	A74		0	short	R	17178
Source Outlet Temperature Fault	A75		0	short	R	17179
Return Temperature Fault	A76		0	short	R	17180
Flow Temperature Fault	A77		0	short	R	17181
DHW Temperature Fault	A78		0	short	R	17182
Storage Tank Temperature Fault	A79		0	short	R	17183
Room 1 Temperature Fault	A80		0	short	R	17184
Room 2 Temperature Fault	A81		0	short	R	17185
Room 3 Temperature Fault	A82		0	short	R	17186
Flow Temperature HC2 Fault	A84		0	short	R	17187
Flow Temperature HC3 Fault	A86		0	short	R	17188
Unit OFF	AOF		0	short	R	17189
Defrost max time exceeded	AdF		0	short	R	17190
EXD1 Connection	E10		0	short	R	17191
EXD1 EKC Error	E11		0	short	R	17192
EXD1 S2 Error	E12		0	short	R	17193
EXD1 S4 Error	E13		0	short	R	17194
EXD1 Pe Error	E14		0	short	R	17195
EXD1 Ext Ref Error	E15		0	short	R	17196
EXD1 NO Refrig. Selected	E16		0	short	R	17197
EXD1 Valve Error	E17		0	short	R	17198
EXD1 Battery low	E18		0	short	R	17199
EXD1 CAN driver diagnostics	E19		0	short	R	17200
Application Control Alarm	AC1		0	short	R	17201
EIM316 Alarm	EEV		0	short	R	17202
Modbus communication alarm	ACC		0	short	R	17203

	Code	Description	Decimals	Type	R/W	Address
Parameters						
Display A value	dSA		0	short	R/W	8193
Display B value	dSb		0	short	R/W	8194
Show rolling text	rOL		0	short	R/W	8195
Low brightness	LBr		0	short	R/W	8196
High brightness	Hbr		0	short	R/W	8197
Level 1 password	L01		0	short	R/W	8198
Level 2 password	L02		0	short	R/W	8199
Level 3 password	L03		0	short	R/W	8200
Logo	Log		0	short	R/W	8201
Parameter version	Ver		0	short	R/W	8202
Restart mode after power-OFF	rest		0	short	R/W	8203
Actuators delay from power-ON	odl		0	short	R/W	8204
System ON/OFF	y01		0	short	R/W	8205
System heat/cool	y03		0	short	R/W	8206
Temperature measurement unit	y05		0	short	R/W	8207
Keyboard lock	y06		0	short	R/W	8208
Force default values	y07		0	short	R/W	8209
Scheduler enable	y08		0	short	R/W	8210
Serial address (Modbus and CAN)	SEr		0	short	R/W	8211
Serial baudrate (Modbus)	bAU		0	short	R/W	8212
Serial settings (Modbus)	COM		0	short	R/W	8213
Analog inp. for temp. regulation	rEG		0	short	R/W	8214
Heating dead zone	Rh0		0	short	R/W	8215
Cooling dead zone	Rh1		0	short	R/W	8216
Compressor 2 ON delay	Rh2		0	short	R/W	8217
STH ON delay	Rh3		0	short	R/W	8218
Compressor 2 OFF delay	Rh4		0	short	R/W	8219
Compressor 1 OFF delay	Rh5		0	short	R/W	8220
Time enable STH	Rh6		0	short	R/W	8221

	Code	Description	Decimals	Type	R/W	Address
Out Temperature to enable STH	Rh7		0	short	R/W	8222
Number of compressors	C00		0	short	R/W	8223
Rotation type	C01		0	short	R/W	8224
Compressor 1 enable	C02		0	short	R/W	8225
Compressor 2 enable	C03		0	short	R/W	8226
Run hours limit	C04		0	short	R/W	8227
Min ON interval different comp.	CT0		0	short	R/W	8228
Min OFF interval different comp	CT1		0	short	R/W	8229
Minimum OFF time	CT2		0	short	R/W	8230
Minimum ON time	CT3		0	short	R/W	8231
Min time between 2 ON same comp	CT4		0	short	R/W	8232
Max difference on running hours	CT5		0	short	R/W	8233
Control type	P01		0	short	R/W	8234
Pump after-run time	P02		0	short	R/W	8235
Pump pre-run time	P03		0	short	R/W	8236
Pump OFF time	P04		0	short	R/W	8237
Maximum limit	P50		0	short	R/W	8238
Return temperature activation	P51		0	short	R/W	8239
Outdoor temperature activation	P52		0	short	R/W	8240
Heat Pump start delay	P53		0	short	R/W	8241
Frost alarm abs limit	P54		0	short	R/W	8242
Hysteresys	P55		0	short	R/W	8243
Reset type	P5r		0	short	R/W	8244
Delay from pump start	P5d		0	short	R/W	8245
Heat Pump source type	H1		0	short	R/W	8246
Number of fans	H2		0	short	R/W	8247
Control type	F01		0	short	R/W	8248
Pump after-run time	F02		0	short	R/W	8249
Pump pre-run time	F03		0	short	R/W	8250
OFF with compressors OFF	F04		0	short	R/W	8251

	Code	Description	Decimals	Type	R/W	Address
Heating setpoint	FHS		0	short	R/W	8252
Heating differential	FHd		0	short	R/W	8253
Cooling setpoint	FCS		0	short	R/W	8254
Cooling differential	FCd		0	short	R/W	8255
Inverter enable	F10		0	short	R/W	8256
Minimum speed	F11		0	short	R/W	8257
Maximum speed	F12		0	short	R/W	8258
Burst time at startup	F14		0	short	R/W	8259
Triac impulse ON time	F15		0	short	R/W	8260
Frost protection limit	SP1		0	short	R/W	8261
Heat pump stop delay	SP2		0	short	R/W	8262
Differential	SP3		0	short	R/W	8263
Reset type	SPr		0	short	R/W	8264
Maximum limit	F16		0	short	R/W	8265
DHW Enable	dH1		0	short	R/W	8266
Enable DHW resistor	dH2		0	short	R/W	8267
DHW request max time	dH3		0	short	R/W	8268
Heating restore time	dH4		0	short	R/W	8269
Hp max temperature	dH5		0	short	R/W	8270
Outside temp. Comp. 2 enabling	dH6		0	short	R/W	8271
Comfort setpoint	ds1		0	short	R/W	8272
Economy setpoint	ds2		0	short	R/W	8273
Activation differential	ds3		0	short	R/W	8274
Frost protection set	ds4		0	short	R/W	8275
Max DHW setpoint	ds5		0	short	R/W	8276
Temperature	tH1		0	short	R/W	8277
Starting time	tH2		0	short	R/W	8278
Duration	tH3		0	short	R/W	8279
Period	tH4		0	short	R/W	8280
Start point	T11		0	short	R/W	8281
Tout at start point	T12		0	short	R/W	8282
End point	T13		0	short	R/W	8283
Tout at end point	T14		0	short	R/W	8284

	Code	Description	Decimals	Type	R/W	Address
Max. flow temperature	T15		0	short	R/W	8285
Start point	T21		0	short	R/W	8286
Tout at start point	T22		0	short	R/W	8287
End point	T23		0	short	R/W	8288
Tout at end point	T24		0	short	R/W	8289
Max. flow temperature	T25		0	short	R/W	8290
Start point	T31		0	short	R/W	8291
Tout at start point	T32		0	short	R/W	8292
End point	T33		0	short	R/W	8293
Tout at end point	T34		0	short	R/W	8294
Max. flow temperature	T35		0	short	R/W	8295
Circuit differential	Cr0		0	short	R/W	8296
ECO offset	Cr1		0	short	R/W	8297
Circuit description	C10		0	short	R/W	8298
Heat curve type	C17		0	short	R/W	8299
Parallel shift heating curve	C18		0	short	R/W	8300
Circuit description	C20		0	short	R/W	8301
Valve type	C21		0	short	R/W	8302
Valve full excursion time	C22		0	short	R/W	8303
Valve minimum variation	C23		0	short	R/W	8304
Valve forcing period	C24		0	short	R/W	8305
Valve range	C25		0	short	R/W	8306
Heat curve type	C27		0	short	R/W	8307
Parallel shift heating curve	C28		0	short	R/W	8308
Circuit description	C30		0	short	R/W	8309
Valve type	C31		0	short	R/W	8310
Valve full excursion time	C32		0	short	R/W	8311
Valve minimum variation	C33		0	short	R/W	8312
Valve forcing period	C34		0	short	R/W	8313
Valve range	C35		0	short	R/W	8314
Heat curve type	C37		0	short	R/W	8315
Parallel shift heating curve	C38		0	short	R/W	8316
Room differential	R00		0	short	R/W	8317

	Code	Description	Decimals	Type	R/W	Address
Frost protection set	R01		0	short	R/W	8318
Max room setpoint	R02		0	short	R/W	8319
Room regulation type	R10		0	short	R/W	8320
Room set COMF in heating	R11		0	short	R/W	8321
Room set ECO in heating	R12		0	short	R/W	8322
Room set COMF in cooling	R13		0	short	R/W	8323
Room set ECO in cooling	R14		0	short	R/W	8324
Start compens. set ECO	R15		0	short	R/W	8325
End compens. set ECO	R16		0	short	R/W	8326
Room regulation type	R20		0	short	R/W	8327
Room set COMF in heating	R21		0	short	R/W	8328
Room set ECO in heating	R22		0	short	R/W	8329
Room set COMF in cooling	R23		0	short	R/W	8330
Room set ECO in cooling	R24		0	short	R/W	8331
Start compens. set ECO	R25		0	short	R/W	8332
End compens. set ECO	R26		0	short	R/W	8333
Room regulation type	R30		0	short	R/W	8334
Room set COMF in heating	R31		0	short	R/W	8335
Room set ECO in heating	R32		0	short	R/W	8336
Room set COMF in cooling	R33		0	short	R/W	8337
Room set ECO in cooling	R34		0	short	R/W	8338
Start compens. set ECO	R35		0	short	R/W	8339
End compens. set ECO	R36		0	short	R/W	8340
Room 1 MMI CanID	Rr1		0	short	R/W	8341
Room 2 MMI CanID	Rr2		0	short	R/W	8342
Room 3 MMI CanID	Rr3		0	short	R/W	8343
Buzzer activation time	BUZ		0	short	R/W	8344
Reset type	AFr		0	short	R/W	8345
Delay from pump starting	AF1		0	short	R/W	8346
Delay in steady operation	AF2		0	short	R/W	8347
Time to restart	AF3		0	short	R/W	8348
Reset type	AHr		0	short	R/W	8349
Enable High Press alarm from AI	AHE		0	short	R/W	8350

	Code	Description	Decimals	Type	R/W	Address
Setpoint in heating	AHS		0	short	R/W	8351
Setpoint in cooling	Aht		0	short	R/W	8352
Reset type	ALr		0	short	R/W	8353
Delay from compressor starting	AL1		0	short	R/W	8354
Enable when compressors OFF	AL2		0	short	R/W	8355
Enable LowP alarm from AI	ALE		0	short	R/W	8356
Setpoint in heating	ALS		0	short	R/W	8357
Setpoint in cooling	ALt		0	short	R/W	8358
Source fan/pump status	ACM		0	short	R/W	8359
Outside temp set for fan/ pump	ACS		0	short	R/W	8360
Outside temp diff. for fan/ pump	ACd		0	short	R/W	8361
Changeover delay	rE1		0	short	R/W	8362
Enable changeover from keyboard	rE2		0	short	R/W	8363
Enable changeover from out temp	rE3		0	short	R/W	8364
Changeover differential	rE4		0	short	R/W	8365
Defrost enable	d01		0	short	R/W	8366
Defrost type	d02		0	short	R/W	8367
Defrost digital input config	d03		0	short	R/W	8368
Fan management while defrosting	d05		0	short	R/W	8369
Fan only defrost	d06		0	short	R/W	8370
Enable LowP alarm in defrost	d07		0	short	R/W	8371
Defrost start setpoint	d09		0	short	R/W	8372
Defrost stop setpoint	d10		0	short	R/W	8373
Start verifying time	d21		0	short	R/W	8374
Start setpoint	d22		0	short	R/W	8375
Defrost start verifying time	d13		0	short	R/W	8376
Defost minimum time	d14		0	short	R/W	8377
Defost maximum time	d15		0	short	R/W	8378
Min time between defrost	d16		0	short	R/W	8379

	Code	Description	Decimals	Type	R/W	Address
Waiting time after defrosting	d20		0	short	R/W	8380
EXD Address offset	ex1		0	short	R/W	8381

Tab 62 [Modbus communication - Exported variables table]

Table index

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