C-PRO CLIMA SISTEMA

INSTALLER MANUAL

CODE 144CLIMA0E02

Important

Read these instructions carefully before installation and use and follow all recommendations regarding installation and for the electric connection; keep these instructions for future reference.

The instrument must be disposed of according to local Standards regarding the collection of electric and electronic appliances.

Summary

1 GENERALITIES

1.1 Description

The c-pro CLIMA Climatic Modules allow to realise innovative control and regulation networks in distributed logic, for air-conditioning and heating systems in residential and commercial buildings, characterised by the most demanding and modern necessity for environmental comfort, system performance and energy savings.

The Climatic Modules are programmable controllers dedicated specifically to the regulation of the different parts of the systems:

- c-pro Mega MCCT, for THERMAL POWER PLANT, where there is a boiler, chiller and/or heat pump present with relative delivery pumps and safety devices.
- c-pro Micro MCZN, for the various ZONES, where it is necessary to control the regulation of the temperature and humidity in the room, via heated or cooled floors and dehumidifiers.
- c-pro Micro MCDE, can manage the most different types of DEHUMIDIFIERS for every zone, which also have integration and support systems for heating and/or cooling the room.
- c-pro Micro MCPS, dedicated to the management of the glycoled circuit of the SOLAR HEAT PANELS and for the circuit of the heating and/or domestic hot water with DHW tank.

Other specific components of the CLIMA system are dedicated for the completion of the requirements of every conditioning and heating system:

- Vgraph, ZONE TERMINALS for the user, which allow to display and set the temperature and room humidity values, the alarms and the time band of each zone.
- EVSET, ZONE SET VARIATOR not displayed, with temperature probe on board, able to modify the room temperature in order to reach maximum well-being.
- Flow switches, air quality probes (and CO2), temperature and immersion humidity probes, channel or room.

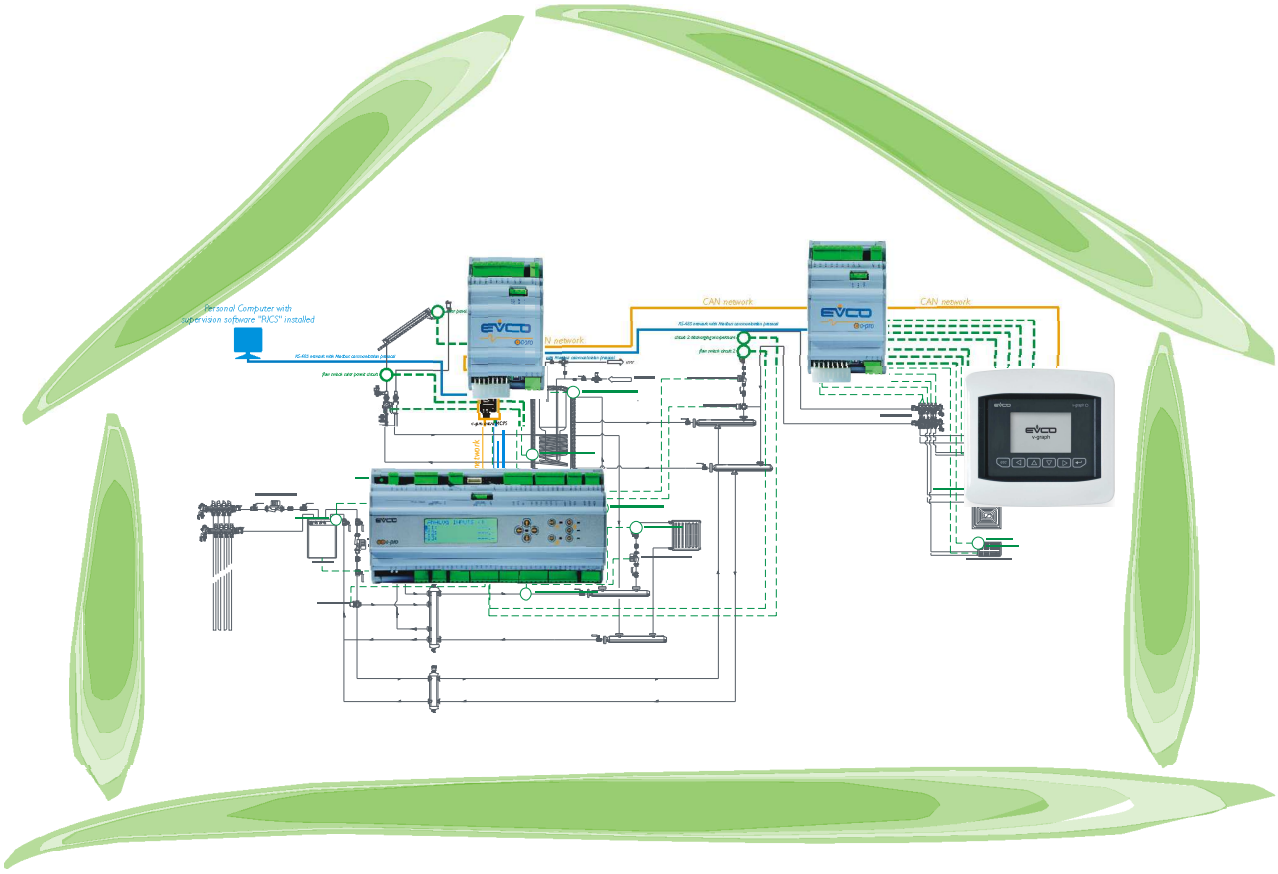
Some features of the Climatic Modules and the components of the c-pro CLIMA system must be highlighted:

- Flexibility: allows to design and realise the correct and convenient regulation and control solution for every type of building, thanks to the capacity of the modules to adapt to the needs of every type of system.
- Modularity: allows to insert the number and type of modules and components necessary to satisfy the requirements of every user and every different and specific new system to be realised, obtaining complete stability of the application software, which must not be realised or modified for very new system that a plant engineer must build (possibility of modifying or developing software, which being programmable controllers remains in all cases).
- capacity of communication among modules and some components, via the CANbus field, which makes the realisation of distributed control network possible in the building, instead of the traditional centralised system. This has the important and fundamental result of reducing realisation times and costs of the electric wiring of the air conditioning and heating system.

• Availability of MODBUS communication, from the Modules to a BMS system supervision system via a serial output, also suitable for the configuration phases or modification of controller parameters in the system installation or maintenance phases.

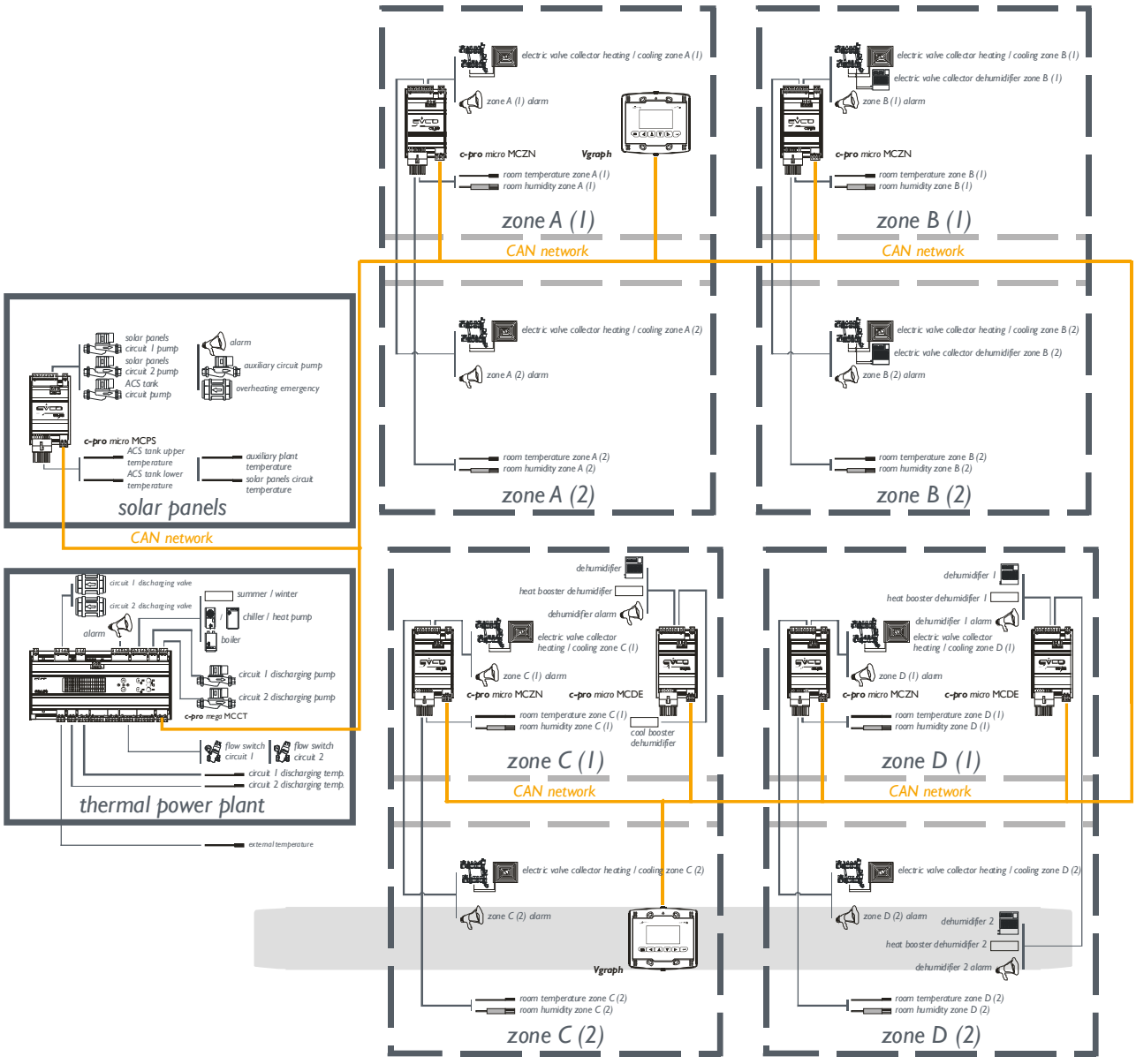
All of these features mean an innovative control and regulation system, from high performance resulting in great system efficiency with consequent maximum energy saving.

2 APPLICATIONS



2.1 Application layouts

Below find the application layouts:

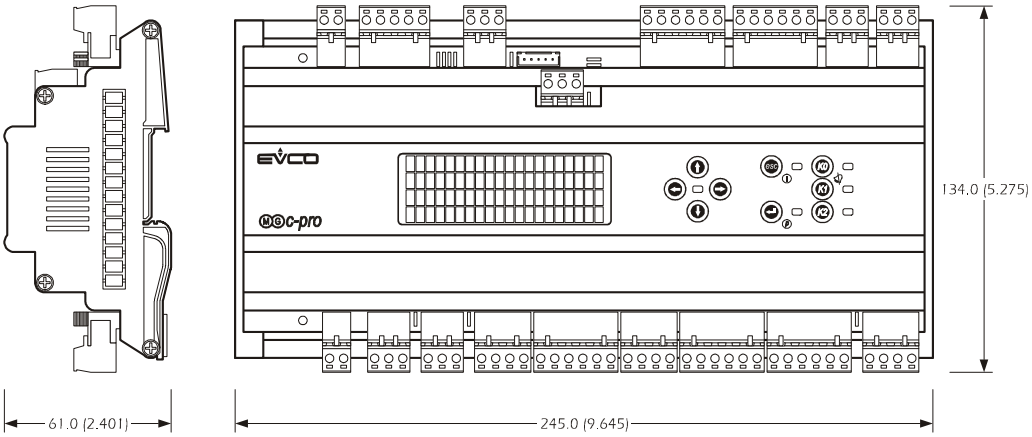


3 INSTALLATION

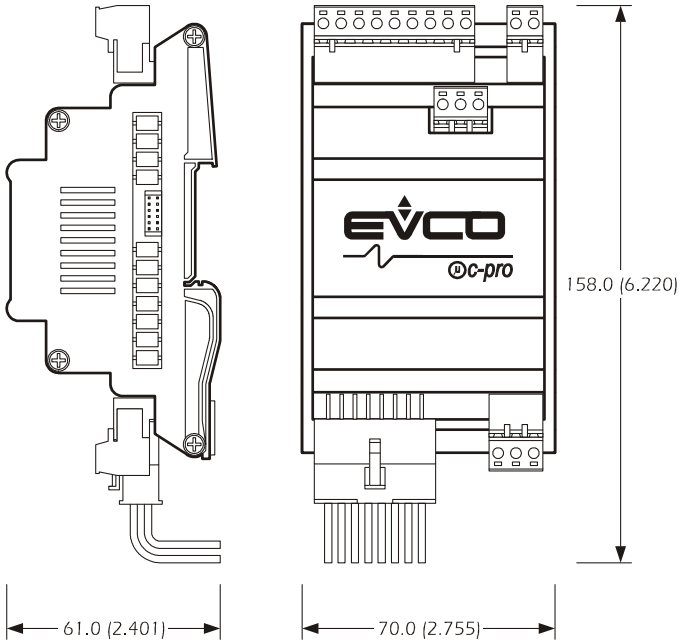
Below we will show the dimensions, assembly and electric connections of the C-PRO CLIMA SYSTEM, made up from thermal power plant modules (MCCT), Zones (MCZN), Dehumidifiers (MCDE), solar panels (MCPS) and graphical displays (Vgraph).

3.1 Dimensions

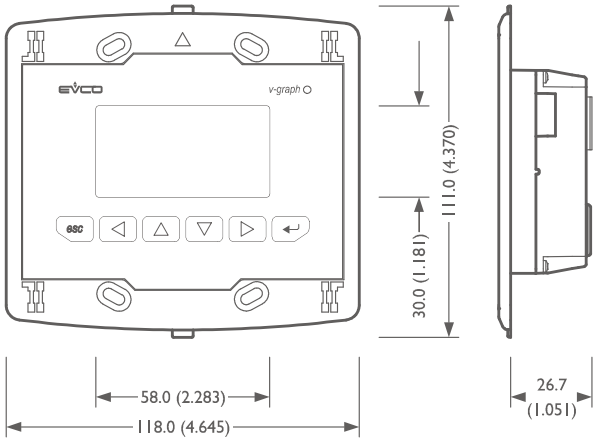
3.1.1 Thermal power plant module dimensional drawing (MCCT).



3.1.2 Zone modules (MCZN), dehumidifier (MCDE) and solar panels (MCPS) dimensional drawing.



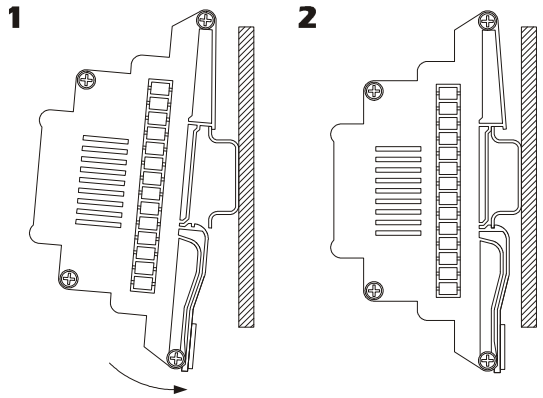
3.1.3 Graphical display dimensional drawing (Vgraph).



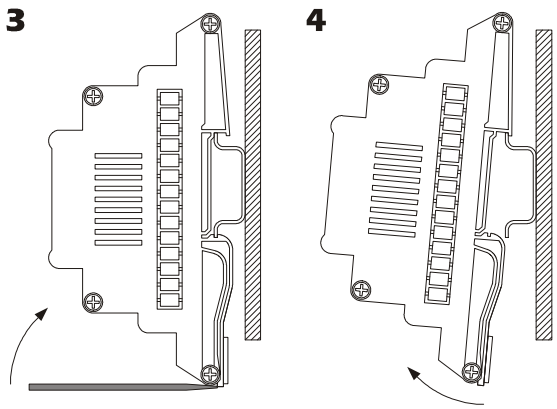
3.2 Assembly

3.2.1 Assembly of thermal power plant modules (MCCT), Zone (MCZN), Dehumidifier (MCDE) and solar panels (MCPS)

To install the thermal power plant, zone, Dehumidifier and solar panels module, operate as indicated in the diagrams (points 1 and 2).



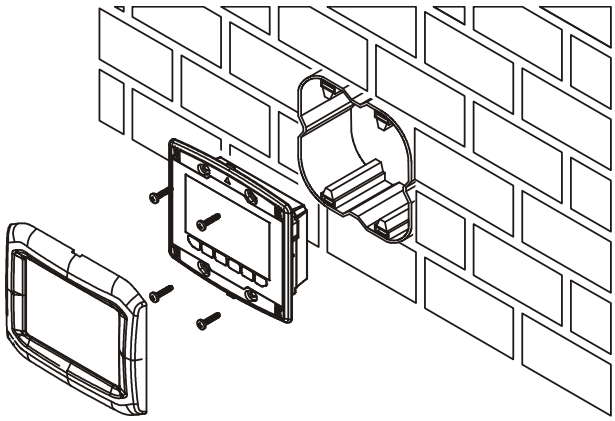
To remove thermal power plant, zone, dehumidifier and solar panels module, use a screwdriver and operate as indicated in the diagrams (points 3 and 4).



3.2.2 Display Assembly (Vgraph)

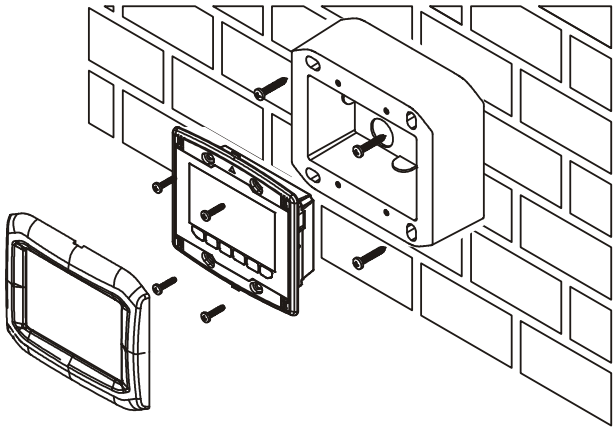
There are three possibilities for assembly of the Vgraph graphical display:

3.2.2.1 Wall recessed in 506E box

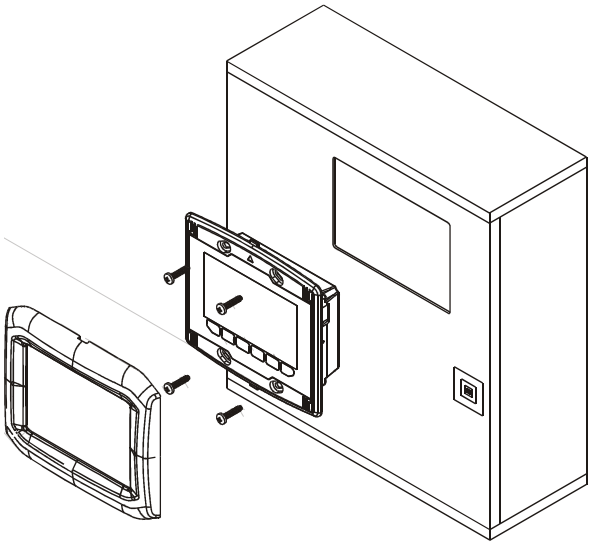


3.2.3

3.2.3.1 Wall-installation, on Evco CPVW00 support

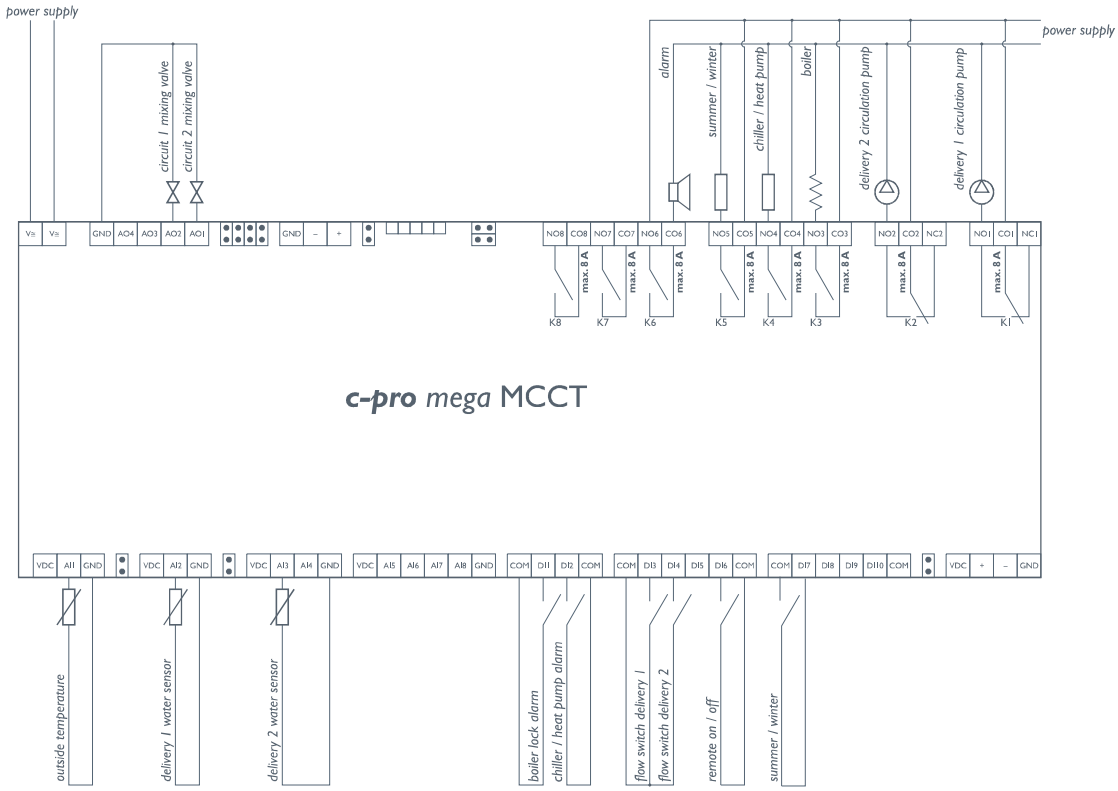


3.2.3.2 Panel installation

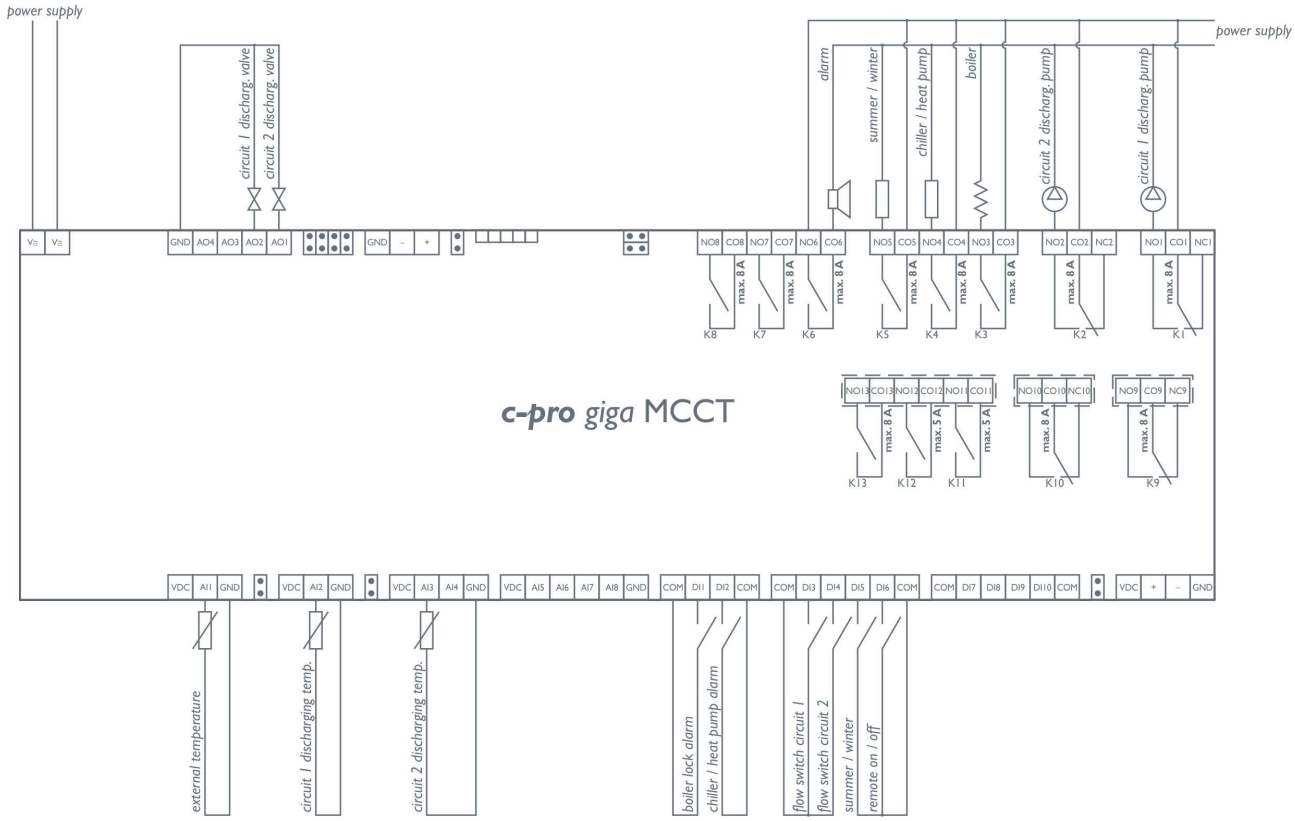


3.3 Electric connections

3.3.1 Thermal power plant electric connections (MCCT).

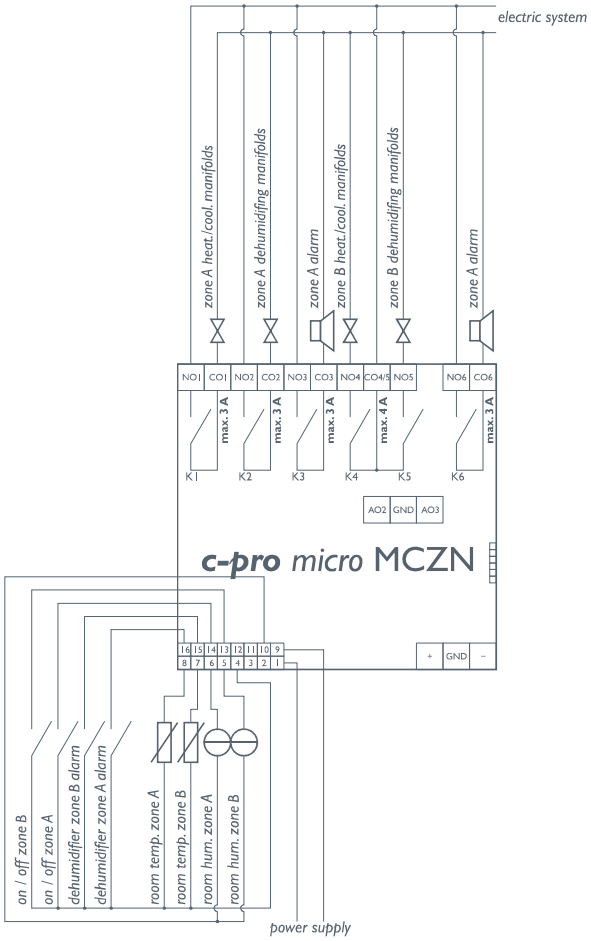


C-PRO Mega Thermal power plant controller	
I/O	Description
	Analogue inputs (NTC / 0-5V / 4-20mA)
A/I 1 CT	External air temperature – NTC
A/I 2 CT	Delivery temperature 1 – NTC
A/I 3 CT	Delivery temperature 2 – NTC
	Serial ports
Rs485	Rs485 modbus
CANbus	At the c-pro CLIMA system modules
	Digital inputs (ON-OFF pocoverial-free contact)
D/I 1 CT	Alarm (block) Boiler
D/I 2 CT	Chiller – Heat pump alarm
D/I 3 CT	Delivery pump 1 flow switch (and/or thermal switch)
D/I 4 CT	Delivery pump 2 flow switch (and/or thermal switch)
D/I 5 CT	*Not used*
D/I 6 CT	ON-OFF remote
D/I 7 CT	Summer/Winter
	Analogue outputs (PWM / 0-10 V / 4-20mA)
A/O 2 CT	Delivery 2 modulating valve control (0-10 V)
A/O 3 CT	Delivery 1 modulating valve control (0-10 V)
	Digital outputs (Relay)
D/O 1 CT	Delivery 1 circulation pump
D/O 2 CT	Delivery 2 circulation pump
D/O 3 CT	Boiler
D/O 4 CT	Chiller/Heat pump
D/O 5 CT	Summer/winter
D/O 6 CT	Alarm that can be configured



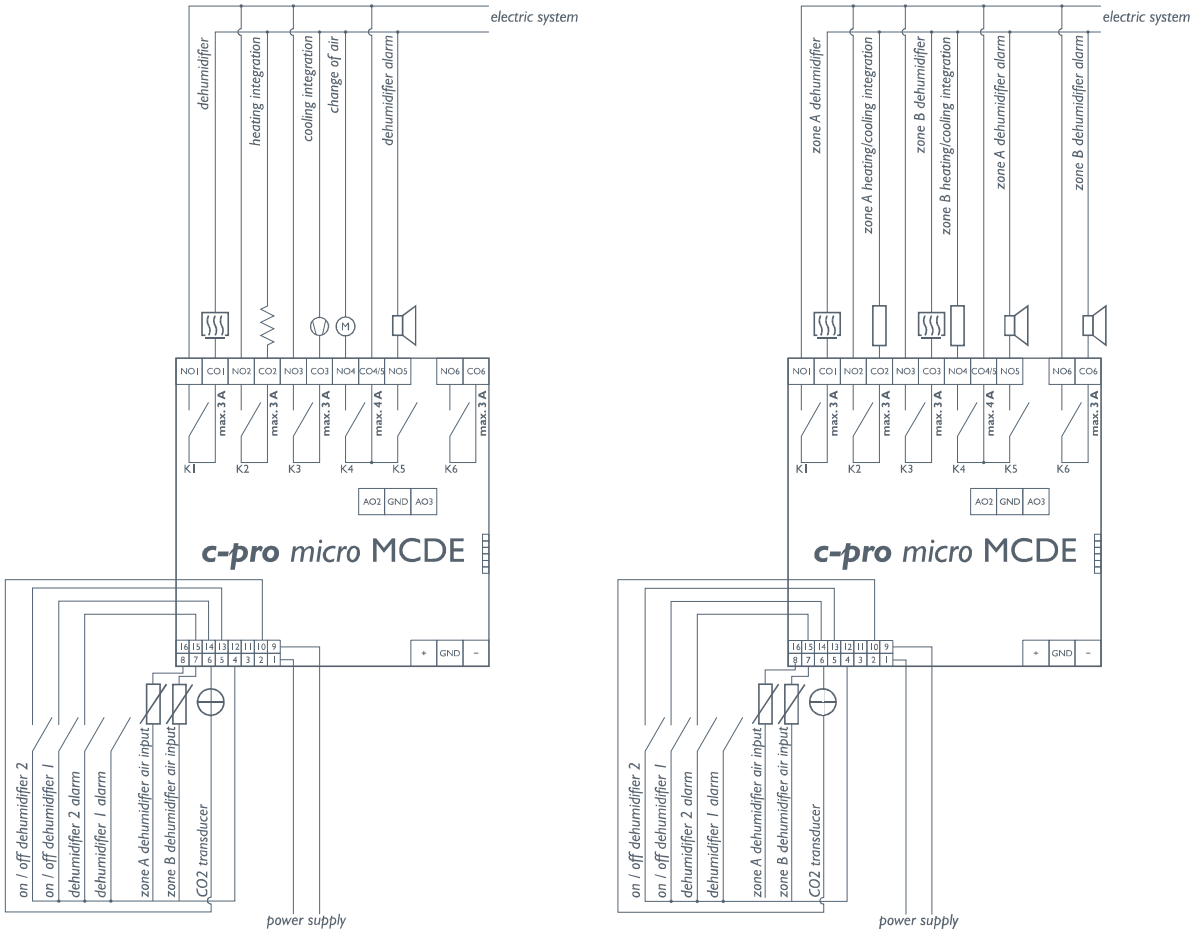
C-PRO Mega Thermal power plant controller	
I/O	Description
	Analogue inputs (NTC / 0-5V / 4-20mA)
A/I 1 CT	External air temperature – NTC
A/I 2 CT	Delivery temperature 1 – NTC
A/I 3 CT	Delivery temperature 2 – NTC
	Serial ports
Rs485	Rs485 modbus
CANbus	At the c-pro CLIMA system modules
	Digital inputs (ON-OFF pocoverial-free contact)
D/I 1 CT	Alarm (block) Boiler
D/I 2 CT	Chiller – Heat pump alarm
D/I 3 CT	Delivery pump 1 flow switch (and/or thermal switch)
D/I 4 CT	Delivery pump 2 flow switch (and/or thermal switch)
D/I 5 CT	*Not used*
D/I 6 CT	ON-OFF remote
D/I 7 CT	Summer/Winter
	Analogue outputs (PWM / 0-10 V / 4-20mA)
A/O 2 CT	*Not used*
A/O 3 CT	*Not used*
	Digital outputs (Relay)
D/O 1 CT	Delivery 1 circulation pump
D/O 2 CT	Delivery 2 circulation pump
D/O 3 CT	Boiler
D/O 4 CT	Chiller/Heat pump
D/O 5 CT	Summer/winter
D/O 6 CT	Alarm that can be configured
D/O 7 CT	Delivery modulating valve 1 open command
D/O 8 CT	Delivery modulating valve 1 close command
D/O 9 CT	Delivery modulating valve 2 open command
D/O 10 CT	Delivery modulating valve 1 close command

3.3.2 Zones electric connections (MCZN).



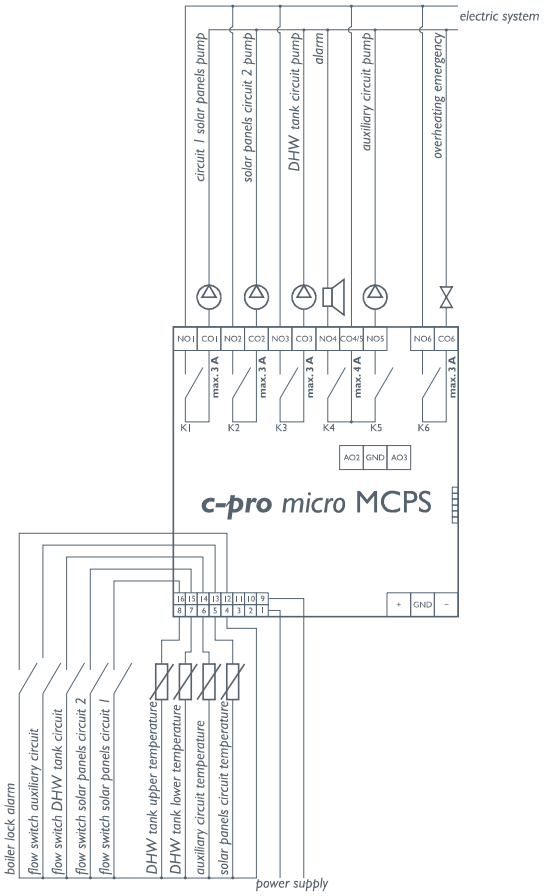
C-PRO Micro zones controller	
I/O	Description
	Analogue inputs (NTC / 0-5V / 4-20mA)
A/I 1 ZN	Zone A room temperature (NTC)
A/I 2 ZN	Zone B room temperature (NTC) Zone A remote set variator (10 K ohm)
A/I 3 ZN	Zone A room humidity (0-5 V or 4-20 mA) (clamps 6 and 10) Zone A remote set variator (10 KOhm) (clamps 6 and 4)
A/I 4 ZN	Zone B room humidity (0-5 V or 4-20 mA) (clamps 5 and 10) Zone B remote set variator (10 KOhm) (clamps 5 and 4)
	Serial ports
TTL (485)	TTL with EVIF external interface becomes RS485 Modbus RTU
CANbus	At the c-pro CLIMA system modules
	Digital inputs (ON-OFF pocoverial-free contact)
D/I 1 ZN	Zone A dehumidifier alarm
D/I 2 ZN	Zone B dehumidifier alarm
D/I 3 ZN	Zone A ON-OFF
D/I 4 ZN	Zone B ON-OFF
	Digital outputs (Relay)
D/O 1 ZN	Zone A Heating/Cooling manifolds
D/O 2 ZN	Zone A dehumidifier manifold
D/O 3 ZN	Zone A alarm
D/O 4 ZN	Zone B Heating/Cooling manifolds
D/O 5 ZN	Zone B dehumidifier manifold
D/O 6 ZN	Zone B alarm

3.3.3 Dehumidifier electric connections (MCDE).



C-PRO Micro zones controller	
I/O	Description
	Analogue inputs (NTC / 0-5V / 4-20mA)
A/I 1 DE	Zone A dehumidifier input temperature
A/I 2 DE	Zone B dehumidifier input temperatures
A/I 3 DE	CO2 transducer (0-5 V or 4-20 mA)
	Serial ports
TTL (485)	TTL with EVIF external interface becomes RS485 Modbus RTU
CANbus	At the c-pro CLIMA system modules
	Digital inputs (ON-OFF pocoverial-free contact)
D/I 1 DE	Zone A dehumidifier alarm
D/I 2 DE	Zone B dehumidifier alarm
D/I 3 DE	Zone A dehumidifier ON-OFF
D/I 4 DE	Zone B dehumidifier ON-OFF
	Digital outputs (Relay)
D/O 1 DE	Dehumidifier (Type 1) Zone A dehumidifier (Type 2)
D/O 2 DE	Heating integration (Type 1) Zone A heating/cooling integration (Type 2)
D/O 3 DE	Cooling integration (Type 1) Zone B dehumidifier (Type 2)
D/O 4 DE	Renew damper Zone B heating/cooling integration (Type 2)
D/O 5 DE	Zone A dehumidifier alarm
D/O 6 DE	Zone B dehumidifier alarm

3.3.4 Solar panels electric connections (MCPS).



C-PRO Micro solar panels controller	
I/O	Description
	Analogue inputs (NTC / 0-5V / 4-20mA)
A/I 1 PS	DHW tank temperature (upper) (NTC)
A/I 2 PS	DHW tank lower temperature (NTC)
A/I 3 PS	Auxiliary temperature 1 (NTC) Solar panel 2 temperature (4-20 mA).
A/I 4 PS	Solar panel 1 temperature (4-20 mA).
	Serial ports
TTL (485)	TTL with EVIF external interface becomes RS485 Modbus RTU
CANbus	At the c-pro CLIMA system modules
	Digital inputs (ON-OFF pocoverial-free contact)
D/I 1 PS	Solar panels 1 circuit pump (thermal) flow switch
D/I 2 PS	Solar panels 2 circuit pump (thermal) flow switch
D/I 3 PS	DHW circuit pump (thermal) flow switch
D/I 4 PS	Auxiliary system circuit pump (thermal) flow switch
D/I 5 PS	*Not used*
	Digital outputs (Relay)
D/O 1 PS	Solar panels 1 circuit pump
D/O 2 PS	Solar panels 2 circuit pump
D/O 3 PS	DHW circuit pump
D/O 4 PS	Alarm (that can be configured)
D/O 5 PS	Auxiliary 1 circuit pump Anti-stagnation emergency (cover opening)
D/O 6 PS	Anti-stagnation emergency (heat disposal/cover opening) Anti-stagnation emergency (cover closing)

3.4 Regulators network configuration

The c-pro CLIMA system is based on the CANbus communication between the various control modules present in the network, with the following maximum configuration:

- N° 1 c-pro Mega MCCT thermal power plant regulator
- N° 8 c-pro micro MCZN zone regulators
- N° 8 regulators for additional c-pro micro MCDE dehumidifiers
- N° 1 regulator for c-pro micro MCPS solar panels

Every controller present in the network must be assigned with a different and specific CANbus address, according to the logic position of the controller inside the c-pro CLIMA network, following the layout given below:

Type of controller	**Controller code**	**CANbus address**
Thermal power plant regulator	c-pro mega MCCT	1 (default)
Zone 1 regulator (zones 1-2)	c-pro micro MCZN	2 (default)
Zone 2 regulator (zones 3-4)	c-pro micro MCZN	3
Zone 3 regulator (zones 5-6)	c-pro micro MCZN	4
Zone 4 regulator (zones 7-8)	c-pro micro MCZN	5
Zone 5 regulator (zones 9-10)	c-pro micro MCZN	6
Zone 6 regulator (zones 11-12)	c-pro micro MCZN	7
Zone 7 regulator (zones 13-14)	c-pro micro MCZN	8
Zone 8 regulator (zones 15-16)	c-pro micro MCZN	9
Regulator for dehumidif. associated to zone 1 regulator	c-pro micro MCDE	22 (default)
Regulator for dehumidif. associated to zone 2 regulator	c-pro micro MCDE	23
Regulator for dehumidif. associated to zone 3 regulator	c-pro micro MCDE	24
Regulator for dehumidif. associated to zone 4 regulator	c-pro micro MCDE	25
Regulator for dehumidif. associated to zone 5 regulator	c-pro micro MCDE	26
Regulator for dehumidif. associated to zone 6 regulator	c-pro micro MCDE	27
Regulator for dehumidif. associated to zone 7 regulator	c-pro micro MCDE	28
Regulator for dehumidif. associated to zone 8 regulator	c-pro micro MCDE	29
Regulator for solar panels	c-pro micro MCPS	17 (default)

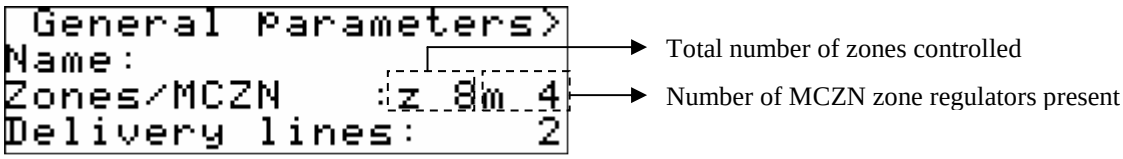
As highlighted in the previous table, the controllers are set by default to be automatically recognised in network as:

- thermal power plant regulator — CANbus 1 address
- zone 1 regulator — CANbus 2 address
- regulator for dehumidifiers added, associated to zone 1 regulator — CANbus 22 address
- regulator for solar panels — CANbus 17 address

3.4.1 MCCT thermal power plant controller network configuration

As the thermal power plant controller is the logical centre of the system controlled, it is first necessary to set how many MCZN zone regulators will be present in the system, following the procedure given below:

1. Enter the *Installer* → *General parameters* menu of the MCCT regulator
2. Set the total number of zones controlled and the number of MCZN zone regulators present in the system



3. Set the c-pro mega MCCT J4 jumpers in the position corresponding to the communication speed of 125Kbyte, as given in the figure below.

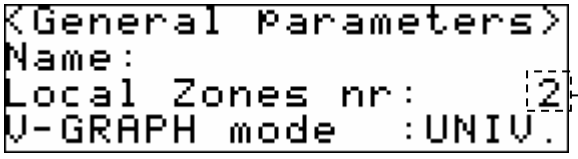
	Jumper A inserted Jumper B not inserted	Baud rate = 125K

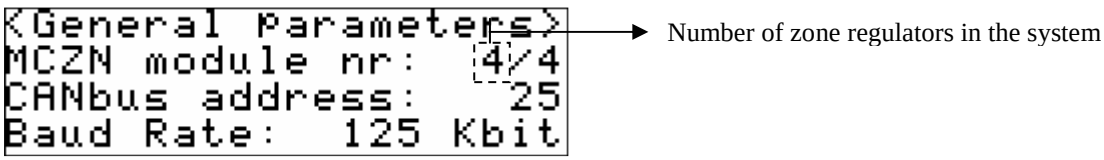
3.4.2 MCZN zone controllers network configuration

The zone regulator leaves the factory configured as zone 1 regulator (therefore with CANbus 2 address).
Whenever it is necessary to install more than one zone controller in the system, it will be necessary to configure the regulators present as zone regulators 2, 3, etc…up to a maximum of 8.

To change the network configuration of the MCZN zone controller network, follow the procedure below:

1. Connect a zone regulator to the CANbus network (leaving all of the other zone regulators disconnected from the network);the controller connected will be recognised as zone 1 controller
2. Access the MCZN zone regulator application as shown in chapter 5.2.1
3. Enter the *Installer* → *General parameters* menu
4. Set the number of local zones managed by the MCZN regulator (1 or 2 local zones)
5. Set the number of the last zone regulator that is to be inserted in the system managed (e.g. zone 4 regulator).
6. The controller will automatically assume the appropriate CANbus address (address 25 for the regulator of zone 4)
7. Repeat the operation, connecting the next to last zone controller to the CANbus network and so on, until the first zone regulator is connected (zone 1 regulator).



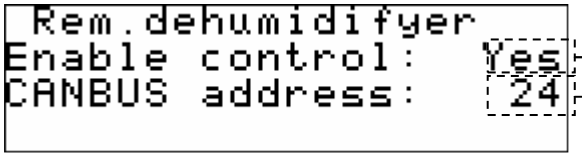


3.4.3 Network configuration of controllers for additional MCDE dehumidifiers

Once the MCZN zone regulators have been configured, if present, it is possible to associate the relative regulators for additional MCDE dehumidifiers to the same.
The regulator for dehumidifiers leaves the factory configured as regulator associated to zone 1(therefore with CANbus 22 address).
Whenever it is necessary to install more than one controller in the system for dehumidifiers and/or to vary the association of the controller for dehumidifiers at the zone controller it will be necessary to configure the regulators present appropriately.

Enabling of presence of a MCDE module for additional dehumidifiers associated to the MCZN regulator

1. Access the MCZN zone regulator to which the regulator for additional dehumidifiers is to be associated, as shown in chapter 5.2.1
2. Enter the *Installer* → *Dehumidifyer* menu
3. To enable the control via the appropriate parameter.
   The *CANBUS address* field will automatically show the CANbus address that the regulator must assume for additional dehumidifiers

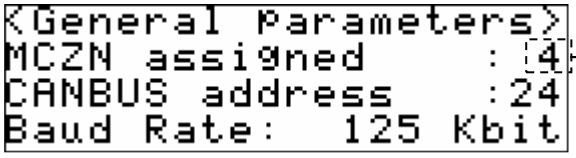


Enabling of regulator for additional dehumidifiers

CANbus address that the regulator must assume for additional dehumidifiers

To change the network configuration of the MCDE zone controller network, follow the procedure below:

1. Connect a regulator for dehumidifiers to the CANbus network (leaving all of the other dehumidifier regulators disconnected from the network);the controller connected will be recognised by the system as controller for dehumidifier associated to zone 1
2. Access the application of the regulator for MCDE dehumidifiers associated to zone 1, as shown in chapter 5.2.2
3. Enter the *Installer* → *General parameters* menu
4. Set the number of the MCZN zone regulator to which to associate the connected regulator for additional MCDE dehumidifiers
5. Return to the MCCT thermal power plant regulator main menu
6. Repeat the operation connecting the next controlled for additional dehumidifiers to the CANbus network and so on, until all regulators for envisioned additional dehumidifiers are connected.

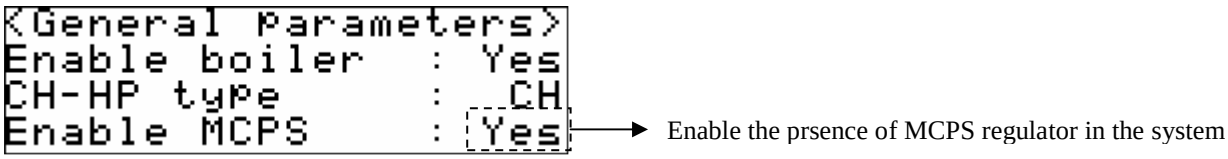


Number of MCZN regulator to associate

3.4.4 MCPS solar panels controller network configuration

As the solar panels controller is the only possible controller of this type that can be installed in the system, in order to configure it just enable the presence of the MCPS regulator from the thermal power plant application, following the procedure given below:

1. Enter the *Installatore* → *Parametri generali* (Installer, General parameters) menu of the MCCT regulator
2. Enable the presence of the MCPS regulator in the system



3.5 Displays network configuration

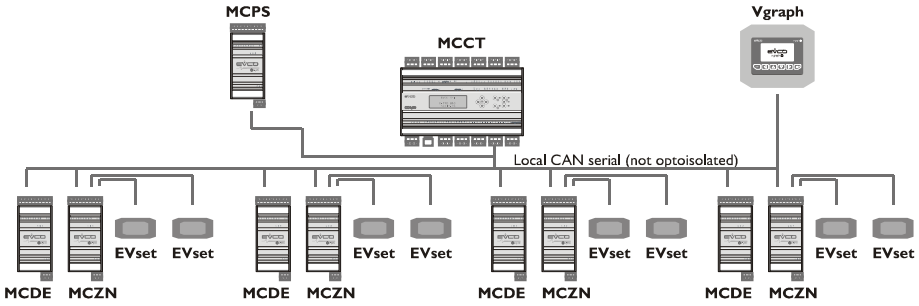
For the final user, the c-pro CLIMA system envisions the use of a series of user terminals installed in zone, from which it is possible to display temperature, humidity, state of the zone and set the work set-points, time bands, etc.
The maximum number of user terminals that can be set in the system depends mainly on the configuration of the terminal selected by the installer, from the following possibilities:

- Public terminal (maximum n°1 display for the entire system)
- Module private terminal (maximum n°8 displays for the entire system)
- Zone private terminal (maximum n°8 displays for the entire system)

Depending on the type of terminal desired, settings must be made in the MCZN zone controller and in the Vgraph user terminal, illustrated in the following paragraphs.

3.5.1 Public terminal

If the Vgraph display is configured as a public terminal (universal), a unique Vgraph display can show all MCZN zone controllers present in the system and all zones managed by the MCZN controllers (called Zone A, Zone B).



A hotel is given as an example.
The unique Vgraph display will be installed in an area with access to authorised staff only, which will establish the temperatures and time bands predefined for every Zone (hotel room) managed.
The hotel client will only have the possibility to change the room temperature, using the EVSET remote set-point variator (installed in the room), by ±3-5°C (from parameter).

Vgraph settings:
Below find the network settings to be made on Vgraph to make it a public terminal (for the setting procedures, consult the Vgraph hardware manual):
CANbus address: 99
CANbus map:

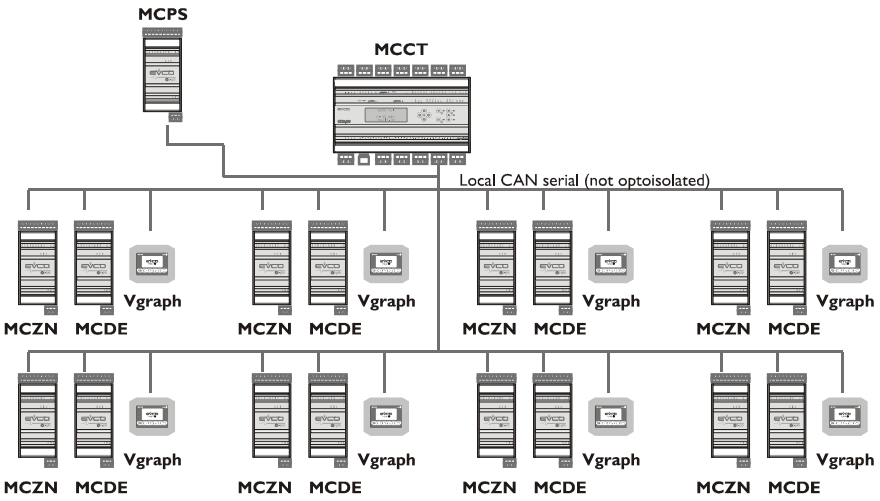
Network node	Address
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
10	1

MCCT thermal power plant controller settings:
Below find the settings to make on the MCCT regulator to make Vgraph a public terminal:
From the *Installer* → *General parameters* menu, enable the presence of the public V-graph display via *Enab. V-GRAPH*- parameter

MCZN zone controllers settings:
Below find the settings to make on the MCZN regulators to make Vgraph a public terminal:
From the *Installer* → *General parameters* menu, enable the presence of the public V-graph display by setting the V-*GRAPH mode* parameter in *UNIV*.

3.5.2 Module private terminal

If the Vgraph display is configured as a private module terminal (AB), every Vgraph display will be able to only show the preselected MCZN zone regulator, managing both zones (called Zone A, Zone B) managed by the MCZN controller.



A condominium is given as an example.
A Vgraph display will be installed in every apartment, which will establish temperatures and time bands for the two Zones present in the apartment, (day zone/night zone or apartment/bathroom), without the possibility to display or modify the settings of the other apartments present.

Vgraph settings:
Below find the network settings to be made on Vgraph to make it a private module terminal (for the setting procedures, consult the Vgraph hardware manual):
CANbus address: 100 + address of the MCZN zone regulator to which the connection is to be made
CANbus map:

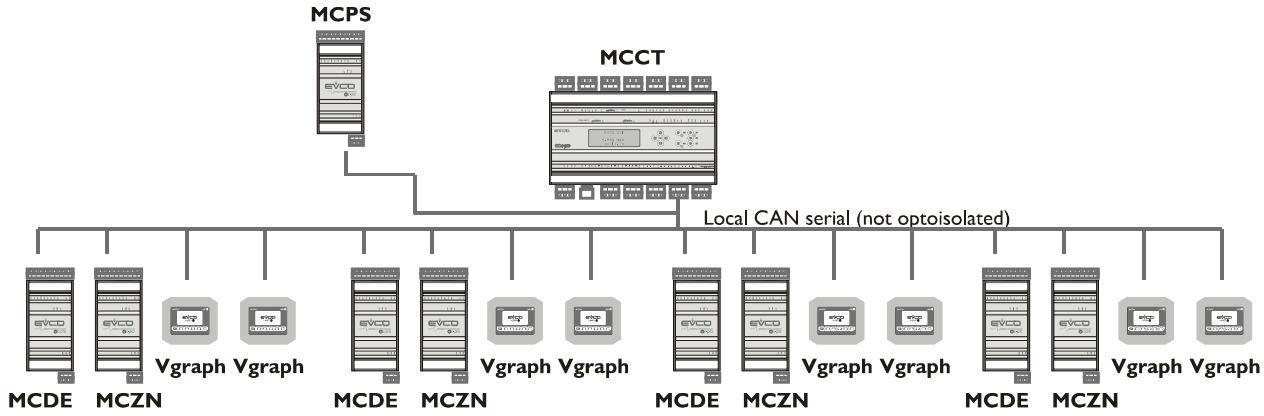
Network node	Address
1	MCZN associated controller address

MCCT thermal power plant controller settings:
Below find the settings to make on the MCCT regulator to make Vgraph a private module:
From the *Installer* → *General parameters* disable the presence of the public V-graph display via *Enab. V-GRAPH.*

MCZN zone controllers settings:
Below find the settings to make on the MCZN regulators to make Vgraph a private module:
From the *Installer* → *General parameters* menu, enable the presence of the private V-graph display by setting the V-*GRAPH mode* parameter in *AB.*

3.5.3 Zone private terminal

If the Vgraph display is configured as a private zone terminal (A+B), every Vgraph display will be able to only show the preselected MCZN zone regulator, and only the zone selected (Zone A or Zone B) managed by the MCZN controller.



As an example, an individually owned villa on two floors.
A Vgraph display will be installed for each zone controlled (living room, bedroom, bathroom), which will establish temperatures and time bands for the Zone where the display is installed, without possibility of displaying or modifying the settings of the other zones present.

Vgraph settings:
Below find the network settings to be made on Vgraph to make it a private zone terminal (for the setting procedures, consult the Vgraph hardware manual):
CANbus address:
For connection to ZONE A: 100 + address of the MCZN zone regulator to which the connection is to be made
For connection to ZONE B: 110 + address of the MCZN zone regulator to which the connection is to be made

CANbus map:

Network node	Address
1	MCZN associated controller address

MCCT thermal power plant controller settings:
Below find the settings to make on the MCCT regulator to make Vgraph a private zone terminal:
From the *Installer* → *General parameters* menu, disable the presence of the public V-graph display via *Enab. V-GRAPH* parameter.

MCZN zone controllers settings:
Below find the settings to make on the MCZN regulators to make Vgraph a private zone terminal:
From the *Installer* → *General parameters* menu, enable the presence of the private zone V-graph display by setting the V-*GRAPH mode* parameter in *A+B.*

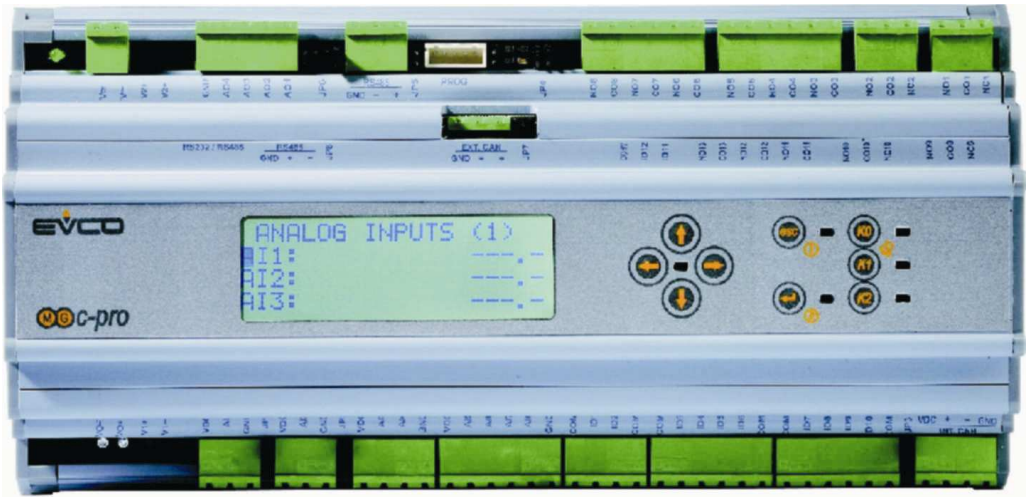
4 USER INTERFACE

4.1 Display and keyboard

A unique incorporated interface is envisioned for the application (herein called built-in) in the MCCT controller with 4 x 20 characters alphanumerical display and several dedicated keys and LEDs.
The built-in display of the MCCT controller is the only user interface available for the installer and the maintenance technician of the c-pro CLIMA system. All settings and configurations of the modules connected will be performed via a unique display.

4.1.1 Built-in interface

The built-in interface is integrated directly onto the MCCT.



There are 9 navigation and value editing pages present in the keyboard with the following meaning:

- and (UP and DOWN): when editing it modifies the parameters; otherwise moves the cursor.
- (LEFT): moves the cursor to the left or takes to the previous menu.
- (RIGHT): moves the cursor to the right.
- (ENTER): in editing it confirms the value; otherwise it sends any controls associated to the text where the cursor is present.
- (ESC): in editing it annuls the value; otherwise request of the default page eventually associated to the current page. If the ESC key is held for about 2 seconds, the machine can be switched on/off,
- (K0): used to silence the alarm buzzer.
- and : they are keys not used.

There are also 2 LEDs present.

- associated to the ESC key, it identifies the machine state
Off: with machine off.
On: with machine on.

- associated to key K0, it identifies the presence or not of alarms
Off: no alarm present.
Flashing: with alarms present.

4.2 Navigation through the applications making up the system

The c-pro mega MCCT controller represents the heart of the c-pro CLIMA system, also from a user interface point of view.
To access the other system components, the procedure given in the following paragraphs must be followed.

4.2.1 Access a c-pro micro MCZN zone regulator

To access one of the c-pro micro MCZN zone regulators present in the system, access the “Regulators state in serial network” page present in the “States” section and select the regulator to which access is to be made from the list of regulators available.

4.2.2 Access a regulator for additional c-pro micro MCDE dehumidifiers

Access to the regulators for additional c-pro micro MCDE dehumidifiers takes place from the MCZN application connected to it. Therefore, not directly from the MCCT thermal power plant regulator.
From the main menu of the MCZN regulator, access the "system network" page and select the MCDE regulator available. The system will automatically access the regulator for additional dehumidifiers associated to the zone controller from which the loading control originated.

4.2.3 Access the regulator for c-pro micro MCPS solar panels

To access the regulator for c-pro micro MCPS solar panels present in the system, the “Solar panels functioning state” page must be accessed, present in the “States” section and select to access the MCPS regulator (if configured).

5 c-pro mega MCCT regulator

Thermal power plant regulator

5.1 List of pages

This paragraph presents the main pages and menus found in the MCCT application. As shown previously, the main menu is divided into 3 levels: user, maintenance technician and installer. A “States” section is also present that can be consulted freely, also necessary for navigation between modules.

The menus have the following structure:

- Menu
    - Alarms/log
        - Alarms log
        - reset active alarms
        - reset alarms log
    - Clock
    - Maintenance
        - general parameters
        - delivery lines
        - manual
        - timer
    - Installer
        - I/O configuration
        - general parameters
        - delivery lines
        - initialisation
    - Program info

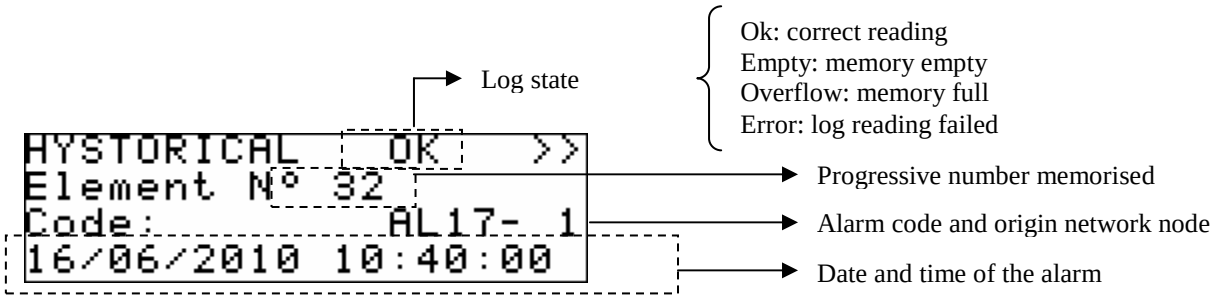
- States
    - LINE 1 functioning state
    - LINE 2 functioning state
    - Functioning state and access to the SOLAR PANELS module
    - Functioning state and access to the ZONE REGULATORS module.

5.2 Alarms/log menu

This menu contains the functionality linked to the controller alarms and the alarms log of the system.

5.2.1 Alarms log

To view the system alarms log (MCCT regulator and MCZN regulators), press ENTER on "*hystorical alarms*".
If there are no elements present, "*NO ALARMS"* is displayed, otherwise the following page is proposed, where the information of the last element memorised in the log is given:



To view the previous element, press ENTER on ">>". By repeating this procedure, scroll all log elements until the first element inserted is reached. From here, on request of the next element, the last element memorised is re-proposed: the log display is circular.
To exit the log pages, press the ESC key or wait 60 timeout seconds. This level is not protected by a password.

5.2.2 Reset active alarms

To view the active alarms of the MCCT regulator, press ENTER on "*Rst running alarms"*.
If there are no alarms present, "*no alarms* is displayed, otherwise a series of pages appear containing all possible alarms present in the controller with relative codes and description.
The alarm or the alarms present, will be highlighted by flashing "Rst ALARM", as shown in the figure below.

If the ESC key is pressed from an alarm page or 60 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

5.2.3 Reset alarms log

To reset the memorised alarms log, press ENTER on "Rst hyst. alarms" and take the value of the "*Do you want to erase hystorical alarms memory?*" parameter to the "Yes" value.
To exit the alarms log reset pages, press the ESC key or wait 60 timeout seconds. This level is not protected by a password.

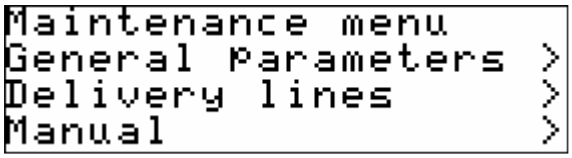
5.3 Clock menu

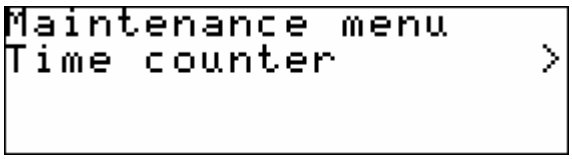
From this menu it is possible to set/modify the value of the date and real time that the c-pro mega MCCT controller propagates to the entire c-pro CLIMA system.
To set/modify the date and/or real time, press ENTER on "*Real time clock*" and set the desired value, as shown in the following figure.

If the ESC key is pressed from a setting page or 60 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

5.4 Maintenance menu

The maintenance menu is level 1, i.e. used to insert the maintenance level password or higher in order to display/modify the parameters present in this branch.





In this menu it is possible to view and set the state of the various devices, inputs and outputs used by the MCCT application.

Entering the *GENERAL PARAMETERS* menu, it is possible to view/enable/define the features relative to functioning of the digital control digital inputs, summer/winter functioning mode changeover (from keyboard, from digital input, from BMS or automatic), relative to the *antigrip* function, management of the flow switches for the delivery pumps and the temporary disabling of the zone controllers.

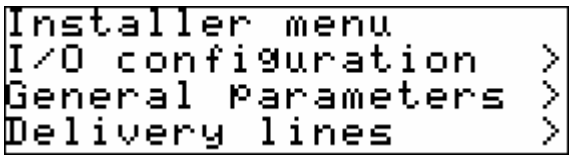
Entering the *DELIVERY LINES* menu, it is possible to view/define the features relative to the functioning of various utilities present and enabled in the controlled system such as the type of delivery lines, the management and the presence of the mixing valve, the management of delay times on activation/deactivation of the utilities, the definition of the standard delivery set-points and the set-points of the mixing valve, the definition of the temperature and calibration alarms of the input probes.

The *MANUAL* menu allows to set the functioning of the utilities managed by the application in manual/automatic mode, thus forcing the state, to test its functionality.

Finally, the *TIME COUNTER* menu allows to display, enable, set and reset the functioning hours and the maintenance requests for the users to manage the MCCT application.

5.5 Installer menu

The installer menu is level 2, i.e. used to insert the installer level password or higher in order to display/modify the parameters present in this branch.



From this menu it is possible to view and set the configuration of the system managed from the MCCT application.

Entering the *I/O CONFIGURATION* menu it is possible to set the type of analogue inputs, the polarity of the digital inputs and the calibration values of the analogue outputs used in the application.

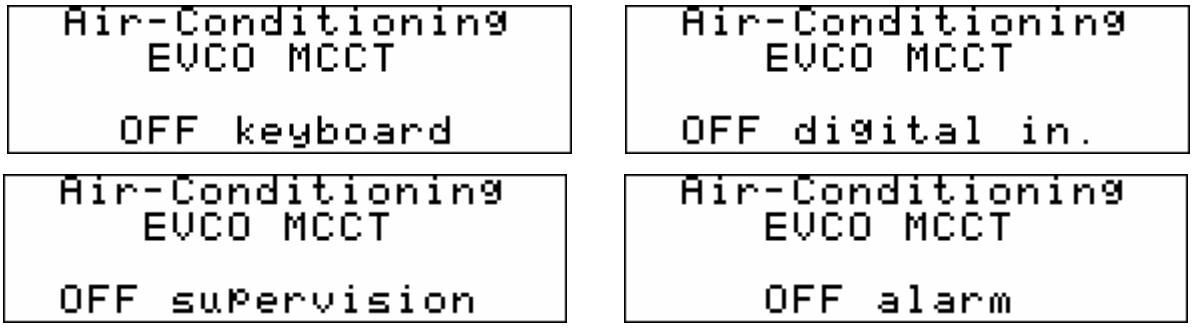
Entering the *GENERAL PARAMETERS* menu, it is possible to define the main features present in the controlled system such as the presence and type of the heating/cooling elements (boiler, chiller, heat pump), the number of delivery lines and the number of MCZN zone regulators present, the presence of the MCPS module for the management of the DHW tank and/or the solar panels system, the presence or not of the public Vgraph display, as well as the possibility of changing the serial communication parameters both CANbus (c-pro CLIMA controllers network) and Modbus (towards the RICS supervision system or other BMS systems).

Entering the *DELIVERY LINES* menu, it is possible to define the main features relative to the delivery lines present and enabled in the controlled system such as the type of delivery lines present, the presence of the mixing valve, the management method of the circulation pumps and the definition of their type of protection digital input.

Finally the *PASSWORDS* menu allows to display and modify the 3 password levels present in the application.

5.6 Main OFF page

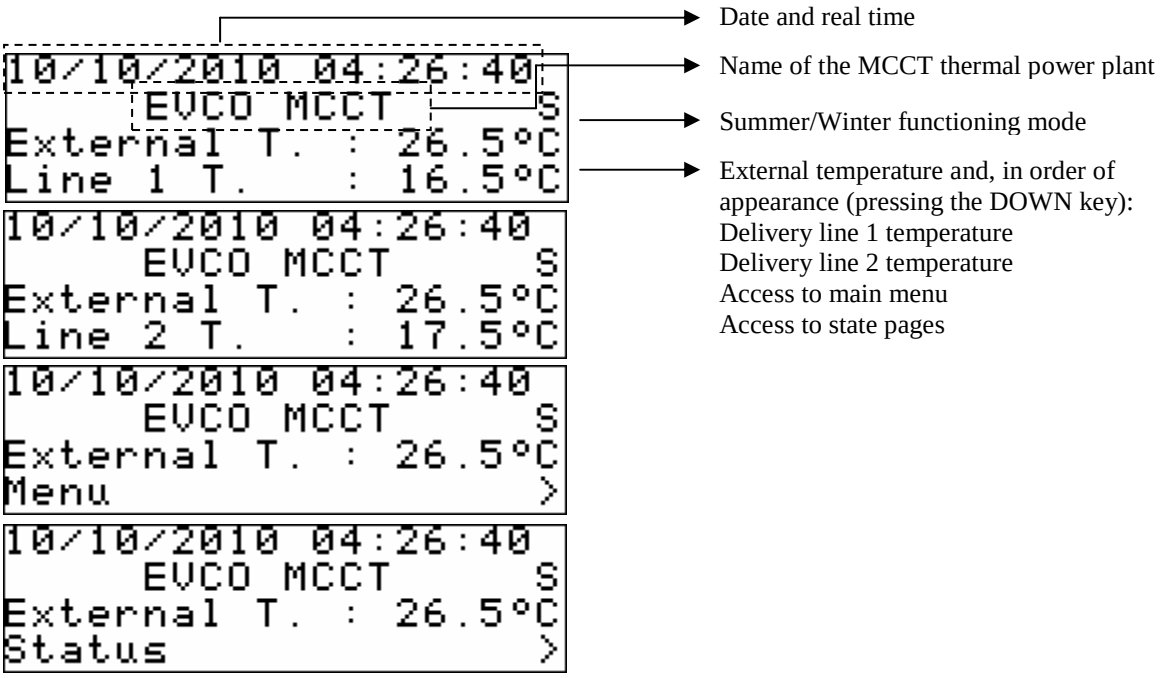
The main OFF page changes depending on the reason for which the unit is off.



The unit in *OFF alarm* can be switched off completely using the key, digital input or supervisor. This type of display is temporary. When the 30 seconds time-out has passed, the controller will go back to the display of the main ON page, however indicating the OFF state of the unit.

5.7 Main ON page

The main page is displayed during the ON state:

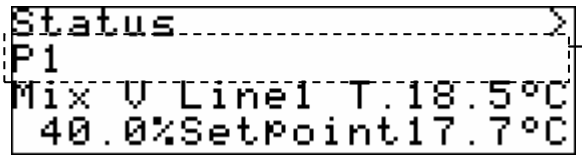


Pressing the DOWN key, it is possible to scroll all information contained in the page (External Temperature, Delivery Line 1 and 2 Temperature). It is also possible to access the Main Menu and the States Pages by pressing ENTER once the cursor is positioned on the corresponding wording.
If the machine is OFF, he screen will be identical but with the OFF indication OFF at the side of the name assigned to the MCCT module by the installer.

5.8 State pages

By accessing the state pages from the ON main page, access the following four screens representing the machine states of the c-pro mega MCCT controller and the entire controlled system.

5.8.1 Delivery line L1 and delivery line L2 state page

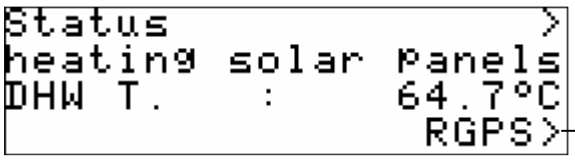


Line indicating the state of the L1/L2 delivery line:
P1 = circulation pump P1 activated
Alr = P1 circulation pump block alarm
FL = delivery line 1 flow switch alarm with automatic rearm
* = delivery line 1 flow switch alarm with manual rearm running
Fs = delivery line 1 flow switch with manual rearm function active
LT = delivery line low water temperature alarm
HT = delivery line high water temperature alarm
Fz = Anti-freeze function active
Ag = Anti-grip function active
Mn = P1 circulation pump functioning in manual mode

The state pages of the Delivery line 1 and 2 show, as well as the state of the line described in the previous illustration, the opening percentage of the mixing valve, the delivery line water temperature,the active work set-point and the calculation of the dew point for the corresponding line.

Pressing ENTER on the ">" access the next state page, corresponding with delivery line 2.
By pressing ENTER on the ">" again, access the next state page, i.e. the SOLAR PANELS state/access page.
When the 30 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main ON page.

5.8.2 State page and access to the MCPS solar panels module

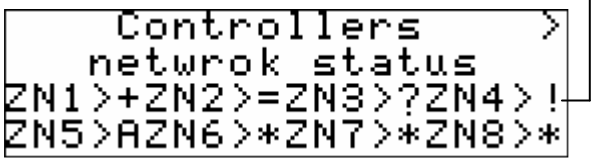


Line indicating the state of the MCPS solar panels module
MCPS = MCPS module enabled and on-line
MCPS OFFLine = MCPS module enabled but off-line
No MCPS = MCPS module not enabled

The state page and access to the MCPS solar panels module shows, as well as the network state of the MCPS regulator, described in the previous element, the temperature of the boiler (DHW tank).

Pressing ENTER on the ">" in the top right of the screen, access the next state page, i.e. the state/access page to the ZONE REGULATORS modules.
Pressing ENTER on the MCPS module state (with MCPS module enabled and on-line) the MCPS application can be accessed.
When the 30 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main ON page.

5.8.3 State and access page of the MCZN zone regulators modules



Indication of the state of the relative MCZN zone module:
+ = zone present, enabled with active zones
+ = zone present, enabled with non-active zones
? = zone present, enabled but off-line
A = zone present, enabled in alarm state
! = zone present but disabled
* = zone not present/not configured

The state and access page to the MCZN zone regulators modules shows the network state of the MCZN regulators described in the previous illustration.

Pressing ENTER on the “>” in the top right of the screen, returns to the DELIVERY LINE L1 state page.
Pressing ENTER on the selected MCZN module state (with MCZN module present, enabled and on-line) the MCZN application can be accessed.
When the 30 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main ON page.

5.9 Configuration parameters

Below find a list of all configuration parameters contained in the MAINTENANCE menu (maintenance technician) and INSTALLER managed by the MCCT application.
A brief description is supplied for every parameter, the range of acceptable values, unit of measurement and the default value proposed.
The menus are structured following the logic given in the respective description paragraphs 6.4 and 6.5.

5.9.1 List of MAINTENANCE menu configuration parameters

Label	Parameter description	Default	Min	Max
	GENERAL PARAMETERS			
ONOFF dig. input	Enable ON OFF digital input	No	No	Yes
W/S keyboard	Enabling of Summer/winter from keyboard	S	S	W
W/S d.input	Enabling of Summer/winter from digital input	No	No	Yes
W/S BMS	Enabling of Summer/winter from BMS	Yes	No	Yes
W/S auto	Enabling automatic Summer/winter switch-over	No	No	Yes
T. ext. W (°C)	Temperature below which automatic summer/winter switch-over takes place, relative to the external temperature (expressed in °C)	5.0	-30.0	30.0
T. ext. S (°C)	Temperature above which automatic winter/summer switch-over takes place, relative to the external temperature (expressed in °C)	30.0	-30.0	30.0
W/S delay (h)	Permanence duration of the external temperature over/below the threshold established so that summer/winter switch-over and vice versa takes place automatically (expressed in hours)	1	0	255
Loads antigrip day	Day of the week for performing the antigrip cycle	Friday	Sunday	Saturday
Loads antigrip Time	Time of performance of the antigrip cycle	2	0	24
Pumps flow switches start	Delay time on activation of the alarms relative to the 1 and 2 delivery flow switches from system start-up (expressed in seconds)	30	0	255

Pumps flow switches Run	Delay time on activation of the alarms relative to the 1 and 2 delivery flow switches with system in normal conditions (expressed in seconds)	5	0	255
Pumps flow switches Nr. alarms/hour	Maximum number of alarms/hour relative to delivery flow switches 1 and 2 for passage to manual rearm	3	0	255
Network management Zone modul. enabling	Temporary MCZN disabling/enabling X = enabled O = not enabled	O	X	O
	DELIVERY LINES			
Maintenance L1 Pump mode	Functioning mode of the circulation pump 1 CONT. = continuous TRICH. = on temperature request	TRICH.	CONT.	TRICH.
Maintenance L1 Pump management Alarm delay	Delay time on activation of the alarm relative to the circulation pump 1 (expressed in seconds)	0	0	255
Maintenance L1 Pump management ON delay	Delay time on switch on of the circulation pump 1 (expressed in seconds)	30	0	255
Maintenance L1 Pump management OFF delay	Delay time on switch-off value change of mixing valve 1 (expressed in seconds)	30	0	255
Maintenance L1 Pump management Mix.vlv. delay	Delay time on opening value change of mixing valve 1 (expressed in seconds)	30	0	255
Maintenance L1 Pump management CH-HP delay	Delay time on activation of the chiller/heat pump (expressed in seconds)	60	0	255
Maintenance L1 Pump management Antigrip enab.	Enabling of the line 1 antigrip function	Yes	No	Yes
Maintenance L1 Temp. regulation Setpoint S LT	L.T. line 1 summer delivery set-point (expressed in °C)	18.0	7.0	30.0
Maintenance L1 Temp. regulation Setpoint W LT	H.T. line 1 winter delivery set-point (expressed in °C)	30.0	20.0	90.0
Maintenance L1 Temp. regulation Setpoint S HT	H.T. line 1 summer delivery set-point (expressed in °C)	12.0	5.0	30.0
Maintenance L1 Temp. regulation Setpoint W HT	H.T. line 1 winter delivery set-point (expressed in °C)	60.0	25.0	90.0
Maintenance L1 T. regulation Dew offset	Offset (differential) to add to the delivery line 1 dew point, calculated to obtain the delivery work set-point value in Summer mode (expressed in °C)	3.0	0.0	10.0
Maintenance L1 Mixing valve S Mode	Summer mixing valve 1 functioning mode - Closed - Modulating - Opened	MODUL.	CLOSED	OPENED
Maintenance L1 Mixing valve S Min.Ext.T.	Minimum external temperature in summer for the calculation of the delivery 1 floating set-point (expressed in °C)	10.0	0.0	30.0
Maintenance L1 Mixing valve S Max.Ext.T.	Maximum external temperature in summer for the calculation of the delivery 1 floating set-point (expressed in °C)	30.0	10.0	60.0
Maintenance L1 Mixing valve S Setpoint 1	Value of the floating delivery 1 set-point relative to the minimum external temperature in Summer mode (expressed in °C)	12.0	0.0	40.0

Maintenance L1 Mixing valve S Setpoint 2	Value of the floating delivery 1 set-point relative to the maximum external temperature in Summer mode (expressed in °C)	7.0	0.0	40.0
Maintenance L1 Mixing valve S Fix setpoint	Fixed value of the delivery 1 floating set-point in summer mode if the function is disabled due to alarm (expressed in °C)	7.0	0.0	40.0
Maintenance L1 Mixing valve W Mode	Winter mixing valve 1 functioning mode - Closed - Modulating - Openend	MODUL.	CLOSED	OPENED
Maintenance L1 Mixing valve W Min.Ext.T.	Minimum external temperature in winter for the calculation of the delivery 1 floating set-point (expressed in °C)	5.0	-30.0	30.0
Maintenance L1 Mixing valve W Max.Ext.T.	Maximum external temperature in winter for the calculation of the delivery 1 floating set-point (expressed in °C)	10.0	0.0	30.0
Maintenance L1 Mixing valve W Setpoint 1	Value of the floating delivery 1 set-point relative to the minimum external temperature in Winter mode (expressed in °C)	35.0	0.0	90.0
Maintenance L1 Mixing valve W Setpoint 2	Value of the floating delivery 1 set-point relative to the maximum external temperature in Winter mode (expressed in °C)	25.0	0.0	90.0
Maintenance L1 Mixing valve W Fix setpoint	Fixed value of the delivery 1 floating set-point in winter mode if the function is disabled due to alarm (expressed in °C)	35.0	0.0	90.0
Maintenance L1 M.Valve regulation Prop. Band	Mixing valve 1 regulation proportional band (expressed in °C)	5.0	0.0	10.0
Maintenance L1 M.Valve regulation Integr. time	Integral time for regulation of mixing valve 1 (expressed in seconds)	0	0	65535
Maintenance L1 M.Valve regulation Fix opening	Valve 1 opening percentage with fixed opening regulation (expressed as % opening)	20.0	0.0	100.0
Maintenance L1 M.Valve regulation Opening time	Opening time valve 1 (sec)	150	0	3600
Maintenance L1 M.Valve regulation Extra time	Extra time of limit switch open / close valve 1 (sec)	5	0	600
Maintenance L1 M.Valve regulation Min variation	Percentage of minimum variation of valve 1 to enable the movement (expressed in % of opening)	2.0	0.0	20.0
Maintenance L1 M.Valve regulation Antigrip enab.	Enabling of activation of mixing valve 1 for anti-grip cycle	Yes	No	Yes
Maintenance L1 Mix V regulation Antigrip open	Opening percentage of mixing valve 1 during antigrip cycle (expressed in % of opening)	100.0	0.0	100.0
Maintenance L1 Temperature limits HT setpoint	Delivery 1 high temperature limit for delivery high temperature alarm activation (expressed in °C)	45.0	0.0	90.0
Maintenance L1 Temperature limits HT hyst.	Hysteresis (differential) relative to delivery 1 high temperature limit (expressed in °C)	5.0	0.0	10.0
Maintenance L1 Temperature limits LT setpoint	Delivery 1 low temperature limit for delivery 1 low temperature alarm activation (expressed in °C)	10.0	-10.0	40.0
Maintenance L1 Temperature limits LT hyst.	Hysteresis (differential) relative to delivery 1 low temperature limit (expressed in °C)	5.0	0.0	10.0

Maintenance L1 Probes calibration Temperature	Delivery 1 temperature probe calibration (expressed in °C)	0.0	-10.0	10.0
* The same menu is also available for the delivery 2 line				

5.9.2 List of INSTALLER menu configuration parameters

Label	Parameter description	Default	Min	Max
	I/O CONFIGURATION			
I/O configuration Analog In.	Configuration of type of analogue inputs	NTC	NTC	NTC
I/O configuration Digital In.	Digital inputs polarity configuration NC = normally closed NA = normally open	N.O.	N.C.	N.O.
I/O configuration Analog out.	Configuration of minimum and maximum calibration values of the analogue outputs (expressed as % of the analogue value in output)	0.0	0.0	100.0
	GENERAL PARAMETERS			
General parameters Number of zones	Setting the number of zones present in the system	1	0	16
General parameters Number of MCZN modules	Setting the number of zone MCZN modules present in the system	1	0	8
General parameters Delivery lines	Setting the number of delivery lines present in the system	1	0	2
General parameters Enable boiler	Enabling of boiler presence	Yes	No	Yes
General parameters CH-HP type	Setting the type of cooling unit present --- = not present CH = chiller CHHP = chiller/heat pump	CH	---	CHHP
General parameters Enable MCPS	Enabling of MCPS solar panels module presence	No	No	Yes
General parameters HP-Boiler switch Switch temp.	Minimum temperature threshold relative to the external temperature for switch functioning from heat pump functioning at boiler (expressed in °C)	7.0	-20.0	30.0
General parameters HP-Boiler switch Hysteresis	Hysteresis (differential) relative to the external temperature for return to functioning with heat pump (expressed in °C)	5.0	0.0	10.0
General parameters HP-Boiler switch HP max. time	Heat pump activation continuous maximum time for automatic switch to boiler (expressed in hours)	3	0	65535
General parameters CANBUS network Node address	MCCT regulator CANBUS address	1	1	127
General parameters CANBUS network Vgraph enab.	Enabling of public V-Graph presence	Yes	No	Yes
General parameters MODBUS network Idx	MCCT regulator MODBUS address	1	1	247
General parameters MODBUS network Baud	MCCT regulator MODBUS communication speed 1200 baud 2400 baud	9600	1200	19200

	4800 baud 9600 baud 19200 baud			
General parameters MODBUS network Parity	Type of MODBUS communication parity	EVEN	NO	EVEN
General parameters MODBUS network Stop bit	MODBUS communication Bit Stop position	1b	1b	2b
	DELIVERY LINES			
Line 1 configuration Line type	Type of delivery line 1 H.T. = High temperature (radiators) L.T. = Low temperature (floor)	L.T.	H.T.	L.T.
Line 1 configuration M.Valve enable	Enabling of mixing valve 1	Yes	No	Yes
Configure line 1 Pump DIn alr	Type of digital input for protection of circulation pump 1 LOCK = protection input FLOW = Flow switch	FLOW	LOCK	FLOW
* The same menu is also available for the delivery 2 line				

5.10 State of the unit

There are several procedures for switching the unit on/off:

1) Via the relative **On/Off key**
   Switch-on: press the relative key for about 2 seconds: if all of the other conditions enabled are present, the machine goes to "ON".
   Switch-off: press the relative key for about 2 seconds: the machine goes to "OFF" mode.

2) Via the **On/Off from digital input** control (*ONOFF d.input* = 1 parameter)
   Switch-on: close the remote On/Off contact: if all of the other conditions enabled are present, the machine goes to "ON".
   Switch-off: if the remote On/Off contact is open, the machine goes to “OFF from digital input” (also signalled by “OFF digital in.”).

3) Via **supervision protocol**
   Switch-on: to activate the switch-on state from protocol: if all of the other conditions enabled are present, the machine goes to "ON".
   Switch-off: if the ignition state is deactivated from protocol, the machine goes to “OFF from supervision protocol” (also indicated by “OFF supervisor”).

The On/Off state from key has priority with respect to the other two. In fact, the On/Off states from digital input and supervision protocol can only be reached with machine on from key.

A machine **switched off from digital input** can:

- pass to the OFF state from key (by pressing the ESC key).
- pass to the OFF state from supervisor if the OFF condition from digital input returns and the OFF state from supervisor is set.
- pass to the ON state if the OFF condition from digital input returns and the OFF state from supervisor is not set.

A machine **switched off from supervision protocol** can:

- pass to the OFF state from key (by pressing the ESC key).
- pass to the OFF state from digital input if the OFF condition from supervisor returns and the OFF state from digital input is tripped.
- pass to the ON state if the OFF condition from supervisor returns and the OFF condition from digital input is not present.

The machine On/Off key is the ESC key, pressed for about 2 seconds.
The remote On/Off input (when present) can be configured via the parameters:

- *ONOFF D input*: Enables the function
- *D In 6* : Sets the NC, NO logic for the digital contact

5.10.1 OFF state due to alarm

When the machine is on, a further state exists **OFF due to alarm**, which switches the nit and all devices off until the alarm condition has been reset. If digital consent is missing in this state from

supervisor or switch-off is requested from key, the power plant goes into the relative OFF state. The alarms that cause this state are:

- Delivery 1 probe alarm
- Delivery 2 probe alarm

The machine works normally again when the alarm has been reset.

5.11 Summer/winter functioning mode

The operational mode can assume the following values:

E/I keyboard parameter	Description
S= ***SUMMER***	Summer functioning mode
W= ***WINTER***	Winter functioning mode

There are procedures that allow to set the c-pro CLIMA system functioning mode:

1) Via the **parameter regarding *S/W keyboard*** in the maintenance menu
   Setting - Be positioned on the *S/W keyboard* parameter and, pressing the ENTER key, modify the value using the UP and DOWN keys. Confirm by pressing ENTER again.

2) Via **supervision protocol** (function enabled by parameter *S/W BMS*)
   Setting - Send the operational mode change control via relative state from protocol.
   This control has priority with respect to the *S/W control from keyboard*

3) Using the **Estate/Inverno da ingresso digitale** (Summer/winter from digital input) control (function enabled from *S/W D. Input parameter*.
   Setting - With contact open the unit is in "winter" functioning mode, with contact closed in "summer" functioning mode.
   This control has priority with respect to the *S/W control from supervision protocol*

4) Using **summer/winter automatic switch-over function** (function enabled from *S/W Auto* parameter)
   Setting - Switch-over from summer to winter takes place when the external temperature remains above the value established with the *T.Ext S* parameter for the time established by the *W/S delay* parameter
   Vice versa, switch-over from winter to summer takes place when the external temperature remains below the value established with the *T.ext W* parameter for the time established by the *W/S delay* parameter
   This control has priority with respect to the *S/W control from digital input*

As well as selection of the operational mode, a digital output is linked to the summer/winter functioning mode, which functions as follows:

Functioning mode	State of the digital input
S= ***SUMMER***	Summer/Winter output ACTIVE
W= ***WINTER***	Summer/Winter output OFF

A typical application of the summer/winter relay is to automatically inform the chiller/heat pump unit of the system functioning mode.

Note. For the two manual summer/winter change modes (procedures 1 and 2) it is recommended to carry out the summer/winter change with the machine off.

6 c-pro micro MCZN regulator

Zone regulator

6.1 List of pages

This paragraph presents the main pages and menus found in the MCZN application. As shown previously, the general menu is divided into 2 levels: maintenance technician and installer are also present along with "Zones State", “ON/OFF” and "System Network" sections for free consultation. The latter is also necessary for navigation among modules.

The menus have the following structure:

- Zones status
  - Zone A functioning status
    Zone B functioning status

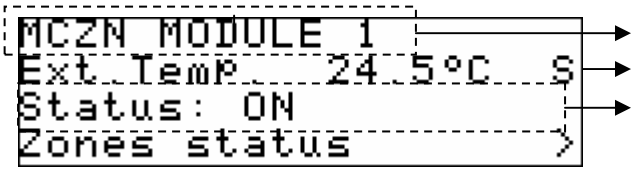
- Main menu
  - Alarms
  - Setpoint
    - Zone A active setpoint pages
    - Zone B active setpoint pages
  - Maintenance
    - Zones
      - Zone A
      - Zone B
    - Manual
  - Installer
    - I/O configuration
    - General parameters
    - Zones
      - Zone A
      - Zone B
    - Passwords
  - Program info

- ON/OFF
  - MCZN zone regulator status

- System Network
  - MCZN system local network

6.2 Main page

The main page is displayed during the ON state:



Name of the MCZN regulator to which access has been

Summer/Winter operational mode

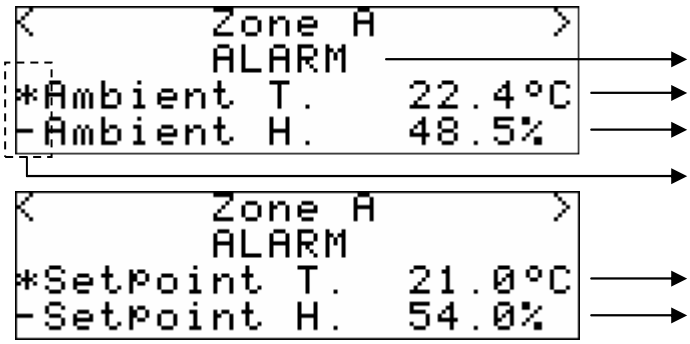
MCZN regulator state:

ON	=	regulation in progress
OFF	=	regulator OFF
ALARM	=	MCZN regulator general alarm
CT ALARM	=	MCCT regulator alarm off-line

By pressing the DOWN key, it is possible to select whether to access the Zones State pages of the Main Menu, the On/Off pages or System Network pages, described below.
By pressing ESC key, the controller will go back to the main display of the MCCT thermal power plant controller.

6.3 Zones status

By accessing the state pages from the “Main Page” access the state pages relative to Zone A and Zone B controlled by the MCZN zone regulator.
The Zone A/B state page will contain the following information:



Alarm present in Zone A (consult alarms menu)

Zone A room temperature

Zone A room humidity

Status of the temperature/humidity regulation
* = regulation in progress
- = regulation not requested/satisfied

Zone A room temperature setpoint active

Zone A room humidity setpoint active

6.4 Main menu

By accessing the pages of the main menu from the “Main Page” of the MCZN regulator, access the setting pages of all regulator functioning parameters organised in the following sub-menu:

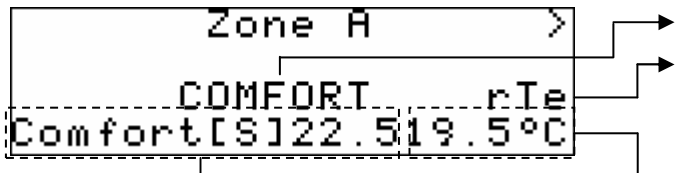
6.4.1 Alarms menu

This menu contains the information linked to the alarms present/active in the MCZN controller.
The MCZN regulator alarms log is contained in the MCCT thermal power plant regulator alarms log.
To view the MCZN regulator active alarms, press ENTER on “*Alarms”*.
If there are no alarms present, “*no alarms”* is displayed, otherwise a series of pages appear containing all possible alarms present in the controller with relative codes and description.
The alarm or the alarms present, will be highlighted by flashing "Rst ALARM", as shown in the figure below.

If the ESC key is pressed from an alarm page or 60 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

6.4.2 Setpoint menu

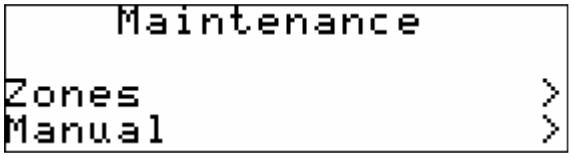
From this menu it is possible to display the temperature and humidity work setpoints for the zones controlled by the zone regulator.
As well as the possibility to view and modify all work setpoints, the pages will also show the “real” work setpoints, indicating by the effect of which type of regulation the work setpoint is different to that set by the user .
The screens will be displayed as follows:



If the ESC key is pressed from a setting page or 240 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

6.4.3 Maintenance menu

The maintenance menu is level 1, i.e. used to insert the maintenance level password or higher in order to display/modify the parameters present in this branch.



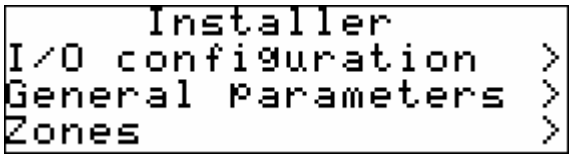
From this menu it is possible to enable and set all features relative to the special control functions of the zones contained in the MCZN application and precisely:

Entering the *ZONES (Zone A / Zone B)* menu, the temperature and humidity regulations are enabled/disabled and the work setpoint remote variation functions, the room climatic curve setpoint and heating/cooling integration are enabled/disabled and defined via external batteries (present in the MCDE module), as well as the setting of all user work set-points (including the anti-freeze setpoint and the regulation hysteresis) and the possibility to calibrate the signals coming from the measurement inputs.

The *MANUAL* menu allows to set the functioning of the utilities managed by the application in manual/automatic mode, thus forcing the state, to test its functionality.

6.4.4 Installer menu

The installer menu is level 2, i.e. used to insert the installer level password or higher in order to display/modify the parameters present in this branch.



From this menu it is possible to view and set the configuration of the system managed from the MCZN application.
Entering the *I/O CONFIGURATION* menu it is possible to set the type of analogue inputs and the polarity of the digital inputs used in the application.

Entering the *GENERAL PARAMETERS* menu, the main features present in the controlled zone regulator are defined, such as the name of the MCZN regulator, the logic positioning of the MCZN regulator in the controlled system (with consequent value of the CANbus address) and the number of zones controlled by the MCZN regulator.
As well as the features of the controller in the system, also defined are the presence and type of Vgraph display connected to it and the features of the serial communication parameters both

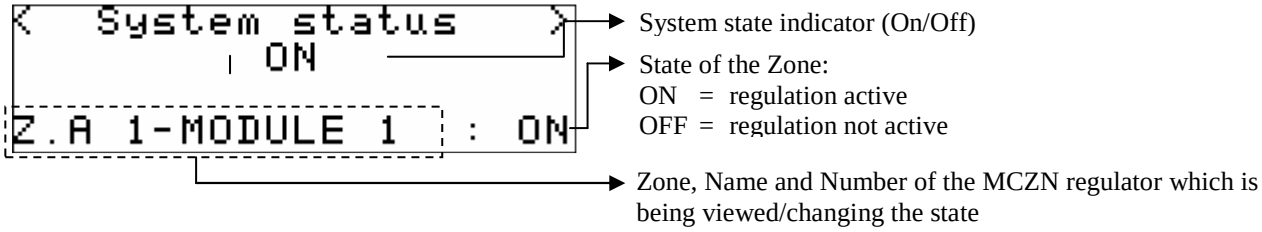
CANbus (c-pro CLIMA controllers network) and Modbus (towards the RICS supervision system or other BMS systems).
Entering the *ZONES (Zone A / Zone B)* menu, it is possible to define the main/construction features relative to the zones enabled and controlled by the MCZN regulator i.e. the type of terminals present (radiators or floor plants), the type of sensors installed in the room and their association to the measurement inputs of the MCZN regulator, the type of regulation to perform in the zone, the type of dehumidifiers installed (with water line use for dehumidification or not) and the calibration of the humidity transducer and the remote setpoint variator, if installed in zone.

Entering the *DEHUMIDIFYER* menu it is possible to enable the presence of the regulator for additional c-pro micro MCDE dehumidifiers.

Finally the *PASSWORDS* menu allows to display and modify the 3 password levels present in the application.

6.5 On/Off pages

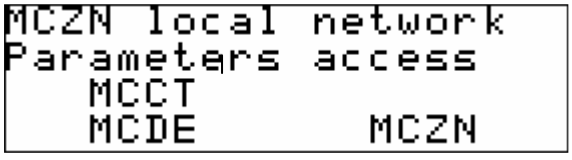
Accessing the On/Off pages of the MCZN regulator, it is possible to display the state of the system (On/Off, to access the next page, press the RIGHT key) and to display and modify the state of Zone A and Zone B controlled by the regulator, as follows:



Pressing ENTER over ON or OFF, it is possible to modify the state of regulation of Zone A.
Pressing the ENTER key over > access the same setting relative to Zone B.
When the 60 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main page.

6.6 System Network page

Accessing the System Network page of the MCZN regulator, it is possible to access the regulator application for additional MCDE dehumidifiers or go back to the display of the MCCT thermal power plant regulator as follows:



Pressing ENTER over MCCT access the thermal power plant regulator. Pressing ENTER over MCDE access the regulator for additional MCDE dehumidifiers connected to the zone. Pressing ENTER over MCZN remain in the MCZN zone regulator from where access was made.
By pressing ESC key, the controller will go back to the main display of the MCCT thermal power plant controller.

6.7 Configuration parameters

Below find a list of all configuration parameters contained in the MAINTENANCE menu and INSTALLER managed by the MCZN application.
A brief description is supplied for every parameter, the range of acceptable values, unit of measurement and the default value proposed.
The menus are structured following the logic given in the respective description paragraphs 7.4.3 and 7.4.4.

6.7.1 List of MAINTENANCE menu configuration parameters

Label	Parameter description	Default	Min	Max
	ZONE A MAINTENANCE			
Zone A Maintenance Regulation enabling Temperature	Enabling of Zone A temperature regulation	YES	NO	YES
Zone A Maintenance Regulation enabling Humidity	Enabling of Zone A humidity regulation	NO	NO	YES
Zone A Maintenance Regulation enabling T.Ext.set var	Enabling of Zone A room setpoint "climatic curve" function	NO	NO	YES
Zone A Maintenance Regulation enabling T. integration	Enabling of Zone A heating/cooling integration" function (via MCDE module) - --- = Function disabled - S = Cooling integration (summer) - W = Heating integration (winter) - S+W = Cooling/heating integration (summer + winter)	---	---	S+W
Zone A Maintenance Temp. regulation COMFORT [S]	Zone A summer Comfort time band pre-defined temperature set-point (expressed in °C)	23.0	10.0	30.0
Zone A Maintenance Temp. regulation ECONOMY [S]	Zone A summer Economy time band pre-defined temperature set-point (expressed in °C)	26.0	10.0	30.0
Zone A Maintenance Temp. regulation COMFORT [W]	Zone A winter Comfort time band pre-defined temperature set-point (expressed in °C)	19.0	10.0	30.0
Zone A Maintenance Temp. regulation ECONOMY [W]	Zone A winter Economy time band pre-defined temperature set-point (expressed in °C)	16.0	10.0	30.0
Zone A Maintenance Temp. Regulation ANTIFREEZE	Anti-freeze time band temperature set-point in winter mode Zone A (expressed in °C)	3.0	-10.0	30.0
Zone A Maintenance Temp. regulation Min Set Ofs	Work temperature set-point maximum negative variation by Zone A remote set-point variator (expressed in °C)	-5.0	-10.0	10.0
Zone A Maintenance Temp. regulation Max Set Ofs	Work temperature set-point maximum positive variation by Zone A remote set-point variator (expressed in °C)	5.0	-10.0	10.0
Zone A Maintenance Temp. regulation Hysteresis	Zone A room temperature regulation hysteresis (differential) relative to the work set-point (expressed in °C)	1.0	0.0	99.9
Zone A Maintenance Temp. integration Winter delta	Difference between room temperature and work set-point due to activation of the winter Zone A “integration to heating” function (expressed in °C)	1.0	0.0	10.0

Zone A Maintenance Temp. integration Winter delay	Delay on activation of the summer Zone A "integration to heating" function (expressed in minutes)	5	1	255
Zone A Maintenance Temp. integration Summer delta	Difference between room temperature and work set-point due to activation of the summer Zone A “integration to cooling” function (expressed in °C)	0.0	0.0	10.0
Zone A Maintenance Temp. integration Summer delay	Delay on activation of the summer Zone A "integration to cooling" function (expressed in minutes)	5	1	255
Zone A Maintenance T.Ext.Set variation MinTExt S	Minimum external temperature in summer for summer Zone A "climatic curve" calculation (expressed in °C)	12.0	0.0	60.0
Zone A Maintenance T.Ext.Set variation MaxTExt S	Maximum external temperature in summer for summer Zone A "climatic curve" calculation (expressed in °C)	35.0	0.0	60.0
Zone A Maintenance T.Ext.Set variation MinTExt Set W	Summer work temperature set-point maximum negative variation for zone A summer “climatic curve” calculation (expressed in °C)	-5.0	-10.0	10.0
Zone A Maintenance T.Ext.Set variation MaxTExt Set W	Summer work temperature set-point maximum positive variation for zone A summer “climatic curve” calculation (expressed in °C)	5.0	-10.0	10.0
Zone A Maintenance T.Ext.Set variation Mode TExt.W	Calculation method of the summer Zone A "climatic curve": - DIR. = Direct - INV. = Inverse	DIR.	DIR.	INV.
Zone A Maintenance T.Ext.Set variation MinTExt W	Minimum external temperature in winter for winter Zone A "climatic curve" calculation (expressed in °C)	-5.0	-30.0	40.0
Zone A Maintenance T.Ext.Set variation MaxTExt W	Maximum external temperature in winter for winter Zone A "climatic curve" calculation (expressed in °C)	12.0	-30.0	40.0
Zone A Maintenance T.Ext.Set variation MinTExt Set W	Winter work temperature set-point maximum negative variation for zone A winter “climatic curve” calculation (expressed in °C)	5.0	-10.0	10.0
Zone A Maintenance T.Ext.Set variation MaxTExt Set W	Winter work temperature set-point maximum positive variation for zone A winter “climatic curve” calculation (expressed in °C)	-5.0	-10.0	10.0
Zone A Maintenance T.Ext.Set variation Mode TExt.W	Calculation method of the winter Zone A "climatic curve" - DIR. = Direct - INV. = Inverse	DIR.	DIR.	INV.
Zone A Maintenance Humid. regulation COMFORT	Zone A Comfort time band pre-defined humidity set-point (expressed in %r.H.)	50.0	0.0	100.0
Zone A Maintenance Humid. regulation ECONOMY	Zone A Economy time band pre-defined humidity set-point (expressed in %r.H.)	50.0	0.0	100.0
Zone A Maintenance Humid. regulation Hysteresis	Zone A room humidity regulation hysteresis (differential) relative to the work set-point (expressed in %r.H.)	5.0	0.0	99.9
Zone A Maintenance Probes calibration Temperature	Zone A room temperature probe calibration (expressed in °C)	0.0	-10.0	10.0
Zone A Maintenance Probes calibration Humidity	Zone A room humidity transducer calibration (expressed in %r.H.)	0.0	-10.0	10.0
Zone A Maintenance Probes calibration Rem. Set.	Zone A remote set-point variator calibration (expressed in points)	0	-100	100

Zone A Maintenance Dehumidifier Alarm Reset type	Zone A dehumidifier alarm reset type -AUTOMATIC -MANUAL	AUTOMATIC	AUTOMATIC	MANUAL
Zone A Maintenance Dehumidifier Alarm Delay	Zone A dehumidifier alarm delay (expressed in seconds)	0	0	1
* The same menu is also available for Zone B				

6.7.2 List of INSTALLER menu configuration parameters

Label	Parameter description	Default	Min	Max
	I/O CONFIGURATION			
I/O configuration AIn1 and AIn2	Type of measure input for analogue inputs 1 and 2	NTC	NTC	NTC
I/O configuration AIn3 and AIn4	Type of measure input for analogue inputs 3 and 4	4-20mA	NTC	4-20mA
I/O configuration DIn 1…4	Type of contact for digital inputs NA = normally open NC = normally closed	N.C.	N.C.	N.O.
	GENERAL PARAMETERS			
General parameters Local zones nr.	Number of zone controlled by MCZN module	2	0	2
General parameters V-GRAPH mode	Method of using V-Graph display - UNIV.= Public terminal - AB= Module private terminal - A+B= Terminal with no zones	UNIV.	UNIV.	A+B
General parameters MCZN module nr.	MCZN regulator "logic" position setting in the regulators network	1	0	8
General parameters CANbus Address	CANbus serial address	2	0	255
General parameters Baud rate	CANbus communication speed (baud rate) -20Kbit -50Kbit -125Kbit -500Kbit	125Kbit	20Kbit	500Kbit
General parameters MODBUS serial port Idx	Modbus serial address	1	1	247
General parameters MODBUS serial port Baud	Modbus communication speed (baud rate) - 1200Kb - 2400Kb - 4800Kb - 9600Kb - 19200Kb	9600Kb	1200Kb	19200Kb
General parameters MODBUS serial port Parity	Type of Modbus communication parity - NO - ODD - EVEN	EVEN	NO	EVEN
General parameters MODBUS serial port Stop	Modbus communication Bit Stop position	1b	1b	2b
	ZONES SETUP			
Zone A setup Plant Zone	Zone A "logic" number with respect to total number of zones present in the system	1	1	16
Zone A setup Delivery line	Delivery line (from MCCT) associated to Zone A	1	0	2

Zone A setup Terminal units	Type of terminal units present in zone A - H.T. = High temperature (radiators) - L.T. = Low temperature (floor heating/cooling)	L.T.	H.T.	L.T.
Zone A setup Sensor type	Type of probe installed in Zone A - --- = Not present - T = Temperature - T+Set = Temperature + remote set-point variator - TH = Temperature + humidity - TH+Set = Temperature + humidity + remote set-point variator	T	---	TH+Set
Zone A setup T. probe pos.	Analogue input to which the Zone A temperature probe is to be associated - --- = no measurement input (probe not present) - AIn1 = analogue input 1 - AIn2 = analogue input 2 - AIn3 = analogue input 3 - AIn4 = analogue input 4	AIn1	---	AIn4
Zone A setup H. probe pos.	Analogue input to which the Zone A humidity transducer is to be associated - --- = no measurement input (transd. not present) - AIn3 = analogue input 3 - AIn4 = analogue input 4	AIn3	---	AIn4
Zone A setup Rem. set pos.	Analogue input to which the Zone A remote set-point variator is to be associated - --- = no measurement input (variator not present) - AIn1 = analogue input 1 - AIn2 = analogue input 2 - AIn3 = analogue input 3 - AIn4 = analogue input 4	---	---	AIn4
Zone A setup Reg. type	Enables the regulation mode for Zone A - OFF = Regulation not active - E = Regulation only in summer mode (cooling) - I = Regulation only in winter mode (heating) - E/I = Regulation in summer and winter mode	E/I	OFF	E/I
Zone A setup D output cfg	Digital output configuration DO3 associated to Zone A - ALR = Zona A generic alarm - BOOST = integration at heating/cooling Zone A	ALR	ALR	BOOST
Zone A setup Dehum. with H2O	Enable use of delivery line water (circulation pump) for dehumidification	Yes	No	Yes
Zone A setup Zone probe signal Probe type	Type of transducer used to detect humidity	4-20mA	4-20mA	0-5V
Zone A setup Zone probe signal Min H. value	Minimum calibration value of the humidity transducer, corresponding to the 4mA or 0V of the transducer (expressed in %r.H.)	0.0	0.0	100.0
Zone A setup Zone probe signal Max H. value	Maximum calibration value of the humidity transducer, corresponding to the 20mA or 5V of the transducer (expressed in %r.H.)	100.0	0.0	100.0
Zone A setup R.Set calibr.	Calibration points for remote setpoint variator calibration (expressed in points) - P1 = maximum negative variation - P2 =neutral position - P3 = maximum positive variation	0	999	999
* The same menu is also available for Zone B				
	REM. DEHUMIDIFIER			
Rem. dehumidifyer Enable control	Enabling of presence of a MCDE module for additional dehumidifiers associated to the MCZN regulator	No	No	Yes
Rem. dehumidfiyer CANBUS address	MCDE module CAN address (assigned automatically by the system)	0	0	55

6.8 State of the unit

The state of the MCZN regulator is given by the state of the MCCT thermal power plant regulator.

6.9 State of Zone A and Zone B

There are two ways to vary the state of Zones A and B:

1) Using the **On/Off keyboard** control
   Using the On/Off pages described in chapter 7.5

2) Using the **Zone A and Zone B On/Off controls from digital input**
   Switch-on: close the remote Zone A/B On/Off contact: if all of the other conditions enabled are present, the regulation of Zones A/B goes to "ON".
   Switch-off: if the Zone A/B remote On/Off contact is open, the regulation of Zone A/B goes to OFF.

7 c-pro Micro MCDE regulator

Regulator for additional dehumidifiers

7.1 List of pages

This paragraph presents the main pages and menus found in the MCDE application. As shown previously, the general menu is divided into 2 levels: maintenance technician and installer are also present along with "Zones State", “ON/OFF” and "System Network" sections for free consultation. The latter is also necessary for navigation among modules.

The menus have the following structure:

- States
  - Dehumidifier module functioning state.

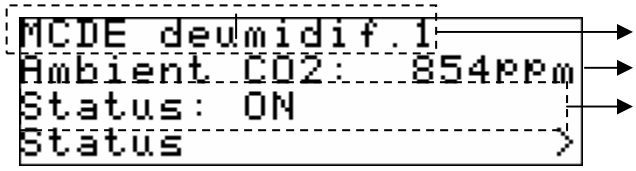
- Menu
  - Alarms/Log
    - alarms log
    - reset active alarms
    - reset alarms log
  - Maintenance
    - general parameters
    - Booster
    - CO2
    - Manual
  - Installer
    - I/O configuration
    - general parameters
    - CO2
    - Dehumidifier
    - Initialisation
  - Program info

- ON/OFF
  - Regulator state for additional MCDE dehumidifiers

- System Network
  - MCDE system local network

7.2 Main page

The main page is displayed during the ON state:



Name of the MCDE regulator to which access has been

Value of CO2 present in the room (if enabled)

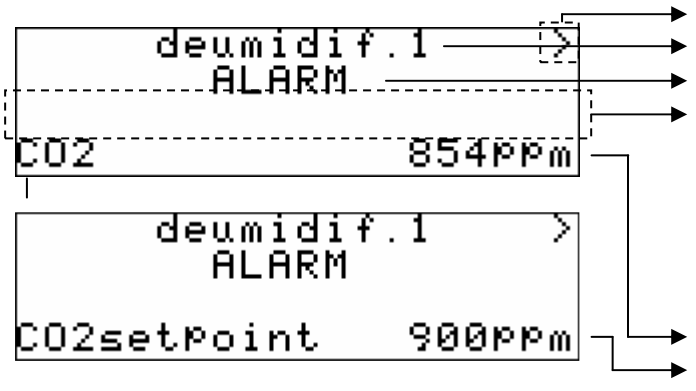
MCDE regulator state:

ON	=	regulation in progress
OFF	=	regulator OFF
ALARM	=	MCDE regulator general alarm
ZN ALARM	=	Associated MCZN regulator alarm off-line

By pressing the DOWN key, it is possible to select whether to access the State pages of the MCZN regulator, the Main Menu, the On/Off pages or System Network pages, described below.
By pressing ESC key, the controller will go back to the main display of the MCCT thermal power plant controller.

7.3 Status

By accessing the “Status” page from the “Main Page” access the two status ages relative to the dehumidifier/s, the booster/s for integration with cooling/heating and/or management of the fresh air damper controlled by the MCDE regulator.
The Status pages will contain the following information:



Access to the next MCDE status page

Name of the MCDE regulator to which access has been

Alarm present (consult alarms menu)

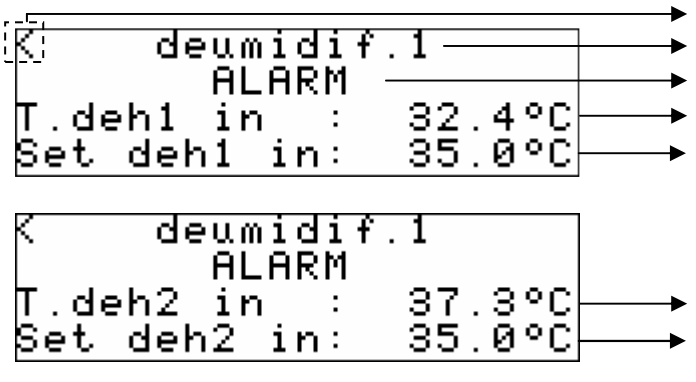
Line indicating the status of the MCDE controller:

Deh1	=	dehumidifier 1 activated
Deh2	=	dehumidifier 2 activated
CO2	=	Fresh air damper activated
Bc	=	dehumidifier 1-2 cooling booster activated
Bh1	=	dehumidifier 1 heating booster activated
Bh2	=	dehumidifier 2 heating booster activated

CO2 level detected in the room

Maximum CO2 level setpoint in the room

By positioning the cursor over the “>” symbol and pressing the ENTER key, it is possible to access the second "Status" page of the MCDE regulator.
The second Status page will contain the following information:



Return to the previous MCDE status page

Name of the MCDE regulator to which access has been

Alarm present (consult alarms menu)

Input temperature dehumidif.1 for booster functioning

Setpoint limit for input temp. dehumidif.1 for booster functioning

Input temperature dehumidif.2 for booster functioning

Setpoint limit for input temp. dehumidif.1 for booster functioning

7.4 Main menu

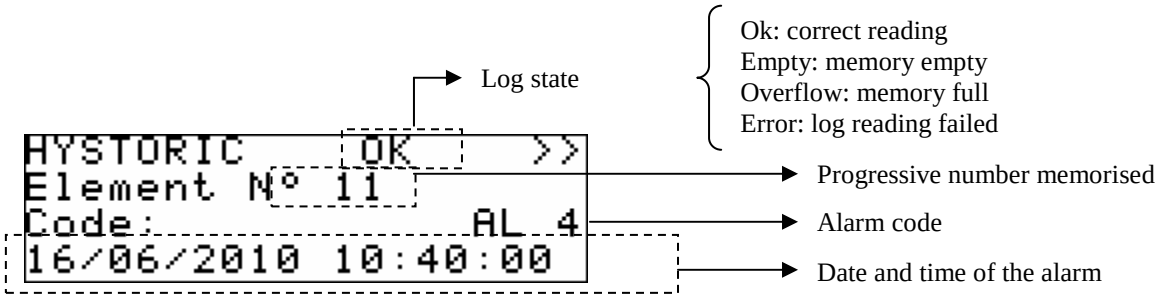
By accessing the pages of the main menu from the "Main Page" of the MCDE regulator, access the setting pages of all regulator functioning parameters organised in the following sub-menu:

7.4.1 Alarms/log menu

This menu contains the functionality linked to the controller alarms and the alarms log of the system.

7.4.2 Alarms log

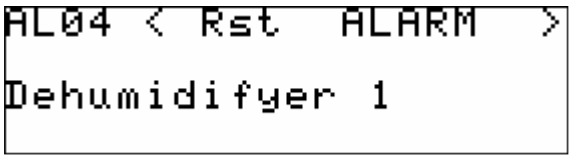
To view the MCDE regulator alarms log, press ENTER on "*Hystorical alarms*".
If there are no elements present, "*NO ALARMS*" is displayed, otherwise the following page is proposed, where the information of the last element memorised in the log is given:



To view the previous element, press ENTER on ">>". By repeating this procedure, scroll all log elements until the first element inserted is reached. From here, on request of the next element, the last element memorised is re-proposed: the log display is circular.
To exit the log pages, press the ESC key or wait 60 timeout seconds. This level is not protected by a password.

7.4.3 Reset active alarms

To view the MCDE regulator active alarms, press ENTER on "*Rst running alarms*".
If there are no alarms present, "*no alarms*" is displayed, otherwise a series of pages appear containing all possible alarms present in the controller with relative codes and description.
The alarm or the alarms present, will be highlighted by flashing "Rst ALARM", as shown in the figure below.



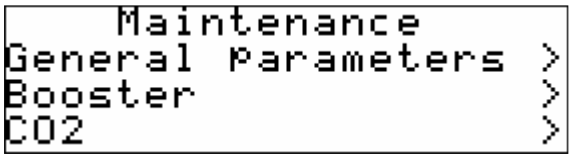
If the ESC key is pressed from an alarm page or 60 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

7.4.4 Reset alarms log

To reset the memorised alarms log, press ENTER on "Rst hystorical alarms" and take the value of the "*Do you want to erase hystorial alarms memory*" parameter to the "Yes" value.
To exit the alarms log reset pages, press the ESC key or wait 60 timeout seconds. This level is not protected by a password.

7.4.5 Maintenance menu

The maintenance menu is level 1, i.e. used to insert the maintenance level password or higher in order to display/modify the parameters present in this branch.



From this menu it is possible to enable and set all features relative to the special control functions of the dehumidifiers, the heating/cooling integration boosters and level of room CO2 contained in the MCDE application and precisely:

Entering the *GENERAL PARAMETER* menu, the MCDE regulator is associated to the desired Zone and the presence of the dehumidifier ON/OFF digital input presence is enabled/disabled.

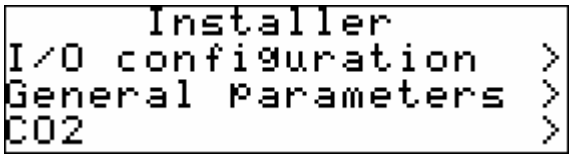
Entering in the *BOOSTER* menu, it is possible to enable/disable and assign the activation modes of the support boosters for heating/cooling with the enabling and definition of the control set-points on the limit temperatures on dehumidifier input.

By entering the *CO2* menu, enable/disable the regulation of the CO2 level in the room, also defining the type of damper, set-point and regulation hysteresis managed.

The *MANUAL* menu finally allows to set the functioning of the utilities managed by the application in manual/automatic mode, thus forcing the state, to test its functionality.

7.4.6 Installer menu

The installer menu is level 2, i.e. used to insert the installer level password or higher in order to display/modify the parameters present in this branch.



From this menu it is possible to view and set the configuration of the dehumidifier/s connected to it and its relative controls.

Entering the *I/O CONFIGURATION* menu it is possible to set the type of analogue inputs and the polarity of the digital inputs used in the application.

Entering the *GENERAL PARAMETERS* menu, it is possible to define the main features present in the regulator for additional controlled dehumidifiers, i.e. the name of the MCDE regulator, to which

MCZN zone regulator it is associated and the features of the serial communication parameters both CANbus (c-pro CLIMA controllers network) and Modbus (towards the RICS supervision system or other BMS systems).

Entering the *CO2* menu, it is possible to define the main/construction features relative to the CO2 sensor used, enabling or not the presence and defining the minimum and maximum calibration values.

Entering the *DEHUMIDIFYER* menu, it is possible to define the main/constructive features relative to the type of dehumidifiers managed and enabling or not of the control probes on the limit temperatures on dehumidifier input.

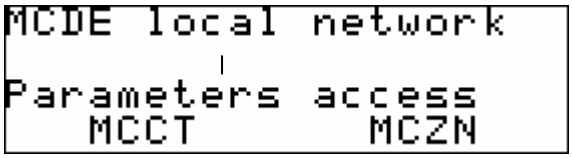
Finally the *PASSWORDS* menu allows to display and modify the 3 password levels present in the application.

7.5 On/Off pages

By accessing the ON/Off page of the MCDE regulator, there is the possibility to view the state of the regulator.
When the 60 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main page.

7.6 System Network page

Accessing the System Network page of the MCDE regulator, it is possible to access the regulator application for MCZN zone regulator connected to it or go back to the display of the MCCT thermal power plant regulator as follows:



By pressing ESC key, the controller will go back to the main display of the MCCT thermal power plant controller.

7.7 Configuration parameters

Below find a list of all configuration parameters contained in the MAINTENANCE menu (maintenance technician) and INSTALLER managed by the MCDE application.
A brief description is supplied for every parameter, the range of acceptable values, unit of measurement and the default value proposed.
The menus are structured following the logic given in the respective description paragraphs 8.4.5 and 8.4.6.

7.7.1 List of MAINTENANCE menu configuration parameters

Label	Parameter description	Default	Min	Max
	GENERAL PARAMETERS			
General parameters MCZN assigned	MCZN zone regulator to which the MCDE dehumidifier module is associated	1	1	8
General parameters ONOFF(1) d.In.en	Enabling ON OFF digital input dehumidifier 1	Yes	No	Yes
General parameters ONOFF(2) d.In.en	Enabling ON OFF digital input dehumidifier 2	Yes	No	Yes
General parameters Regulations Dehumidifyer	Zone assignment (of the associated MCZN regulator) to which the dehumidification function is associated: - --- = no Zone associated - ZA = associated to Zone A - ZB = associated to Zone B - ZA+ZB associated to Zone A and Zone B	ZA+ZB	---	ZA+ZB
General parameters Regulations Dehum. delay	Delay on activation of the humidifier (expressed in seconds)	30	0	999
General parameters Regulations Booster H	Zone assignment (of the associated MCZN regulator) to which the heating integration Hot Booster function is associated: - --- = no Zone associated - ZA = associated to Zone A - ZB = associated to Zone B - ZA+ZB associated to Zone A and Zone B	ZA+ZB	---	ZA+ZB
General parameters Regulations Booster C	Zone assignment (of the associated MCZN regulator) to which the cooling integration Cold Booster function is associated: - --- = no Zone associated - ZA = associated to Zone A - ZB = associated to Zone B	ZA+ZB	---	ZA+ZB
	BOOSTER			
Booster Parameters Mode	Assignment of the system functioning mode for activation of heating/cooling integration Booster functions: - --- = Booster not enabled - E = Summer (Cooling Booster only) - I = Winter (Heating Booster solo) - E+I = Summer+Winter (Cooling and Heating Booster only)	E+I	---	E+I

Booster Parameters Booster H	Zone assignment (of the associated MCZN regulator) to which the heating integration Hot Booster function is associated: - --- = no Zone associated - ZA = associated to Zone A - ZB = associated to Zone B - ZA+ZB associated to Zone A and Zone B	ZA+ZB	---	ZA+ZB
Booster Parameters Booster C	Zone assignment (of the associated MCZN regulator) to which the cooling integration Cold Booster function is associated: - --- = no Zone associated - ZA = associated to Zone A - ZB = associated to Zone B - ZA+ZB associated to Zone A and Zone B	ZA+ZB	---	ZA+ZB
Booster Parameters Set deh1 in	Minimum input temperature dehumidifier 1 setpoint for enabling of Heating Booster (expressed in °C)	35.0	0.0	100.0
Booster Parameters Set deh2 in	Minimum input temperature dehumidifier 2 setpoint for enabling of Heating Booster (expressed in °C)	35.0	0.0	100.0
Booster Parameters Dehum. activ.	Link between the activation of the booster output and the activation of the dehumidifier output	Yes	No	Yes
	CO2			
CO2 parameters Enable reg.	Enabling regulation of the CO2 level	Yes	No	Yes
CO2 parameters Dumper mode	Fresh air dumper functioning mode: - --- = not enabled - CLOSED = fixed - MODUL. = modulating - OPEN = fixed	MODUL.	---	OPEN
CO2 parameters Setpoint	Room maximum CO2 level setpoint due to dumper opening (expressed in parts per million)	0	0	2000
CO2 regulation Hysteresis	Hysteresis (differential) relative to the CO2 setpoint (expressed in parts per million)	10	0	100

7.7.2 List of INSTALLER menu configuration parameters

Label	**Parameter description**	**Default**	**Min**	**Max**
	I/O CONFIGURATION			
I/O configuration AIn3	AIn3 analogue input configuration type: - 4-20mA - 0-5V	4-20mA	4-20mA	0-5V
I/O configuration DIn	Type of contact for digital inputs NA = normally open NC = normally closed	N.O.	N.C.	N.O.
	GENERAL PARAMETERS			
General parameters MCZN assigned	MCZN zone regulator to which the MCDE module is associated	1	1	8
General parameters CANBUS address	CANbus serial address	0	0	255
General parameters Baud Rate	CANbus communication speed (baud rate) -20Kbit -50Kbit -125Kbit -500Kbit	125Kbit	20Kbit	500Kbit

General parameters MODBUS network Idx	Modbus serial address	1	1	247
General parameters MODBUS network Baud	Modbus communication speed (baud rate) - 1200Kb - 2400Kb - 4800Kb - 9600Kb - 19200Kb	9600Kb	1200Kb	19200Kb
General parameters MODBUS network Parity	Type of Modbus communication parity - NO - ODD - EVEN	EVEN	NO	EVEN
General parameters MODBUS network Stop	Modbus communication Bit Stop position	1b	1b	2b
	CO2			
CO2 regulation CO2 control en.	Enabling of CO2 transducer reading	No	No	Yes
CO2 regulation Min. limit	Minimum calibration value of the CO2 transducer, corresponding to the 4mA or 0V of the transducer (expressed in ppm)	0	0	5000
CO2 regulation Max. limit	Maximum calibration value of the CO2 transducer, corresponding to the 20mA or 5V of the transducer (expressed in ppm)	2000	0	5000
	DEHUMIDIFYER			
Dehumidifyer Dehum. type	Type of dehumidifier managed: 0 = dehumidifier type 0 1 = dehumidifier type 1 2 = dehumidifier type 2	1	0	2
Dehumidifier Boost1 T.in en.	Enabling of dehumidifier 1 input temperature limit function due to activation of Booster 1 function.	No	No	Yes
Dehumidifier Boost2 T.in en.	Enabling of dehumidifier 2 input temperature limit function due to activation of Booster 1 function.	No	No	Yes

7.8 State of the unit

The state of the MCDE regulator is given by the state of the MCZN associated regulator.

8 c-pro micro MCPS regulator

Regulator for Solar Panels

8.1 List of pages

This paragraph presents the main pages and menus found in the MCPS application. As shown previously, the main menu is divided into 2 levels: maintenance technician and installer are also present along with "States" and "System Network" sections for free consultation. The latter is also necessary for navigation among modules.

The menus have the following structure:

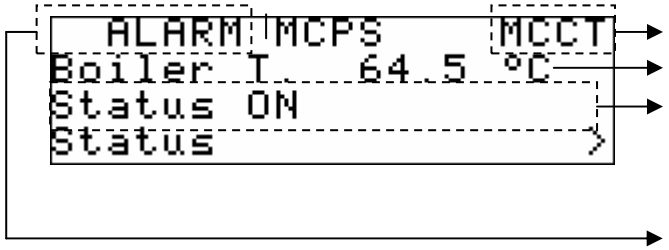
- States
  - Functioning state of DHW circuit (boiler)
  - Functioning state of solar panels 1 circuit
  - Functioning state of solar panels 2 circuit
  - Functioning state of auxiliary circuit (aux1)

- Main menu
  - Alarms/Log
    - Alarms log
    - Reset active alarms
    - Reset alarms log
  - Set-point
    - Setting DHW tank set-point (boiler)
    - Setting auxiliary circuit set-point (aux1)
  - Maintenance (maintenance technician menu)
    - general parameters
    - Panels maintenance
    - Auxiliary circuit management (aux1)
    - DHW tank management (boiler)
    - Flow switches
    - Manual
    - Timer
  - Installer
    - I/O configuration
    - general parameters
    - Solar panels
    - Initialisation
  - Program info

- System Network
  - MCPS system local network

8.2 Main page

The main page is displayed during the ON state:



If flashing, thermal power plant OFFline
DHW tank (lower) temperature (boiler)
MCPS regulator state:
ON = regulation in progress
OFF = regulator OFF
ALARM = MCPS regulator general alarm
If flashing, c-pro CLIMA system in alarm

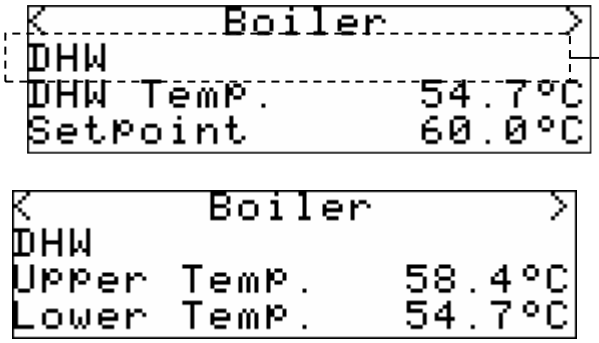
By pressing the DOWN key it is possible to select whether to access the State, pages, the Main Menu or the System Network, described below.
By pressing ESC key, the controller will go back to the main display of the MCCT thermal power plant controller.

8.3 State pages

By accessing the *STATUS* menu from the "Main Page" access the state pages relative to the DHW circuit (boiler), the two solar panels circuits and the auxiliary circuit (aux1) managed by the MCPS regulator.

8.3.1 Functioning state of DHW circuit (boiler)

The DHW circuit state page (boiler) will contain the following information:



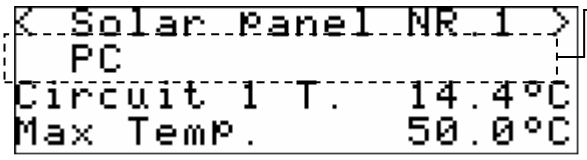
Line indicating the state of the DHW circuit
Alr = DHW circulation pump block alarm
FL = DHW line flow switch alarm with automatic rearm
FL* = DHW line flow switch alarm with manual rearm
LT = DHW line low water temperature alarm
HT = DHW line high water temperature alarm
Ag = Anti-grip function active
Mn = DHW circulation pump functioning in manual mode manual

The DHW (boiler) circuit state pages show, as well as the state of the line described in the previous illustration, the regulation temperature of the DHW tank (i.e. the lower of the two), the DHW tank work set-point, the upper and lower temperature of the DHW tank and the days missing to the next planned running of the antilegionella cycle.

Pressing ENTER on the ">" access the next state page, corresponding with the SOLAR PANELS CIRCUIT 1.
By pressing ENTER on the "<" access the last state page, i.e. the AUXILIARY 1 CIRCUIT state page.
When the 60 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main ON page.

8.3.2 Functioning state of solar panels circuit 1 and 2

The functioning state page of the solar panels circuits 1 and 2 will contain the following information:



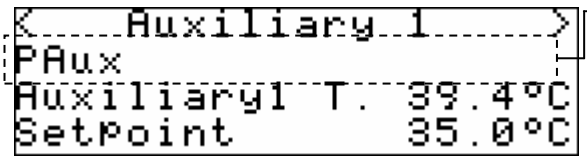
Line indicating the state of solar panels circuit 1 and 2 (PS1 and 2):
P1-2 = PS 1-2 circuit circulation pump activated
PC = PS 1-2 circuit circulation pump activated for periodic cycle
Alr = PS 1-2 circuit circulation pump thermal switch alarm
FL = PS 1-2 line flow switch alarm with automatic rearm
FL* = PS 1-2 line flow switch alarm with manual rearm
LT = PS 1-2 line low water temperature alarm
HT = PS 1-2 line high water temperature alarm
Ag = PS 1-2 circuit antigrip function active
Mn = PS1-2 circ. pump functioning in manual mode

The state page of the solar panels circuit 1-2 shows, as well as the state of the line described in the previous illustration, the temperature of the water in the solar panels circuit and the maximum temperature accepted before the high temperature alarm is signalled

Pressing ENTER on the ">" access the next state page, corresponding with the SOLAR PANELS CIRCUIT 2.
By pressing ENTER on the "<" access the previous state page, i.e. the DHW CIRCUIT state page.
When the 60 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main ON page.

8.3.3 Functioning state of auxiliary circuit

The auxiliary circuit state page will contain the following information:



Line indicating the state of the auxiliary circuit (Aux1):
PAux = Aux1 circulation pump activated
Alr = Aux1 circulation pump heat alarm
FL = Aux1 line flow switch alarm with automatic rearm
FL* = Aux1 line flow switch alarm with manual rearm
LT = Aux1 line low water temperature alarm
HT = Aux1 line high water temperature alarm
Ag = Aux1 circuit Antigrip function active
Mn = PS1-2 circ. pump functioning Aux1 in manual mode

The state page of the auxiliary circuit shows, as well as the state of the line described in the previous illustration, the temperature of the water of the auxiliary circuit and its work set-point set.

Pressing ENTER on the ">" access the next initial state page, corresponding with the DHW CIRCUIT.
By pressing ENTER on the "<" access the previous state page, i.e. the SOLAR PANELS 2 state page.
When the 60 seconds time-out has passed or by pressing ESC, the controller will go back to the display of the main ON page.

8.4 Main menu

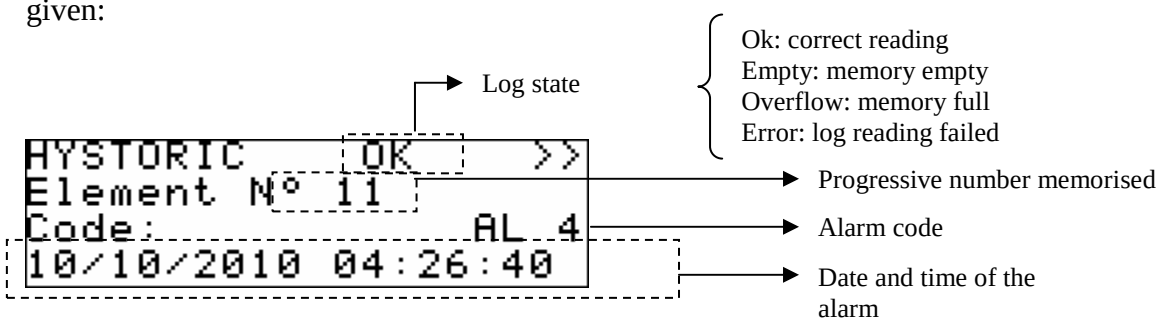
By accessing the pages of the main menu from the "Main Page" of the MCPS regulator, access the setting pages of all regulator functioning parameters organised in the following sub-menu:

8.4.1 Alarms/log menu

This menu contains the functionality linked to the controller alarms and the alarms log of the system.

8.4.2 Alarms log

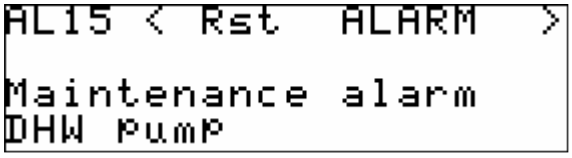
To view the MCPS regulator alarms log, press ENTER on "*storico allarmi (alarms log)*".
If there are no elements present, *"NO ALLARMI" (NO ALARMS)* is displayed, otherwise the following page is proposed, where the information of the last element memorised in the log is given:



To view the previous element, press ENTER on ">>". By repeating this procedure, scroll all log elements until the first element inserted is reached. From here, on request of the next element, the last element memorised is re-proposed: the log display is circular.
To exit the log pages, press the ESC key or wait 60 timeout seconds. This level is not protected by a password.

8.4.3 Reset active alarms

To view the active alarms of the MCPS regulator, press ENTER on "*Rst running alarms"* .
If there are no alarms present, *"no alarms"* is displayed, otherwise a series of pages appear containing all possible alarms present in the controller with relative codes and description.
The alarm or the alarms present, will be highlighted by flashing "Rst ALARM", as shown in the figure below.



If the ESC key is pressed from an alarm page or 60 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

8.4.4 Reset alarms log

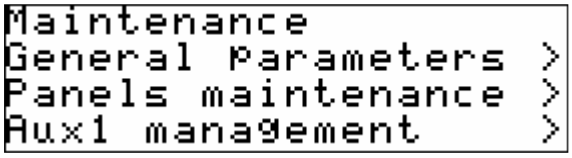
To reset the memorised alarms log, press ENTER on "Rst storico allarmi" (Rest alarms log) and take the value of the "*Cancellazione totale elementi storico in memoria* (Total cancellation of log elements in memory)" parameter to the "Yes" value.
To exit the alarms log reset pages, press the ESC key or wait 60 timeout seconds. This level is not protected by a password.

8.4.5 Set-point menu

From this menu it is possible to display and set the temperature work set-point for the DHW tank and for the AUX1 auxiliary circuit.
If the ESC key is pressed from a setting page or 240 timeout seconds are allowed to pass, you go back to the main page of the application. This level is not protected by a password.

8.4.6 Maintenance menu

The maintenance menu is level 1, i.e. used to insert the maintenance level password or higher in order to display/modify the parameters present in this branch.



From this menu it is possible to enable and set all features relative to the functions linked to the DHW tank and the DHW circuits, solar panels and auxiliaries, contained in the MCPS application and precisely.

Entering the *GENERAL PARAMETERS* menu, it is possible to enable/disable and set the parameters relative to the execution of the Antigrip and Antilegionella cycles, as well as the calibration of the signals coming from the temperature probes.

From the *PANELS MAINTENANCE* menu, it is possible to enable/disable and set the parameters relative to the periodic activation cycles of the solar panels heat pumps and the solar panels Antistagnation function. The activation/deactivation differentials of the pumps are set as well as the minimum and maximum temperature limits for the two circuits.

The *AUX 1 MANAGEMENT* menu allows to set the parameters relative to the management of the Auxiliary, defining the circulation pump activation mode, the plant type where it is placed, the water work set-point, its differential and the calibration of the auxiliary probe.

Entering the *DHW MANAGEMENT* menu, it is possible to set an activation delay of the DHW circuit circulation pump.

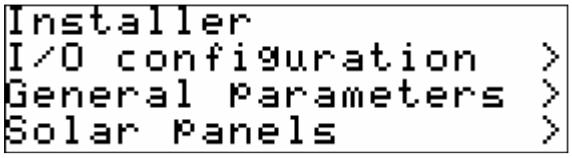
For all flow switches present in the MCPS application, the *FLOW SWITCHES* menu allows to set a delay time from machine ON, a delay time in normal conditions and the number of alarms with manual rearm in order to pass to the necessity for automatic rearm of the alarm.

The *MANUAL* menu allows to set the functioning of the utilities managed by the application in manual/automatic mode, thus forcing the state, to test its functionality.

Finally, the *TIME COUNTER* menu allows to display, enable, set and reset the functioning hours and the maintenance requests for the users to manage the MCPS application.

8.4.7 Installer menu

The installer menu is level 2, i.e. used to insert the installer level password or higher in order to display/modify the parameters present in this branch.



From this menu it is possible to view and set the configuration of the DHW system, the solar panels system/s and the auxiliary system and their controls.

Entering the *I/O CONFIGURATION* menu it is possible to view the type of analogue inputs set in the application and set the polarity of the digital inputs used.

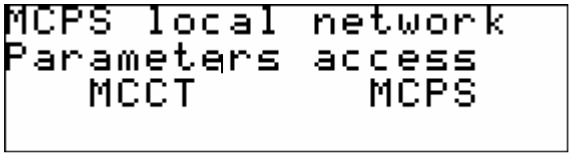
Entering the *GENERAL PARAMETERS* menu, it is possible to define the main features present in the regulator for solar panels, i.e. the name of the MCPS regulator, the number of solar panel circuits present in the system, the presence or not of the auxiliary circuit, the number of temperature probes present in the DHW tank, the type of digital inputs for protection of the circulation pumps and the features of the serial communication parameters both CANbus (c-pro CLIMA controllers network) and Modbus (towards the RICS supervision system or other BMS systems).

Entering the *SOLAR PANELS* menu it is possible to set the calibration of the solar panels temperature transducers, also defining their minimum and maximum calibration values.

Finally the *PASSWORDS* menu allows to display and modify the 3 password levels present in the application.

8.5 System Network page

Accessing the System Network page of the MCPS regulator, it is possible to go back to the MCCT thermal power plant application as follows:



By pressing ESC key, the controller will go back all the same to the main display of the MCCT thermal power plant controller.

8.6 Configuration parameters

Below find a list of all configuration parameters contained in the MAINTENANCE menu (maintenance technician) and INSTALLER managed by the MCPS application.
A brief description is supplied for every parameter, the range of acceptable values, unit of measurement and the default value proposed.
The menus are structured following the logic given in the respective description paragraphs 9.4.6 and 9.4.7.

8.6.1 List of MAINTENANCE menu configuration parameters

Label	Parameter description	Default	Min	Max
	GENERAL PARAMETERS			
General parameters Antigrip Execution day	Antigrip function start day	Monday	Sunday	Saturday
General parameters Antigrip Execution hour	Antigrip function start time	2:00	0:00	23:00
General parameters Probes offset Upper DHW tank	Boiler upper probe calibration (offset) (expressed in °C)	0.0	-10.0	10.0
General parameters Probes offset Lower DHW tank	Boiler lower probe calibration (offset) (expressed in °C)	0.0	-10.0	10.0
General parameters Antilegionella Enable	Enabling of antilegionella cycle	No	No	Yes
General parameters Antilegionella Mode	Antilegionella cycle activation mode - MONTH = Monthly - WEEK = Weekly - DAY = Daily	WEEK	MONTH	DAY
General parameters Antilegionella Start hour	Time of antilegionella cycle start (expressed in hours:minutes)	16:00	0:00	23:00
General parameters Antilegionella Day week	Day of the week for antilegionella cycle start (if weekly activation enabled)	Wednes-day	Sunday	Saturday
General parameters Antilegionella Day month	Day of the month for antilegionella cycle start (if monthly activation enabled)	15	1	28
General parameters Antilegionella Setpoint	Water temperature set-point during the antilegionella cycle (expressed in °C)	70.0	0.0	150.0
General parameters Antilegionella Duration	Duration of the antilegionella cycle (expressed in minutes)	60	0	255
	MAINTENANCE			
Panels Maintenance Periodic cycle Interval	Interval between two periodic activation cycles of the solar panels circulation pumps (expressed in minutes)	30	0	255
Panels MAINTENANCE Periodic cycle Duration	Duration of the periodic activation cycle of the solar panels circulation pumps (expressed in minutes)	10	0	255

Panels maintenance Stag.emergency	Anti-stagnation emergency management mode - ON/OFF = via a heat disposal ON-OFF valve - Cover1 = via cover opening closing management (on same relay contact) - Cover2 = via cover opening closing management (on two relay contacts)	ON/OFF	ON/OFF	Cover2
Panels maintenance ON hyst.	Offset (differential) solar panels pump connection, relative to work set-point. (expressed in °C)	10.0	0.0	50.0
Panels maintenance OFF hyst.	Offset (differential) solar panels pump disconnection, relative to work set-point. (expressed in °C)	5.0	-50.0	50.0
Panels maintenance Temperature limits HT setpoint	Solar panels circuit water high temperature alarm set-point (expressed in °C)	130.0	0.0	200.0
Panels maintenance Temperature limits HT hyst.	Solar panels circuit water high temperature alarm set-point differential, relative to the high temperature alarm set-point (expressed in °C)	20.0	0.0	50.0
Panels maintenance Temperature limits LT setpoint	Solar panels circuit water low temperature alarm set-point (expressed in °C)	5.0	-10.0	40.0
Panels maintenance Temperature limits LT hyst.	Solar panels circuit water low temperature alarm set-point differential, relative to the low temperature alarm set-point (expressed in °C)	5.0	0.0	10.0
	AUX 1 MANAGEMENT			
Aux 1 Maintenance Mode	Auxiliary circuit 1 circulation pump regulation mode: - CONT. = Continuous - T.RICH. = On temperature request	T.RICH.	CONT.	T.RICH.
Aux 1 Maintenance Contr. probe	Circuit connected with AUX1 for differential temperature control for AUX1circulation pump activation: - DHW = heat exchange with DHW tank - SOL = heat exchange with solar panel	SOL	DHW	SOL
Aux1 Maintenance Setpoint	Auxiliary 1 circuit water temperature set-point (expressed in °C)	60.0	35.0	80.0
Aux1 Maintenance Hysteresis	Hysteresis (differential) for auxiliary circuit circulation pump start (expressed in °C)	5.0	0.0	20.0
Aux1 Maintenance Offset ON	Temperature differential between control probe and AUX1 probe for auxiliary circuit circulation pump activation (expressed in °C)	10.0	-50.0	50.0
Aux1 Maintenance Offset OFF	Temperature differential between control probe and AUX1 probe for auxiliary circuit circulation pump deactivation (expressed in °C)	5.0	-50.0	50.0
Aux1 Maintenance Probe offset	Auxiliary circuit 1 probe calibration (offset) (expressed in °C)	0.0	-10.0	10.0
Aux1 Maintenance HT setpoint	Auxiliary circuit 1 high temperature alarm set-point (expressed in °C)	70.0	0.0	90.0
Aux1 Maintenance HT hyst.	High temperature alarm differential (Hysteresis) relative to the high temperature alarm set-point (expressed in °C)	5.0	0.0	10.0
Aux1 Maintenance LT setpoint	Auxiliary circuit 1 low temperature alarm set-point (expressed in °C)	10.0	-10.0	40.0
Aux1 Maintenance LT hyst.	Low temperature alarm differential (Hysteresis) relative to the low temperature alarm set-point (expressed in °C)	5.0	0.0	10.0

Aux 1 Maintenance Mode	Auxiliary circuit 1 circulation pump regulation mode: - CONT. = Continuous - T.RICH. = On temperature request	T.RICH.	CONT.	T.RICH.
	DHW MANAGEMENT			
DHW maintenance Delay	Delay on activation of the DHW circuit pump (expressed in seconds)	30	0	255
	FLOW SWITCHES			
Flow switches Alr ON delay	Delay on activation of the flow switch alarm from system start-up (expressed in seconds)	3 0	0	255
Flow switches Alr RUN delay	Delay on activation of the flow switch alarm with system in normal conditions (expressed in seconds)	5	0	255
Flow switches Auto reset n°	Maximum number of flow switch alarms with automatic rearm for passage to manual rearm	3	0	255

8.6.2 List of INSTALLER menu configuration parameters

Label	Parameter description	Default	Min	Max
	I/O CONFIGURATION			
I/O configuration AIn 1	Type of analogue input configured for AIn2: read only parameter	NTC	NTC	NTC
I/O configuration AIn 2	Type of analogue input configured for AIn2: read only parameter	NTC	NTC	NTC
I/O configuration AIn 3	Type of analogue input configured for AIn3: read only parameter	NTC	NTC	4-20mA
I/O configuration AIn 4	Type of analogue input configured for AIn4: read only parameter	4-20mA	4-20mA	4-20mA
I/O configuration DIn	Type of contact for digital inputs: NO = normally open NC = normally closed	N.C.	N.C.	N.O.
	GENERAL PARAMETERS			
General parameters Solar panels	Number of solar panel circuits present in the plant	1	0	2
General parameters Aux 1 circuit	Enabling of auxiliary circuit 1 (aux1)	No	No	Yes
General parameters DHW probes Upper probe en.	Enabling of DHW tank upper probe (boiler)	Yes	No	Yes
General parameters DHW probes Upper probe en.	Enabling of DHW tank lower probe (boiler)	Yes	No	Yes
General parameters Pumps alarm setup Solar pump 1	Type of digital input for protection of solar panel circuit circulation pump 1: THERMAL = Protection input FLOW = Flow switch	FLOW	THER-MAL	FLOW
General parameters Pumps alarm setup Solar pump 2	Type of digital input for protection of solar panel circuit circulation pump 2: THERMAL = Protection input FLOW = Flow switch	FLOW	THER-MAL	FLOW
General parameters Pumps alarms cfg DHW pump	Type of digital input for protection of DHW circuit circulation pump: THERMAL = Protection input FLOW = Flow switch	FLOW	THER-MAL	FLOW
General parameters Pumps alarms cfg AUX1 pump	Type of digital input for protection of AUX1 circuit circulation pump: THERMAL = Protection input FLOW = Flow switch	FLOW	THER-MAL	FLOW

General parameters CANbus address	CANbus serial address	17	0	255
General parameters Baud rate	CANbus communication speed (baud rate) -20Kbit -50Kbit -125Kbit -500Kbit	125Kbit	20Kbit	500Kbit
General parameters MODBUS network Idx	Modbus serial address	1	1	247
General parameters MODBUS network Baud	Modbus communication speed (baud rate) - 1200Kb - 2400Kb - 4800Kb - 9600Kb - 19200Kb	9600Kb	1200Kb	19200Kb
General parameters MODBUS network Parity	Type of Modbus communication parity - NO - ODD - EVEN	EVEN	NO	EVEN
General parameters MODBUS network Stop	Modbus communication Bit Stop position	1b	1b	2b
	SOLAR PANELS			
Solar panels Probes offset Panel 1	Solar panel 1 water temperature transducer (offset) calibration (expressed in °C)	0.0	-10.0	10.0
Solar panels Probes offset Panel 2	Solar panel 2 water temperature transducer (offset) calibration (expressed in °C)	0.0	-10.0	10.0
Solar panels P.1 sensor Min.	Solar panel 1 water temperature transducer minimum calibration value (expressed in °C)	0.0	-100.0	300.0
Solar panels P.1 sensor Max.	Solar panel 1 water temperature transducer maximum calibration value (expressed in °C)	200.0	-100.0	300.0
Solar panels P.2 sensor Min.	Solar panel 2 water temperature transducer minimum calibration value (expressed in °C)	0.0	-100.0	300.0
Solar panels P.2 sensor Max.	Solar panel 2 water temperature transducer maximum calibration value (expressed in °C)	200.0	-100.0	300.0

8.7 State of the unit

The state of the MCPS regulator is given by the state of the MCCT thermal power plant regulator.

9 Regulations

This chapter will state all main regulations made by the c-pro CLIMA system.
At the side of the title of every paragraph, in brackets find the control module or modules involved in these regulations.
It can therefore be immediately understood from which application to set the function and if the function is available or not in the system available, depending on the presence or not of the control modules indicated.

9.1 Regulation of the zone temperature (MCZN, MCCT modules)

9.1.1 Regulation principle

Depending on the system functioning mode (summer or winter) and the time band active in every zone regulated by the system (manual, economy, comfort in summer and manual, anti-freeze, economy, comfort in winter), when the temperature detected by the room probe is over (summer) or below (winter) the active zone set-point value plus the value of the differential for that zone, the MCZN regulator will activate the corresponding zone heating/cooling manifold.

The activation of the manifold automatically generates an activation request for the delivery circulation pump in the MCCT controller (delivery line 1 or delivery line 2) that serves the requesting zone which, after a delay time that can be set from the parameter, activates the circulation of water in the system and the management of the mixing valve.

After activation of the circulation pump the delivery water temperature control is performed.
Whenever the temperature of the delivery water does not satisfy the delivery set-point (or the mixing valve set-point, if present) after a delay time that can be set from parameter, the heat pump/boiler can be activated in winter mode (depending on the settings made) or the chiller is activated in summer mode.

To regulate the delivery water temperature of the mixing valve and the relative utilities for heating/cooling of the water, consult the relative paragraphs.

9.1.2 Management of the zone heating/cooling manifolds (MCZN module)

The zone heating/cooling manifold is activated when:

- Winter functioning mode: the value of the room set-point is lower that the active room set-point - hysteresis value (differential)
- Summer functioning mode: the value of the room set-point is higher that the active room set-point + hysteresis value (differential)

Every zone heating/cooling manifold present in the system works independently and, once activated, generates an activation request of the delivery circulation pump to which it is associated using the relevant parameter.

Important parameters:
MCZN: Installer menu → General parameters → Local zones nr.
MCZN: Installer menu → Zones → Zona A(B) → Delivery line
MCZN: Installer menu → Zones → Zone A(B) → Terminal units
MCZN: Installer menu → Zones → Zone A(B) → Sensor type
MCZN: Installer menu → Zones → Zone A(B) → T. probe pos.
MCZN: Installer menu → Zones → Zone A(B) → Reg. type
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Regulation enablings → Temperature
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Temp. regulation →Hysteresis

9.1.3 Zone work set-point (MCZN module)

The zone work set-point is decided depending on the work mode, manual or automatic (with programmed weekly time bands), always using the Vgraph zone display.
For the types of work set-point acceptable and for their settings, consult the c-pro CLIMA system user manual.
Other possibilities also exist to change the work set-point established via Vgraph in the modes listed below:

9.1.3.1 Variation of the zone work set-point for "climatic curves" (MCZN, MCCT modules)

By activating the work set-point variation function for “climatic curve”, depending on the external temperature it is possible (available on the MCCT regulator) to vary the active zone work set-point value within the minimum and maximum limits that can be set from parameter, in order to adapt the room temperature to the external climatic conditions, as follows:

- set the minimum and maximum external temperature limits specific for summer functioning and winter functioning, within which the variation function of the room set-point is active
- the room work set-point minimum and maximum variation values are set
- set the direction of the compensation if direct or inverse for increase or decrease compensation of the work set-point.

Important parameters:
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Regulation enabling → T. Ext set var.
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MinTExt S
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MaxTExt S
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MinTExt Set S
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MaxTExt Set S
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation → ModeTExt Set S
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MinTExt W
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MaxTExt W
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MinTExt Set W
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation →MaxTExt Set W
MCZN: Maintenance Menu →Zone A(B) Maintenance→ T.ext set variation → ModeTExt Set W

9.1.3.2 Variation of the zone work set-point for "manual compensation" (MCZN module)

By activating the work set-point variation function for “manual compensation” by installing a remote set-point variator it is possible (e.g. the EVSET01 accessory), to allow the final user to increase/lower the active zone work set-point within the pre-established limits, by simply acting on the pocoveriometer distinguished by the + / - indication.

Remote set-point variator
EVSET01

The system installer/maintenance technician must enable and set the function features from parameter, i.e.:

- set the room work set-point minimum and maximum variation values
- enable and set the presence of the remote set-point variator
- calibrate the movement of the pocoveriometer for 3 basic positions, i.e. maximum negative variation, neutral (0°C variation) and maximum positive variation.

Calibration procedure

- access the remote set-point variator calibration screen
  MCZN: Installer Menu → Zone A(B) → Zone A(B) setup → R.Set calibr.
- position the cursor on position P1
- move the pocoveriometer into the negative set-point maximum variation position (the display will show the number of points read by the pocoveriometer)
- press ENTER to calibrate the first calibration point
- position the cursor on position P2
- move the pocoveriometer into the neutral position (variation of 0°C set-point, the display will show the number of points read by the pocoveriometer)
- press ENTER to calibrate the second calibration point
- position the cursor on position P3
- move the pocoveriometer into the positive set-point maximum variation position (the display will show the number of points read by the pocoveriometer)
- press ENTER to calibrate the third and last calibration point

Important parameters:
MCZN: Installer Menu → Zone A(B) → Zone A(B) setup → Sensor type
MCZN: Installer Menu → Zone A(B) → Zone A(B) setup → Rem. Set pos.
MCZN: Installer Menu → Zone A(B) → Zone A(B) setup → R.Set calibr.
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Temp. Regulation →Min Set Ofs
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Temp. Regulation →Max Set Ofs

9.1.4 Zone anti-freeze protection (MCZN module)

During the winter functioning mode when the system is not running (i.e. in OFF state or with time bands enabled but in a day when the system is off), however an zone anti-freeze protection control remains active
If the zone room temperature goes below the anti-freeze set-point, the system will however function (activating the zone manifolds, the circulation pump of the associated delivery line, the heat pump or the boiler if necessary), in order to guarantee a minimum temperature in the room and so as not to risk compromising the good functioning of the system due to frozen piping.

Important parameters:
MCZN: Maintenance Menu → Zone A(B) → Temp. Regulation → Antifreeze

9.1.5 "Heating/cooling integration" function (MCZN, MCDE modules)

If the control of the module for additional dehumidifiers linked to the zone regulator is present and enabled, then it is possible to activate the "heating/cooling integration" function (also defined with the term "booster").
This function allows the use of the battery housed in the dehumidifier for the regulation of the room temperature, via an air system aiding that regularly controlled by the system. This function is used to compensate the regulation transistors in the system commissioning phase or for passage between regulation conditions at a distance from each other.

The heating/cooling integration can be summer or winter and is defined as a delta with respect to the room work set-point. When the room temperature is above/below the room set-point of the delta value for a continuous time defined by the parameter, then the hot/cold booster activation will be allowed.
The dependence of integration or booster by one or both zones must be set by assigning functioning from specific maintenance technical parameter
Setting is separate for hot and cold booster in a way to be flexible to second the temperature regulation set in the different zones.

In order to check the temperature of the battery housed in the dehumidifier before allowing activation of the booster, it is possible to activate the presence of a control probe on the MCDE module (defined as “limit temperature”) and a temperature above/below which to allow the activation of ventilation.
Moreover, it is possible to decide whether, following activation of the hot/cold booster output, to force the dehumidifier output or not in ON mode.

Important parameters:
MCZN: Installer Menu → Rem. Dehumidifyer → Enable control
MCZN: Maintenance Menu → Zone A(B) Maintenance → Regulation enabling → T.Integration
MCZN: Maintenance Menu → Zone A(B) Maintenance → Temp. Integration → Winter Delta
MCZN: Maintenance Menu → Zone A(B) Maintenance → Temp. Integration → Winter Delay
MCZN: Maintenance Menu → Zone A(B) Maintenance → Temp. Integration → Summer Delta
MCZN: Maintenance Menu → Zone A(B) Maintenance → Temp. Integration → Summer Delay

MCDE: Installer Menu → Dehumidifier → Dehum. type
MCDE: Installer Menu → Dehumidifier → Boost1 T.in en.
MCDE: Installer Menu → Dehumidifier → Boost2 T.in en.
MCDE: Maintenance Menu → General parameters → Regulations → Booster H
MCDE: Maintenance Menu → General parameters → Regulations → Booster C

MCDE: Maintenance Menu → Booster parameters → Mode
MCDE: Maintenance Menu → Booster parameters → Booster H
MCDE: Maintenance Menu → Booster parameters → Booster C
MCDE: Maintenance menu → Booster parameters → Set deh1 in.
MCDE: Maintenance menu → Booster parameters → Set deh2 in.
MCDE: Maintenance Menu → Booster parameters → Dehum. activ.

9.2 Regulation of the delivery temperature (MCZN, MCCT modules)

9.2.1 Management of the delivery circulation pumps (MCCT module)

The thermal power plant can control up to 2 delivery lines, each with relative circulation pump.
As seen in paragraph 9.1.2, each controlled area must be associated to the delivery line by which it is served.
Via the relevant parameter, the circulation pumps can be managed as follows:

- CONTINUOUS: the delivery circulation pump will remain constantly activated with system ON and in absence of blocking alarms.
- TEMPERATURE REQUEST: the delivery circulation pump will be activated on request by at least one of the zone heating/cooling manifolds associated to the delivery line itself.

The activation/deactivation of the circulation pumps will follow the delay times on switch-on/off established via the relevant parameters.

As well as the request by the zone heating/cooling manifolds, the delivery circulation pumps will be activated for the following special cycles:

- low temperature protection of the delivery line
- system anti-freeze protection
- anti-grip cycle

The correct functioning of the circulation pumps is controlled via a digital input that can be configured as pump protection input (block) or delivery flow switch (consult the relative explanatory paragraph).

Important parameters:
MCCT: Installer menu → General parameters → Delivery lines
MCCT: Installer menu → Delivery lines → Line 1(2) configuration → Pump DIn alr
MCCT: Maintenance menu → Delivery lines → Pump mode
MCCT: Maintenance Menu → Delivery lines → Pump management → Alarm Delay
MCCT: Maintenance Menu → Delivery lines → Pump management → ON Delay
MCCT: Maintenance Menu → Delivery lines → Pump management → OFF Delay

9.2.2 Management of the utilities set-up for heating delivery water: boiler (and heat pump (MCCT module)

During winter regulation, once the water has been put into circulation in the system, whenever the delivery work set-point is not satisfied, the c-pro CLIMA system will send a request to the thermal power plant controller for the activation of the utilities set-up for heating of the delivery water.
The MCCT thermal power plant regulator can control two different utilities to heat delivery water. heat pump and a boiler.
Depending on the type of system, the two heating utilities can be present separately or at the same time and will be managed in the following way:

- Management of the boiler: whenever the delivery temperature is below the Winter delivery work set-point of the hysteresis value, then a boiler activation request will be sent.
  Correct boiler functioning is controlled via a boiler block digital input which, whenever activated, will block the utility immediately.
- Management of the heat pump: whenever the delivery temperature is below the Winter delivery work set-point of the hysteresis value, then a heat pump activation request will be sent.
  Correct heat pump functioning is controlled via a chiller-heat pump digital input alarm which, whenever activated, will block the utility immediately.
- Management of the boiler and the heat pump: whenever the delivery temperature is below the Winter delivery work set-point of the hysteresis value, then a heat pump activation request will be sent.
  The heat pump will always have activation priority with respect to the boiler, which will only be activated in the following cases, at the same time as the deactivation of the heat pump.
  1) Activation of the digital input for chiller-heat pump alarm:
  2) External temperature below the value established with the relevant parameter (therefore for low performance of the heat pump due to the low external temperature)
  3) On reaching the number of continuous activation hours of the heat pump
     Correct boiler functioning is always controlled via a boiler block digital input which, whenever activated, will block the utility immediately.

In case N°3, the intervention of the digital input boiler block will cause the automatic reactivation of the heat pump utility.

Important parameters:
MCCT: Installer menu → General parameters → Enable boiler
MCCT: Installer menu → General parameters → CH-HP type
MCCT: Installer menu → General parameters → HP-Boiler switch → Switch temperature
MCCT: Installer menu → General parameters → HP-Boiler switch → Hysteresis
MCCT: Maintenance Menu → Delivery lines → Pump management → CH-HP delay

9.2.3 Management of the utility set-up for cooling delivery water: the chiller (MCCT module)

During summer regulation, once water has been made to circulate in the system, whenever the delivery temperature is above the Summer delivery work set-point of the hysteresis value, then a chiller activation request will be sent.
Correct chiller functioning is controlled via a chiller-heat pump digital input alarm which, whenever activated, will block the utility immediately.

Important parameters:
MCCT: Installer menu → General parameters → CH-HP type
MCCT: Maintenance Menu → Delivery lines → Pump management → CH-HP delay

9.2.4 Delivery work set-point (MCCT module)

The summer/winter delivery work set-point is established in manual mode in the installation phase of the system by authorised staff and differs according to the type of system is installed, i.e. due to High Temperature line (H.T. at radiators) or Low Temperature line (L.T. at floor).
The delivery work set-point corresponds with the effective regulation set-point only when the mixing valve is not present in delivery.

Important parameters:
MCCT: Maintenance Menu → Delivery lines → Temp. Regulation → Setpoint S LT
MCCT: Maintenance Menu → Delivery lines → Temp. Regulation → Setpoint W LT
MCCT: Maintenance Menu → Delivery lines → Temp. Regulation → Setpoint S HT
MCCT: Maintenance Menu → Delivery lines → Temp. Regulation → Setpoint W HT

9.2.5 Output of the delivery mixing valve (MCCT module)

The thermal power plant controller can regulate a mixing valve for every delivery line, via two 0-10V proportional analogue outputs.
If the mixing valve check is enabled, the regulation set-point of the delivery line will be given by the regulation set-point calculated for the valve
The mixing valve control can be enabled individually for each delivery line.
Normally the mixing valve is used for low temperature delivery lines in high-low temperature systems.

It is possible to set the functioning mode of the mixing valve for the distinct summer and winter functioning mode among the following possibilities:

- Valve forced closed: the valve remains always closed during the entire functioning independently from the system functioning conditions.
- Valve forced open: the valve remains open at the percentage set until the regulation is active, with regulation off the valve is closed.
- Valve in modulation: the opening of the mixing valve is controlled on the measurement of the delivery water temperature with respect to the regulation set-point.
  In the installation phase it is necessary to set a proportional regulation band and, if necessary, an integration constant for a PI control, on the basis of system features.

Important parameters:
MCCT: Installer Menu → I/O configuration →Analog out. 1(2)
MCCT: Installer Menu → Delivery lines → Line 1(2)configuration → M.Valve 1(2) enable
MCCT: Maintenance Menu →Delivery lines 1(2) → Mixing valve S → Mode
MCCT: Maintenance Menu →Delivery lines 1(2) → Mixing valve W → Mode
MCCT: Maintenance Menu →Delivery lines 1(2) → M. valve regulation → Prop. band
MCCT: Maintenance Menu →Delivery lines 1(2) → M. valve regulation → Integr. time
MCCT: Maintenance Menu →Delivery lines 1(2) → M. valve regulation → Fix opening

9.2.6 Mixing valve delivery work set-point (MCCT module)

The summer/winter delivery mixing valve work set-point only has effect if the mixing valve is present and if the modulation valve regulation is enabled.
If the mixing valve check is enabled, the regulation set-point of the delivery line will be given by the regulation set-point calculated for the valve.

The regulation set-point can be the fixed type or linked to the linear calculation on the external air temperature measurement.
If the external air temperature probe is present and functioning, the regulation set-point is calculated according to a climatic curve.
If the external air temperature probe is not present or broken, the regulation set-point is fixed. It is established via a relevant maintenance level parameter.

The climatic curve for calculation of the set-point envisions the setting of two pairs of External-Set-point temperature values.
This two pairs determine a linearisation line of the two set-point values. All intermediate values relative to the external temperature conditions included between the minimum and maximum values set are calculated between the two set-point values.

The two climatic curves and set-points differ due to Summer and Winter functioning modes, separating the functioning of the valve in the two seasons.

Important parameters:
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve S → Min.Ext.T.
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve S → Max.Ext.T.
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve S → Setpoint 1
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve S → Setpoint 2
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve S → Fix setpoint
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve W → Min.Ext.T.
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve W → Max.Ext.T.
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve W → Setpoint 1
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve W → Setpoint 2
MCCT: Maintenance Menu → Delivery lines 1(2) → Mixing valve W → Fix setpoint

9.2.7 Dew point control (MCCT, MCZN modules)

During the SUMMER functioning mode, the work set-point of the mixing valve (or delivery valve) will be continuously monitored and if necessary modified in order to check the dew point of each individual active Zone.

The dew point is the temperature at which a mass of air must be cooled at constant pressure, so that it becomes saturated (i.e. when the percentage of water vapour reaches 100%) and can therefore start to condense if further heat is lost.
This would lead to the formation of dew in the cooled floor, thus compromising the integrity of the controlled room.
Every active Zone, equipped with room temperature and humidity sensor, calculates the temperature of its own dew point and sends this data to the thermal power plant.

Given the different zones associated to the specific delivery line the thermal power plant regulator will consider the highest dew point value sent by the individual zones as the dew point of the entire delivery line.
To consider the construction features of the system, the dew point will be raised by a predefined offset that can be set by parameter.
The regulation set-point of the mixing valve (or delivery line) will be limited to the minimum value given by the “delivery dew point + offset” calculated whenever necessary.

Important parameters:
MCCT: Maintenance Menu → Delivery lines 1(2) → Temp. Regulation → Dew offset

9.2.8 Control of the high and low delivery temperature (MCCT module)

Whenever the temperature of the delivery water exceeds or drops below the minimum and maximum temperature values accepted for the system of the hysteresis value, then the c-pro mega MCCT thermal power plant will start special management cycles for these emergencies:

- High temperature protection: the high temperature protection intervention will force the immediate closure of the mixing valve in order to prevent overtemperatures in the controlled system, until the temperature returns to the maximum values accepted for the system.
- Low temperature protection: After a fixed delay of 60 seconds, the intervention of the low temperature protection will cause the activation of the delivery circulation pump in order to ease heating of the water in the system. The pump will remain on until the minimum temperature conditions are recovered.

Important parameters:
MCCT: Maintenance menu → Delivery lines 1(2) → Temperature limits → HT setpoint
MCCT: Maintenance menu → Delivery lines 1(2) → Temperature limits → HT hyst.
MCCT: Maintenance menu → Delivery lines 1(2) → Temperature limits → LT setpoint
MCCT: Maintenance menu → Delivery lines 1(2) → Temperature limits → LT hyst.

9.2.9 Delivery anti-freeze protection (MCDE module)

During the winter functioning mode when the system is not running (i.e. in OFF state or with time bands enabled but in a day when the system is off), however an delivery anti-freeze protection control remains active
If the external temperature goes below the predefined anti-freeze threshold, the system will function with special circulation pumps activation in order prevent breakage in the system caused by frozen pipes.

- External temperature lower than 4.0°C: delivery pumps always active;
- External temperature between 5.0 and 1.5 °C: delivery pumps active 10 minutes every 6 hours;
- External temperature over 1.5°C: delivery pumps off

When the external temperature is between -4.0 and -5.0°C the delivery pumps behaviour depends on the previous situation.

9.3 Regulation of the zone humidity (MCZN, MCCT, MCDE modules)

9.3.1 Regulation principle

Whenever the function is enabled and a room humidity transducer is present in zone, during SUMMER functioning mode when the relative humidity detected by the room humidity transducer is over the active zone humidity set-point value plus the value of the differential, the MCZN regulator will activate the corresponding manifold/zone dehumidification valve.

Whenever dehumidification makes use of the delivery water for its action (established via the relative parameter), the activation of the manifold/zone dehumidification valve generates the same sequence of activations/controls triggered with zone heating/cooling.
For its functioning, consult the zone temperature regulation part.

9.3.2 Management of the dehumidification manifold/valve (MCZN module)

The manifold/zone dehumidification valve is activated when the value of the room relative humidity is over the active room humidity set-point + hysteresis value (differential).

Important parameters:
MCZN: Installer menu → Zones → Zone A(B)setup → Sensor type
MCZN: Installer menu → Zones → Zone A(B)setup → H. probe pos.
MCZN: Installer menu → Zones → Zone A(B)setup → Dehum. with H2O
MCZN: Installer menu → Zones → Zone A(B)setup → Zone probe signal → Probe type
MCZN: Installer menu → Zones → Zone A(B)setup → Zone probe signal) → Min H. value
MCZN: Installer menu → Zones → Zone A(B)setup → Zone probe signal) → Max H. value
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Regulation enabling → Humidity
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Humid. regulation →Hysteresis

9.3.3 Zone humidity work set-point (MCZN module)

The zone humidity work set-point is decided in manual mode via the relative maintenance technical parameters present in the c-pro micro MCZN zone regulator or automatically, set by the final user via programmed weekly time bands.
To set the automatic humidity work set-points (Economy and Comfort set-points), consult the c-pro CLIMA system user manual.

Important parameters:
MCZN: Maintenance Menu →Zone A(B) Maintenance→ Humid. regulation →COMFORT
MCZN: Maintenance Menu →Zone A(B) Maintenance→ H. Regulation →ECONOMY

9.3.4 Management and configuration of the c-pro micro MCDE module for additional dehumidifiers (MCZN, MCDE modules)

As well as direct control of the manifold/zone dehumidification valve, the c-pro CLIMA system has the possibility of managing various types of additional dehumidifiers via CANbus, equipped with utilities (fans/batteries) dedicated to increasing heating/cooling capacities of the controlled system.
To use these types of additional dehumidifiers, the c-pro micro MCDE module must be used.
As previously described, the additional dehumidifiers can be associated to a zone regulator and can serve just one of the controlled areas (Zone A or Zone B) or both, depending on the type and size of the controlled rooms.

Depending on the type of dehumidifier used in the system, via the relevant parameter, the c-pro micro MCDE module assumes a different functioning type, varying the type of utility managed by the digital outputs, as follows:

Digital outputs configuration

Dehumidif. type 0:	DO1 = zone A dehumidifier	DO4 = not used
	DO2 = not used	DO5 = zone A dehumidif. alarm
	DO3 = zone B dehumidifier	DO6 = zone B dehumidif. alarm
Dehumidif. type 1:	DO1 = dehumidifier	DO4 = fresh air damper
	DO2 = heating booster	DO5 = dehumidifier alarm
	DO3 = cooling booster	DO6 = not used
Dehumidif. type 2:	DO1 = zone A dehumidifier	DO4 = heat./cool. booster zone B
	DO2 = heat./cool. booster zone A	DO5 = zone A dehumidif. alarm
	DO3 = zone B dehumidifier	DO6 = zone B dehumidif. alarm

Important parameters:
MCZN: Installer Menu → Dehumidifier → Rem. dehumidifier →Enab. control
MCZN: Installer Menu → Dehumidifier → Rem. dehumidifier →CANBUS address

MCDE: Installer menu → General parameters → MCZN assigned
MCDE: Installer menu → General parameters → CANBUS address
MCDE: Installer Menu → Dehumidifyer → Dehum. type
MCDE: Maintenance Menu → General parameters → Regulations → Dehumidifyer
MCDE: Maintenance Menu → General parameters → Regulations → Dehum. delay

9.3.5 Management of the dehumidifiers on/off digital inputs

The zone c-pro micro MCZN has two dehumidifiers on/off digital inputs (one for every zone)
Whenever the digital input finds the logic level "disabled", the corresponding additional dehumidifier will be considered in OFF stare and all of the relative regulations will be disabled.
In order to make this control active the inputs must be enabled via the relevant maintenance technician parameters.

Important parameters:
MCDE: Installer Menu → I/O configuration →DIn
MCDE: Maintenance Menu → General parameters→ ONOFF(1)d.In.en
MCDE: Maintenance Menu → General parameters→ ONOFF(2)d.In.en

9.4 Regulation of air quality (recirculation) (MCDE module)

9.4.1 Regulation principle

Whenever at least one regulator for c-pro micro MCDE additional dehumidifiers is present in the system and whenever the function is enabled, when the level of CO2 detected by the room CO2 transducer is over the CO2 set-point value plus the differential value, the MCDE regulator will control opening of the room air recirculation damper.

It is possible to control an air circulation damper for every MCDE regulator present in the system.
Every regulation is independent and strictly linked to the reading of the CO2 transducer connected to the MCDE regulator same.

9.4.2 Management the air circulation damper (MCDE module)

The zone air recirculation damper can be managed in three different ways, depending on the value set via the relative *Damper mode* parameter available at the maintenance technician level:

- Open: the damper is kept open independently from the active CO2 regulation.
  Total renewal.
- Closed: the damper is kept closed independently from the active CO2 regulation.
  Total recirculation.
- Modulating: the damper is opened/closed according to the specific requirements of fresh air given by the measurements of CO2 in the room.

Important parameters:
MCDE: Installer Menu → I/O configuration →AIn3
MCDE: Installer Menu → CO2 → CO2 control en.
MCDE: Installer Menu → CO2 → Min. limit
MCDE: Installer Menu → CO2 → Max. Limit
MCDE: Maintenance Menu → CO2 → Enable reg.
MCDE: Maintenance Menu → CO2 → Damper mode
MCDE: Maintenance Menu → CO2 → Setpoint
MCDE: Maintenance Menu → CO2 → Hysteresis

9.5 Regulation of the DHW tank temperature for the DHW water (MCPS module)

9.5.1 Regulation principle

Whenever the c-pro micro MCPS module is present and enabled in the system, the system will automatically consider the presence of a DHW storage tank in the system for the DHW.
With the presence of the DHW tank, the temperature regulation principle of the entire system will change significantly in the following way:

- WINTER REGULATION Via its utilities proposed for heating, the c-pro CLIMA system, always keeps the DHW tank at the pre-fixed temperature.
  The delivery hot water for any heating requests of the Zones is withdrawn directly from the DHW tank.

- SUMMER REGULATION: Via its utilities proposed for heating EXCEPT the heat pump, the c-pro CLIMA system, always keeps the DHW tank at the pre-fixed temperature.
  The cool delivery water for any cooling requests from the Zones will be supplied by the chiller unit, obviously without the use of the DHW tank.

9.5.2 Management of the DHW circuit circulation pump (MCPS module)

The MCPS solar panels controller can manage a DHW tank with relative circulation pump.
The circulation pump is activated on temperature request of the DHW tank, whenever the heat pump or boiler utilities are used to heat the DHW. When the use of the solar panel circuit/s for heating is sufficient, the DHW circulation pump will not be used.

The activation of the DHW circulation pump will follow the delay times on switch-on established via the relevant parameter.

As well as the request by the DHW tank, the DHW circulation pump can be activated during a special anti-grip or antilegionella cycle.

The correct functioning of the circulation pumps is controlled via a digital input that can be configured as pump protection input (thermal switch) or delivery flow switch (consult the relative explanatory paragraph).

Important parameters:
MCCT: Installer menu → General parameters → Enable MCPS

MCPS: Installer Menu → General parameters → Pump alarms cfg → DHW pump
MCPS: Maintenance Menu → DHW Management → Delay

9.5.3 DHW tank work set-point (MCPS module)

The DHW tank work set-point is established in manual mode from the relevant *Set-point* menu present in the main menu of the c-pro micro MCPS regulator.
Depending on the dimensions of the system, the DHW tank can have just one temperature probe (DHW tank probe) or two different temperature probes (DHW tank upper and lower probe).
If the DHW tank works with two probes, temperature regulation will be satisfied when both the lower water temperature and the upper water temperature have reached the work set-point value set.

The regulation differential of the DHW tank is fixed and corresponds to -1°C.

Important parameters:
MCPS: Main Menu → Setpoint → Boiler
MCPS: Installer Menu → General parameters→ Upper probe en.
MCPS: Installer Menu → General parameters→ Lower probe en.
MCPS: Maintenance Menu → General parameters → Probes Offset → Upper DHW tank
MCPS: Maintenance Menu → General parameters → Probes Offset → Lower DHW tank

9.5.4 Management of the AUX1 auxiliary circuit circulation pump (MCPS module)

The MCPS solar panels controller can manage an AUX1 hot water auxiliary circuit with relative circulation pump.
Via the relevant parameter, the circulation pump can be managed as follows:

- CONTINUOUS: the auxiliary circuit circulation pump will remain constantly activated with system ON and in absence of blocking alarms.
- TEMPERATURE REQUEST: with heating request by the AUX1 circuit (depending from work set-point and differential), when the temperature of the DHW tank or of the solar panels circuit (depending on the value of *Control probe* parameter) is over a value set by the (*Offset ON*) parameter at the temperature of the AUX1 circuit, then the AUX1 water circulation pump will be switched on, in a way to contribute with the heating of the AUX1 circuit.
  Whenever the difference between DHW tank (or solar panels circuit) temperature and AUX1 becomes lower than a value set by (*Offset OFF*) parameter, the AUX1 circulation pump will be switched off.

For the temperature regulation to be effective, it is necessary for the work set-point of the auxiliary circuit to be lower than the DHW tank work set-point.

As well as the request by the AUX 1 circuit, the solar panels circuit circulation pump will be activated for the following special cycles:

- auxiliary circuit low temperature protection
- anti-grip cycle

The correct functioning of the circulation pump is controlled via a digital input that can be configured as pump protection input (thermal switch) or delivery flow switch (consult the relative explanatory paragraph).

N.B.
The AUX1 auxiliary circuit can be managed only in systems with individual heating solar panels circuits. If this is not the case, all other enablings and settings made will have no effect.

Important parameters:
MCPS: Installer menu → General parameters → Aux1 Circuit
MCPS: Installer Menu → General parameters → pumps alarm CFG → AUX1 pump
MCPS: Maintenance Menu → Aux1 Management → Setpoint
MCPS: Maintenance Menu → Aux1 Management → Hysteresis
MCPS: Maintenance Menu → Aux1 Management → Probe offset
MCPS: Maintenance Menu → Aux1 Management → Mode

9.5.5 Control of the high and low temperature of the auxiliary circuit AUX1 (MCPS module)

Whenever the temperature of the AUX1 auxiliary circuit water exceeds or drops below the minimum and maximum temperature values accepted for the system of the hysteresis value, then the c-pro micro MCPS solar panels regulator will start special management cycles for these emergencies:

- High temperature protection: the high temperature protection intervention will trigger a simple signal to the maintenance staff.
- Low temperature protection: the low temperature protection will trigger the activation of the circulation pump of the auxiliary circuit in order to ease heating of the circuit water. The pump will remain on until the minimum temperature conditions are recovered.

Important parameters:
MCPS: Maintenance Menu → Aux1 Management → HT setpoint
MCPS: Maintenance Menu → Aux1 Management → HT hyst.
MCPS: Maintenance Menu → Aux1 Management → LT setpoint
MCPS: Maintenance Menu → Aux1 Management → LT hyst.

9.5.6 Management and setting of the periodic antilegionella cycle for the DHW tank (MCPS module)

In order to disinfect the DHW tank from the proliferation of legionella bacteria due to the deposit of DHW, the c-pro CLIMA system envisions the periodic management of anti-legionella cycles.
Depending on the type of system, it is possible to select daily, weekly or monthly antilegionella cycles.
An anti-legionella cycle consists in taking, the temperature of the DHW tank to a temperature such to destroy bacteria (standard to 70°C, but which can be set from parameter) for a long enough period of time (standard at 60 minutes, but can be set from parameter) by activation of the boiler and the DHW circulation pump.
These periodic cycles will help with respect to the Standards in force on the subject.

Important parameters:
MCPS: Maintenance Menu → General parameters→ Antilegionella → Enable
MCPS: Maintenance Menu → General parameters→ Antilegionella → Mode
MCPS: Maintenance Menu → General parameters→ Antilegionella → Start hour
MCPS: Maintenance Menu → General parameters→ Antilegionella → Day week
MCPS: Maintenance Menu → General parameters→ Antilegionella → Day month
MCPS: Maintenance Menu → General parameters→ Antilegionella → Setpoint
MCPS: Maintenance Menu → General parameters→ Antilegionella → Duration

9.6 Management and configuration of the heating solar panel circuits (MCPS module)

Whenever the c-pro micro MCPS module for solar panels is present and enabled in the system, one or two heating solar panel circuits management can be enabled, with the function of heating the DHW in the DHW tank.

The heating solar panels circuits will be added to the other utilities set-up for heating the DHW tank, with PRIMARY importance with respect to the other utilities, with the following functioning principle:

- with heating request by the DHW tank, when the temperature of the solar panels circuit is over a value set by the (*Offset ON*) (ON Offset) parameter at the temperature of the DHW tank, then the solar panels circuit will start its own water circulation pump, in a way to contribute with the heating of the DHW tank.
  Whenever the contribution of the solar panels circuits is sufficient to reach the DHW set-point, at this point the solar panels circuit circulation pump will be switched off.
  Whenever the difference between solar panels and DHW tank temperature becomes lower than a value set by (OFF Offset) parameter, the solar panels circulation pump will be switched off and the other utilities set-up for heating will be activated (heat pump or boiler, with the rules and times described in the previous points), in order to reach the work set-point set for the DHW tank.

The two measurement inputs set-up to read the temperatures of the two circuits are the 4-20mA type. Therefore it is necessary to be equipped with a temperature transducer with 4-20mA output or a converter able to convert the value read by the temperature probe into a 4-20mA signal.
For this purpose, EVCO suggests the use of the EVCONV01 accessory, i.e. a Pt100 / 4-20mA converter able to convert the signal coming from the Pt100 3 probe wires at input into a 4-20mA signal compatible with the c-pro micro MCPS measurement inputs.

The presence of the second circuit of solar hating panels automatically disables the presence of the AUX1 auxiliary circuit and of the management of the anti-stagnation emergency in *Tenda2* (Cover2) mode.

Important parameters:
MCPS: Installer menu → General parameters → Solar panels
MCPS: Installer Menu → Solar panels → Probes offset → Panel 1
MCPS: Installer Menu → Solar panels → Probes offset → Panel 2
MCPS: Installer Menu → Solar panels → P.1 sensor → Min.
MCPS: Installer Menu → Solar panels → P.1 sensor → Max.
MCPS: Installer Menu → Solar panels → P.2 sensor → Min.
MCPS: Installer Menu → Solar panels → P.2 sensor → Max.
MCPS: Maintenance Menu → Panels Maintenance→ ON hyst.
MCPS: Maintenance Menu → Panels Maintenance→ OFF hyst.

9.6.1 Management of the solar panels circuits circulation (MCPS module)

The controller for the MCPS solar panels can manage up to 2 thermal solar panel circuits, each with relative circulation pump.
The circulation pump is activated on temperature request of the DHW tank, whenever the conditions described in previous paragraph 9.5.4. are satisfied.

As well as the request by the DHW tank, the solar panels circuits circulation pumps will be activated for the following special cycles:

- periodic activation cycle for uniformity of temperatures
- solar panels circuits low temperature protection
- anti-stagnation emergency
- anti-grip cycle

The correct functioning of the circulation pumps is controlled via a digital input that can be configured as pump protection input (thermal switch) or delivery flow switch (consult the relative explanatory paragraph).

Important parameters:
MCPS: Installer Menu → I/O Configuration →DIn
MCPS: Installer Menu → General parameters → Pumps alarm setup → Solar pump 1
MCPS: Installer Menu → General parameters → Pumps alarm setup → Solar pump 2
MCPS: Maintenance Menu → Panels Maintenance → Periodic cycle → Interval
MCPS: Maintenance Menu → Panels Maintenance → Periodic cycle → Duration

9.6.2 Control of the high and low temperature of the solar panel circuits (MCPS module)

Whenever the temperature of one of the solar panels circuits exceeds or drops below the minimum and maximum temperature values accepted for the system of the hysteresis value, then the c-pro micro MCPS solar panels regulator will start special management cycles for these emergencies:

- High temperature protection: after a fixed delay of 60 seconds, the high temperature protection intervention will start an anti-stagnation emergency cycle (described in the following paragraph), in order to dispose of the overheated water and to take the temperature of the water back within the system safety conditions.
- Low temperature protection: after a fixed delay of 60 seconds, the intervention of the low temperature protection will cause the activation of the solar panels circuit circulation pump in order to ease heating of the water in the circuit. The pump will remain on until the minimum temperature conditions are recovered.

Important parameters:
MCPS: Maintenance menu → Panels Maint. → Temperature limits → HT setpoint
MCPS: Maintenance menu → Panels Maint. → Temperature limits → HT hyst.
MCPS: Maintenance menu → Panels Maint. → Temperature limits → LT setpoint
MCPS: Maintenance menu → Panels Maint. → Temperature limits → LT hyst.

9.6.3 Management and setting the stagnation emergency for solar panels circuits (MCPS module)

Whenever the temperature of the water in one of the solar panels circuits exceeds the maximum temperature value accepted for the system of the hysteresis value, then the regulator for c-pro micro MCPS solar panels will start a special stagnation emergency cycle.
The emergency condition must remain at least for a fixed time of 60 seconds and will be managed in the following way, according to the value set for the *Stagnation emergency* parameter:

- *ON/OFF:* the stagnation emergency will be managed via the activation of a solenoid vent valve, which will dispose of the hot water.
  The heat disposal relay will remain enabled until the temperature of the solar panels circuit has gone back below the maximum temperature value accepted of the hysteresis value (differential).
  As well as the heat disposal relay, the circulation pump of the corresponding solar panels circuit is activated at the same.
- *Cover1:* the stagnation emergency will be managed by the opening of a motorised cover (servomotor with spring return) which will cover the surface of the solar panels from solar exposure.
  The cover opening relay will remain enabled until the temperature of the solar panels circuit has gone back below the maximum temperature value accepted of the hysteresis value (differential).
  As well as the cover opening relay, the circulation pump of the corresponding solar panels circuit is activated at the same.
- *Cover2:* the stagnation emergency will be managed by the opening/closing of a motorised cover (servomotor with separate opening and closing controls) which will cover the surface of the solar panels from solar exposure.
  The cover opening relay will remain enabled until the temperature of the solar panels circuit temperature has returned below the maximum temperature value accepted of the hysteresis value (differential). If this is not the case, the cover closing relay will remain active for all periods in which the cover must be closed.
  As well as management of the cover opening/closing relays, the circulation pump of the solar panels circuit is activated at the same.

N.B.
Setting the parameter at the *Cover2* value will not have any effect if the system has been configured to manage the second solar panels circuit or if the Aux1 auxiliary circuit is present.

Important parameters:
MCPS: Maintenance Menu → Panels Maintenance → Stag. emergency

9.7 Other regulations

9.7.1 Management and setting of the periodic anti-grip cycle (MCCT, MCPS modules)

The function has the purpose of preventing the blocking of the pumps and valves present in the c-pro CLIMA system during system standstill due to any deposits present in the system or due to the formation of crystalline aggregates (lime scale or other) on the mechanical seals of the pumps and valves.
The function automatically activates all pumps and valves in sequence once a week, which have been at a standstill for at least a week.
The day and time of weekly activation can be set by the user via the relevant Maintenance technician parameters.
The sequence scans the various utilities in the system every minute (pumps and valves): the cycle leads to the activation of the element considered for 30 seconds.

The enabling and setting of the periodic anti-grip cycle is set separately on the thermal power plant c-pro mega MCCT controller and on the c-pro micro MCPS module for solar panels, respectively for the following utilities:

MCCT regulator anti-grip :	delivery 1 circulation pump	if enabled from parameter
	delivery 1 mixing valve	if enabled from parameter
	delivery 2 circulation pump	if enabled from parameter
	delivery 2 mixing valve	if enabled from parameter

MCPS regulator anti-grip :	DHW circuit circulation pump	always enabled
	AUX1 circuit circulation pump	always enabled
	solar panels 1 circuit circulation pump	always enabled
	solar panels 2 circuit circulation pump	always enabled

Important parameters:
MCCT: Maintenance Menu → General parameters→ Loads antigrip → Day
MCCT: Maintenance Menu → General parameters→ Loads antigrip → Time
MCCT: Maintenance Menu → Maintenance L1(2) → Pump management → Antigrip enab.
MCCT: Maintenance Menu → Maintenance L1(2) → M-Valve regulation → Antigrip enab.
MCCT: Maintenance Menu → Maintenance L1(2) → M-Valve regulation → Antigrip open.

MCPS: Maintenance Menu → General parameters→ Antigrip→ Execution day
MCPS: Maintenance Menu → General parameters→ Antigrip→ Execution hours

9.7.2 Management of the circulation pumps protection digital input (MCCT, MCPS modules)

Every circulation pump present in the c-pro CLIMA system has a protection digital input.
Every protection digital input linked to a circulation pump can be associated to one of the following functionalities, depending on the value selected via the relevant parameters.

- THERMAL SWITCH: every activation of the digital input will cause the immediate deactivation of the relative circulation pump.
  Once the digital input is deactivated, the circulation pump will start to work according to its own regulation (automatic rearm).

- FLOW: every activation of the digital input, after a delay time or from the activation of the pump (start) or from the activation of the input itself (normal conditions), will cause the deactivation of the relative circulation pump.
  Once the digital input is deactivated, the circulation pump will start to work according to its own regulation (automatic rearm) unless the maximum number of flow switch alarms is not reached for automatic rearm, however the deactivation of the alarm will be possible only with manual procedure (manual rearm).

The regulation parameters relative to the delivery 1 and 2 circulation pumps are present in the MCCT thermal power plant controller while the parameters relative to the circulation pumps of the auxiliary DHW circuit, solar panels 1 and 2 are present in the MCPS controller for solar panels.

Important parameters:
MCCT: Installer Menu → I/O Configuration →Digital In
MCCT: Installer Menu→ Delivery lines 1(2) → Pump DI n alr
MCCT: Maintenance Menu → General parameters→ Pumps flow switches→ Start
MCCT: Maintenance Menu → General parameters→ Pumps flow switches→ Run
MCCT: Maintenance Menu → General parameters→ Pumps flow switches→ Nr alarms/hour

MCPS: Installer Menu → I/O Configuration →D In
MCPS: Installer Menu → General parameters → Pumps alarm setup → Solar pump 1
MCPS: Installer Menu → General parameters → Pumps alarm setup → Solar pump 2
MCPS: Installer Menu → General parameters → Pumps alarm setup → DHW pump
MCPS: Installer Menu → General parameters → Pumps alarm setup → AUX1 pump
MCPS: Maintenance Menu → Flow switches → Alr ON delay
MCPS: Maintenance Menu → Flow switches → Alr RUN delay
MCPS: Maintenance Menu → Flow switches → Auto reset n°

9.7.3 Manual functioning mode (MCCT, MCZN, MCDE, MCPS modules)

The c-pro CLIMA system allows to set manual functioning for the various uses.
In this state the devices are not governed by the automatic functions, but are however sensitive to any alarms.
The manual activation of the devices replaces the regulation for the determined device, therefore from now on gives origin to all automatic controllers for the activation of the system.
For example, if the zone valve is controlled manually, it will be interpreted by the system as thermostatic activation causing the activation of the relative delivery circulation pump, the mixing valve and the boiler/chiller etc.
The manual functioning of the devices is useful for the execution of functional tests on system start-up or in case or probe breakage or other.

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