AERMEC
air conditioning

English

UNIQUE MANUAL

Control system for the management of several chillers

multi chiller

CE

AERMEC
COMPANY QUALITY SYSTEM
ICIM
ISO 9001:2000 - Cert. n° 0128/5
CISQ IQNet
AERMEC S.P.A.

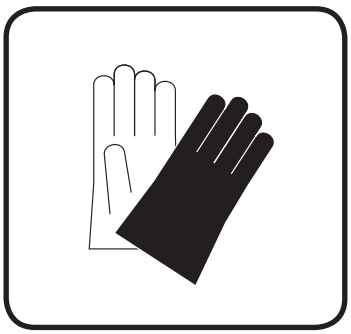
0609 - 5148051_01

Precautions and safety regulations

DO NOT let the packaging get wet

DO NOT tread on the packaging

Handle with care



Disposal information

Warning: this product contains electric and electronic equipment that cannot be scrapped via the normal waste collection channels. There are special differentiated collection points for these products.

The electric and electronic equipment must be handled separately, and in accordance with the legislation in force in that specific country.
Batteries or accumulators in the equipment must be scrapped separately, in accordance with the regulations in that specific municipality.

Note sulla manualistica

Keep the manuals in a dry place - to maintain their good condition - for at least 10 years, for any future reference needs.

Read all the information in this manual carefully and completely. Pay special attention to the user regulations marked by the words "DANGER" or "WARNING", as these points could cause damage to the machine and/or persons and property if not observed. For any irregularities not foreseen by this manual, promptly contact your local After Sales Service.
The equipment must be installed in such a way as to facilitate any maintenance and/or repair operations.

The manufacturer cannot accept any responsibility for any damage resulting from the improper use of the machine, or from the partial or superficial reading of the information contained in this manual.

Safety symbols

Danger - voltage

Warning

Danger - moving parts

EC declaration of conformity notes

The accessory described in this manual may only be used in combination with the machine for which it has been designed. The EC declaration of conformity of the equipment to which it will be integrated is valid when this condition is satisfied. Refer to the manual provided with the unit in order to check the list of compatible accessories.

Index

Introduction

The scope of this project is to a realise a control system (which hereon will be called Multichiller) for the switching on and off of chillers in a plant where several chillers are installed parallel to each other with constant water flow on the individual evaporators.

It is possible to chose between different chiller switch on/off logics:

Sequential: the chillers are switched on/off one at a time (possible if each chiller has its own pump that is switched on/off with it)

Homogeneous: the chillers are switched on/off at the same time (recommended if all of the chillers have the same pump)

Combined: the chillers are switched on and taken to a certain power that is lower than maximum before switching on others. (possible if each chiller has its own pump that is switched on/off with it)

The Multichiller regulates using its own temperature probes. Once a chiller has been switched on it uses its own temperature probes to regulate in an independent manner from the others until it is switched-off by the Multichiller itself.

IThe maximum number of units that can be connected to a Multichiller is Max 9 RVBH (each of which up to 4 compressors) or Max 9 NRA (NRC, NLW, NBW)

Chiller unit means the following families of models :
- NRA
- NRC
- NLW
- NBW
- RVBH
- NSB
- WSB
- NRL

Multichiller exclusive functions

In particular, the additional functions performed by the Multichiller that are not available for the management of individual chillers, are the following:

1) Regulation of water temperature in a unique point.
- Connection of plant water input and output probe to the Multichiller
- Adjustment on the plant primary or secondary (depending on the type of plant)
- Pulldown (delays between the activation of one compressor and another)
- Introduction and disconnection of the chillers (not of the individual compressors) on the basis of the load
- Introduction in tandem, in parallel or mixed

2) Centralised setting of the main functioning parameters:
- ON/OFF
- Hot/Cold functioning
- Work set point:
- From analogue input, from keyboard
- Proportional band
- Timer
- Demand Limit:
- From analogue input
- Set point compensation:
- external air probe (optional for set point compensation)
- from analogue input

3) Centralisation of information regarding the state of the machine in a unique display

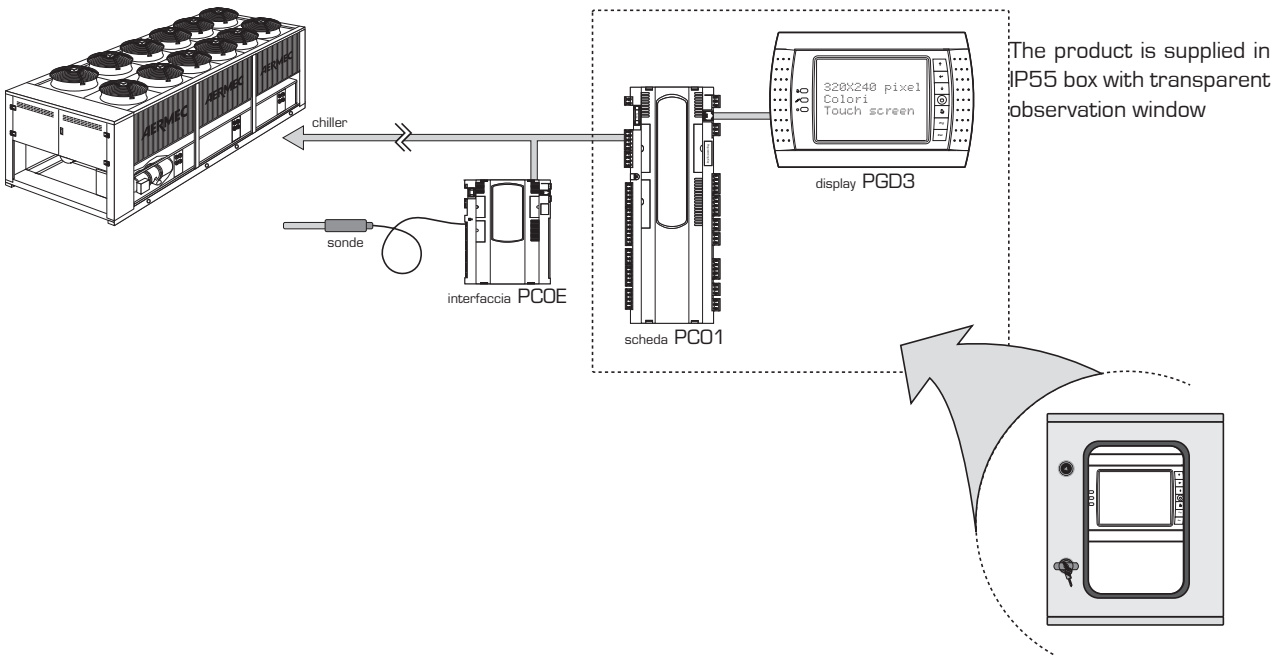
ON/OFF
- Set point
- Detailed chiller alarms
- Chiller temperature and pressures
- Choking level of individual chillers

4) Management of chiller rotation with possibility of maintaining the machine as per emergency
- Rotation for balancing compressor work hours
- Rotation for alarms
- Chiller switch-on sequence selection can be set

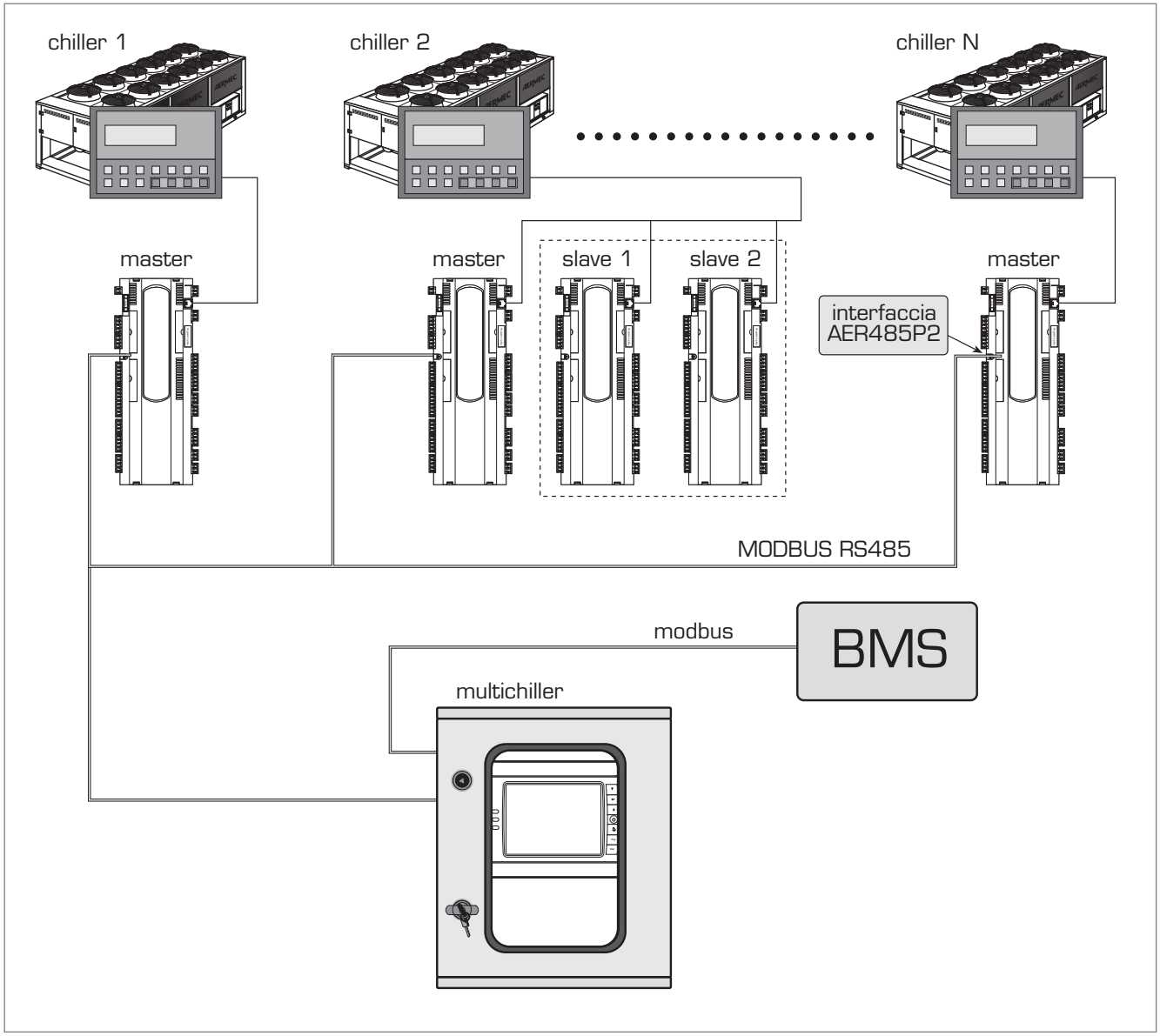
5) Possibility of keeping a chiller as a reserve in case of breakdown

Multichiller architecture

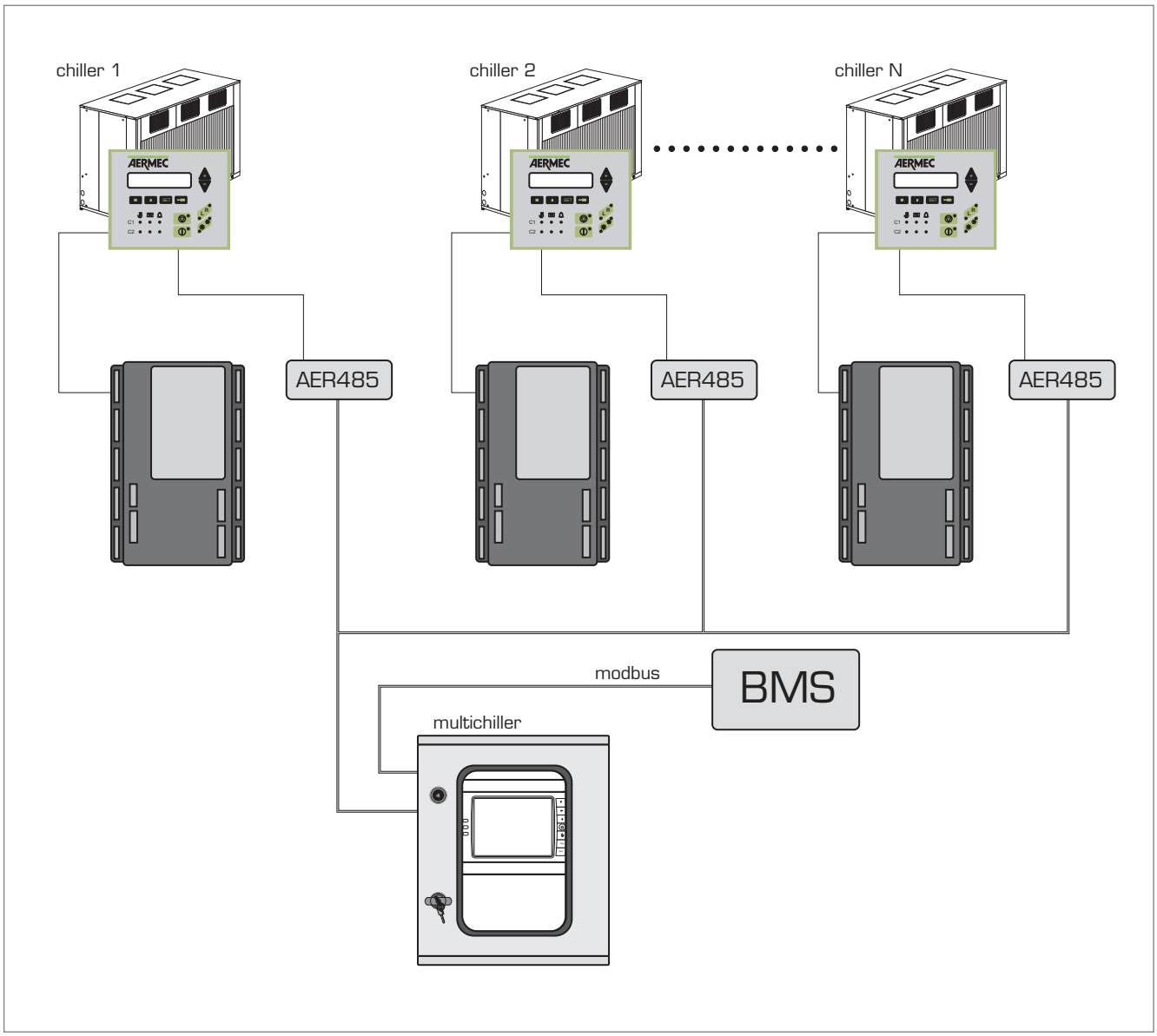
• It is a PCO1 controller and PGD3 touch screen display:



Multichiller/PCO2 interface hardware



Multichiller/GR03 interface hardware



PCO1 card Inputs/Outputs

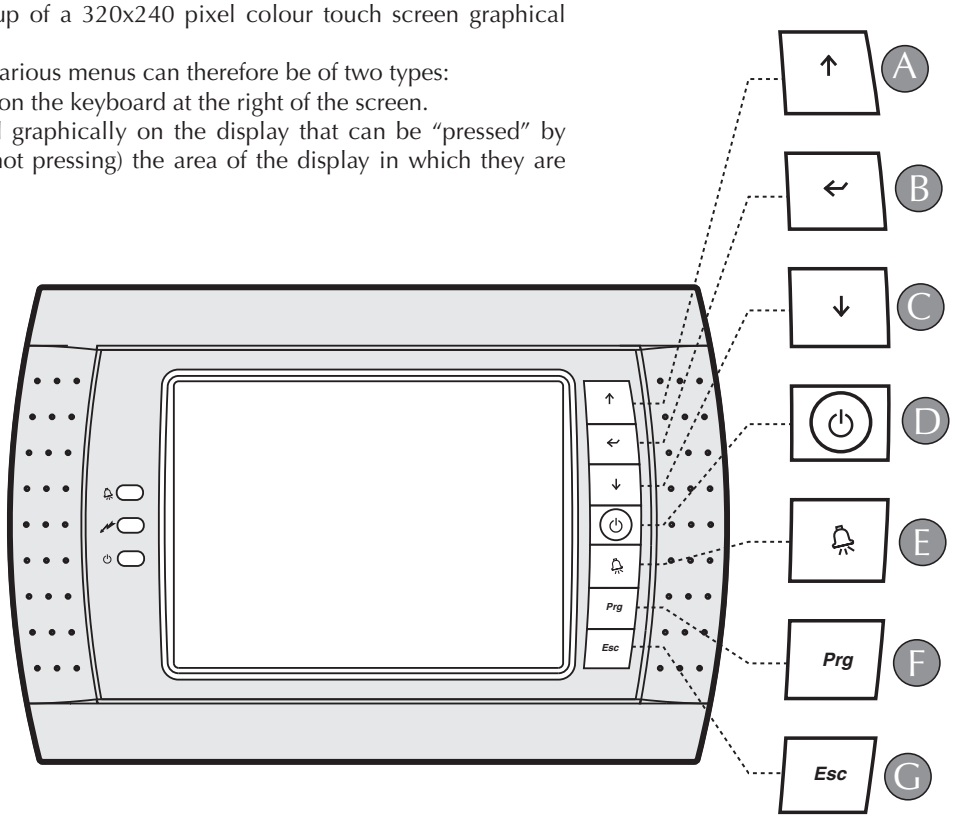
ANALOGUE INPUTS	FUNCTION	TYPE OF INPUT
B1	Multifunction input	0 - 20 mA
B2	Multifunction input	0 - 5 Vcc
B3	Multifunction input	NTC 10k Temperature probe
B4	SIW	NTC 10k Temperature probe
B5	SUW	NTC 10k Temperature probe
B6	SUW2	NTC 10k Temperature probe
N.B: SUW3 cannot be managed without PCOE		
DIGITAL INPUTS	**FUNCTION**	
ID1	Not used	
ID2	Not used	
IDI3	Enabling of double set point (2° Set) Contact closed = double set enabled	
ID4	Enabling of multifunction inputs (Mult) Contact closed = multifunction enabled	
ID5	Flow meter 1 (FL1)	
ID6	Flow meter 2 (FL2)	
ID7	Flow meter 3 (FL3)	
ID8	Not used	
DIGITAL OUTPUTS	**FUNCTION**	
ID1	Summary of chiller and Multichiller global alarms	
ANALOGUE OUTPUTS	**FUNCTION**	
Not used		

PCOE card Inputs/Outputs

ANALOGUE INPUTS	FUNCTION	TIPO INGRESSO
B1	SIW	NTC 10k Temperature probe
B2	SUW	NTC 10k Temperature probe
B3	SUW2	NTC 10k Temperature probe
B4	SUW3	NTC 10k Temperature probe
DIGITAL INPUTS	**FUNCTION**	
Not used		
DIGITAL OUTPUTSI	**FUNCTION**	
Not used		
ANALOUE OUTPUTS	**FUNCTION**	
Not used		

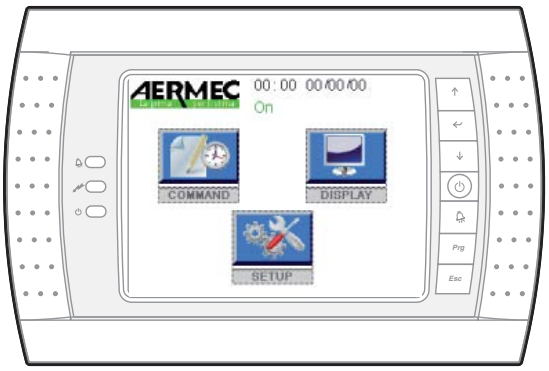
User interface

The user interface is made up of a 320x240 pixel colour touch screen graphical display.
The keys used to access the various menus can therefore be of two types:
Physical, the traditional keys on the keyboard at the right of the screen.
Virtual, the keys represented graphically on the display that can be "pressed" by simply touching them (and not pressing) the area of the display in which they are represented.



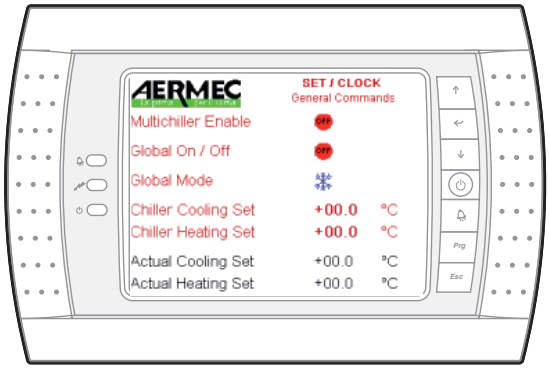
KEY	FUNCTION
A - C	These keys are used to scroll a menu mask. From the last access the first and vice versa. If the cursor is inside a numerical field the keys increase or decrease the value on which the cursor is positioned. If it is a selection field, by pressing the UP/DOWN keys the options available are visualised (e.g. Yes / No)
B	In the value setting masks, by pressing the key once, the cursor moves onto the first introduction field. When pressed successively, the value set is confirmed and the cursor moved to the following field. The cursor is hidden from the last field
D	No function
E	When pressed once it allows visualisation of the alarms that have intervened and switches off the alarm buzzer. When in alarm visualisation, pressing a second time determines alarm/s reset. If there are no alarms go to the NO ALARM ACTIVE mask. The sequence of the alarms is given by pressing the UP/DOWN keys.
F	No function
G	Go back to main menu from any menu

Main menu

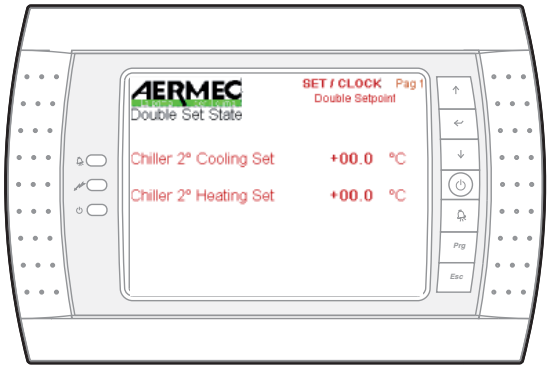


Note:
Virtual COMMAND key: Access to the user menu from where it is possible to perform all control actions on the plant (chiller set points, programming clock reset alarms, on/off of the individual units etc.)
Virtual DISPLAY key: Access to the plant synoptic page in which the main information regarding the functioning state of the plant are supplied briefly and clearly as graphics..
Virtual SETUP key: Goes to the installation menu where the parameters for the definition of the plant and the type of check to be carried out are set.
A virtual key appears in the plant synoptic window (identified by a small chiller) for every chiller present in the plant. Access the chiller menu by pressing the corresponding icon. This displays the data relative to the individual chiller in detail.
General state: On = plant on Off by timer = plant off due to time period Off by keyboard = plant switched-off by Multichiller disable = the management of the multichiller on the plant is disabled and all chillers are in ON, the multichiller only functions as a data supervisor.

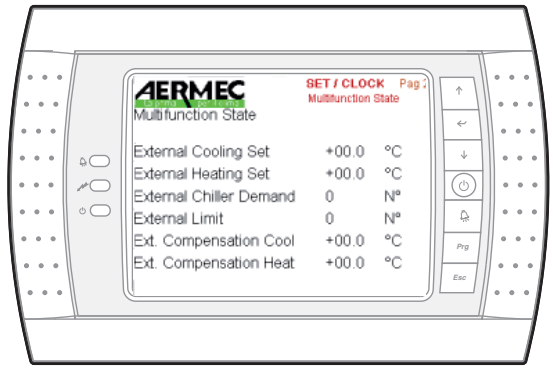
USER Menu



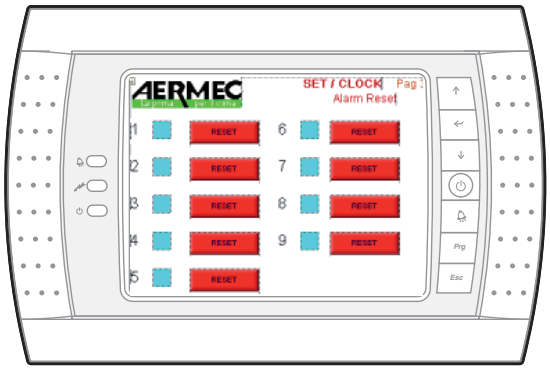
Note:
Multichiller Enable: enables chiller introduction/disconnection. If OFF, all chillers are requested always switched-on, independently from the temperatures detected. Time period controls, global on/off and switching-off of the individual chillers remain always active. The Multichiller with this parameter in OFF only functions as plant supervisor
Global On/Off: centralised switch on/off control of all chillers.
Chiller Cooling Set: cold functioning mode set point that is set for all chillers
Chiller Heating Set: heat pump functioning mode set point that is set for all chillers
Actual Cooling Set: cold functioning mode set point used currently by the chillers (can be different to Chiller Cooling Set as the double set point or multifunction input could be used to determine the work set point)
Actual Heating Set: heat pump functioning mode set point used currently by the chillers (can be different to Chiller Heating Set as the double set point or multifunction input could be used to determine the work set point)



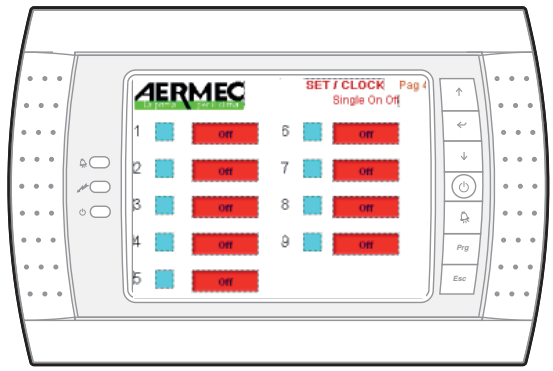
Note:
Chiller 2° Cooling Set: second cold functioning mode set point that can be used as an alternative to the first if the function is enabled
Chiller 2° Heating Set: second heat pump functioning mode set point that can be used as an alternative to the first if the function is enabled



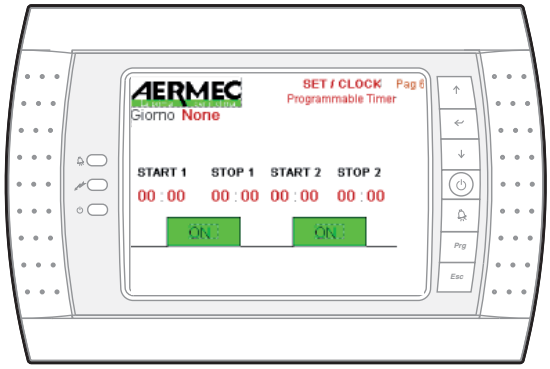
Note:
External Cooling Set : visualisation of the cold set point obtained from analogue input if function enabled
External Heating Set: visualisation of the hot set point obtained from the analogue input if function is enabled
External Chiller Demand: visualisation of the 0-100% power requested by analogue input if function is enabled
External Limit: visualisation of the power limit from analogue input if function is enabled
External Compensation Cool: visualisation of cold set point compensation obtained from analogue input if function is enabled
External Compensation Heat: visualisation of hot set point compensation obtained from analogue input if function is enabled



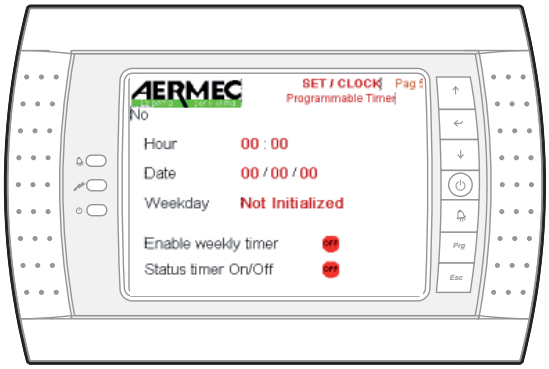
Note:
This window allows access to alarms reset of the individual chilers. A chiller icon appears for every chiller present in the plant at the side of the touch screen reset button. By pressing the reset button the request to reset alarms is started for the relative chiller, which requires a few seconds



Note:
This window allows access to the On/Off control of the individual chillers. A chiller icon appears for every chiller unit present in the plant at the side of the touch screen On/Off button. By pressing the reset button, the unit switches on or off. The programme considers eventual unavailability of the chiller positioned in Off in the chiller rotation

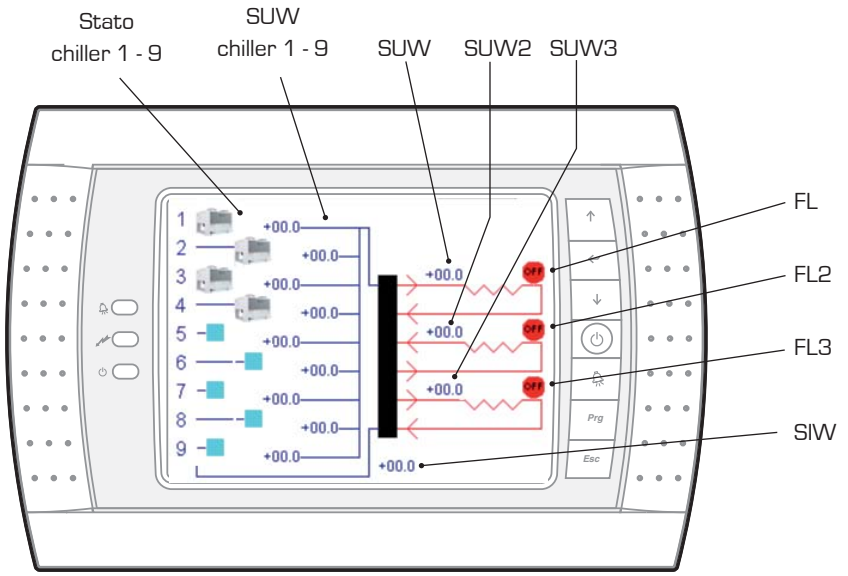


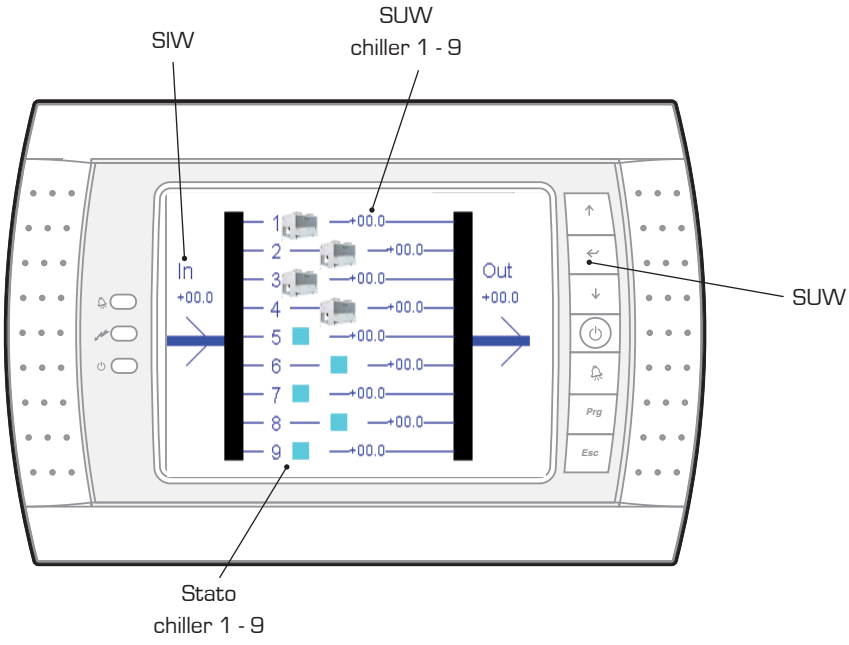
Note:
Day: selects the day of the week for which the time period is to be set.
Start1 : plant switch-on time for the first period
Stop 1: plant switch-off time for the first period
Start 2 : plant switch-on time for the second period
Stop 2 : plant switch-off time for the second period



Note:
Weekly time programming: In this window it is possible to set time, date and day of the week.
Enable weekly timer: enabling of the plant's weekly programming
Status timer On/Off: indicates if the plant is switched on or off by the weekly time programming. When programming is disabled the status is always On.

DISPLAY Menu





Note:

This window clearly displays the state of the plant. Two different synoptics are available to represent the plant's operating principle in a more appropriate manner, which can be selected from the Setup menu, page 4. Enable display circuit 1/2

Note:

IThe primary circuit is represented in this synoptic in blue and the secondary in red, separated by a hydraulic disconnecting device in black

SIW: return water temperature to the primary. It is read by the Multichiller

SUW, SUW2, SUW3: delivery temperatures to the secondary circuit. Up to 3 branches of the secondary circuit can be managed for secondaries with variable chiller. They are read by the Multichiller.

FL, FL2 FL3: used to enable reading of the respective probes for delivery to the secondary, if the flow meter contact is open it is not taken into consideration when adjusting the temperature of the respective probe. They are read by the Multichiller.

SUW chiller 1-9: the temperature of the water exiting the chiller is stated at the side of the icon of every chiller present and is read via serial. In the case of machines from the following series NRA, NRC, NLW and NBW it is the only chiller water evaporator exit probe; in the case of RV, NSB, NW, WSB machines it is the Master card evaporator exit probe B5.

Chiller state 1-9: an icon is visualised that is also a touch screen key for each chiller from 1 to 9 with the following meaning:


Chiller not present

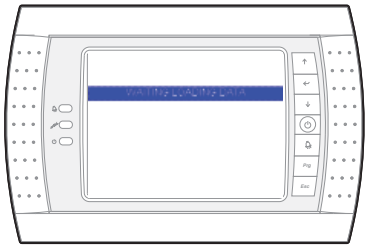

Flashing = chiller ON
Fixed = chiller standby


Chiller with circuit in alarm


Chiller with all circuits in alarm

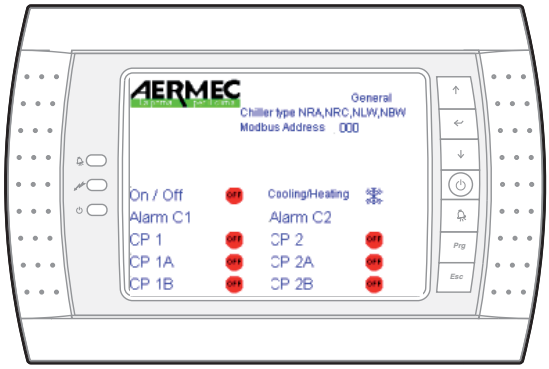

Chiller with which it is not possible to communicate

Note:

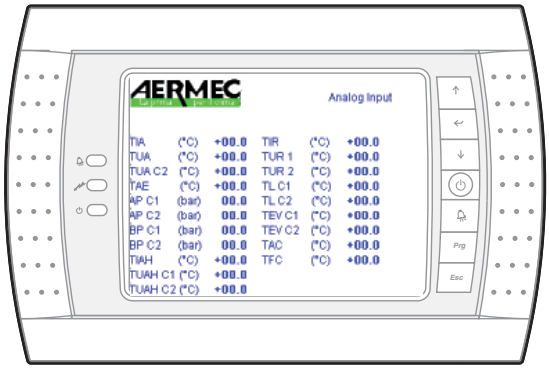


By pressing the icon key of each chiller, access the visualisation menu of the details of the relative chiller. This page appears for a few seconds during loading of the data if the chiller is present. If the chiller is not present (the icon of a blue square is pressed) this page remains indefinitively.

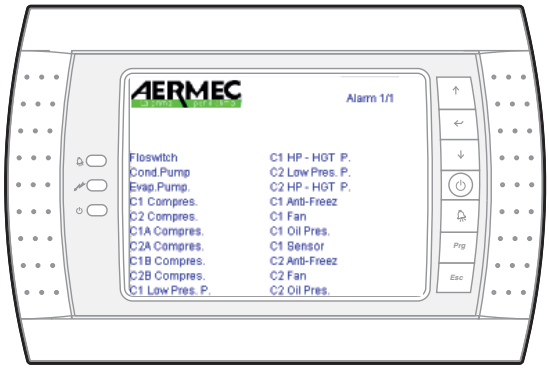
Type of machine NRA, NRC, NLW, NBW



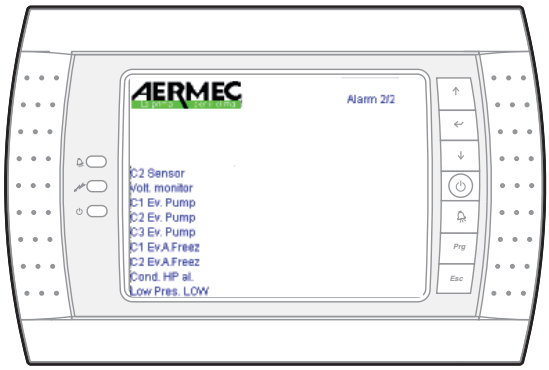
Note:
Chiller model
Serial address
On/Off state of the chiller and functioning mode
Circuits 1 and 2 alarm summary, the flashing symbol LED indicates an alarm is present
Compressor state



Note:
Temperature and pressure inputs, the abbreviations correspond to those on the display

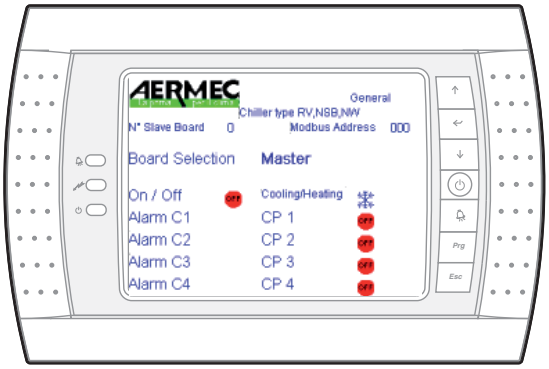


Note:
Alarms present (the symbol flashing LED indicates alarm presence) page 1

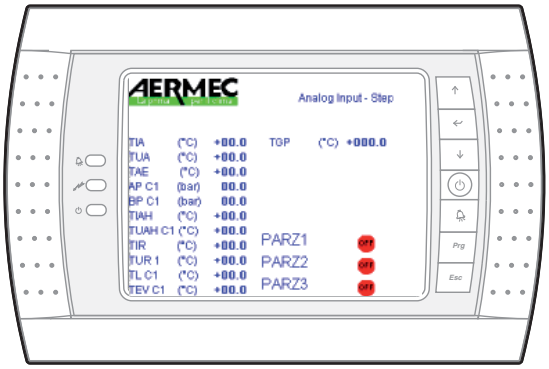


Note:
Alarms present (the symbol flashing LED indicates alarm presence) page 2

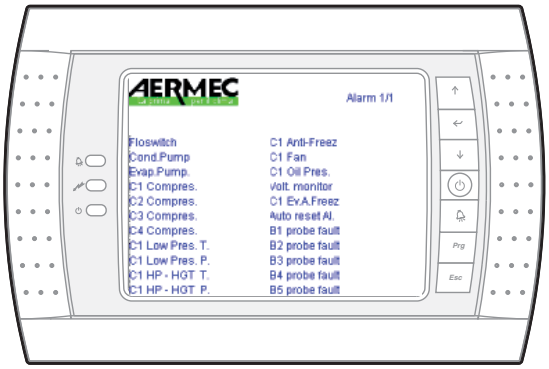
Type of machine RV, RVB, NW, NSB, WSB



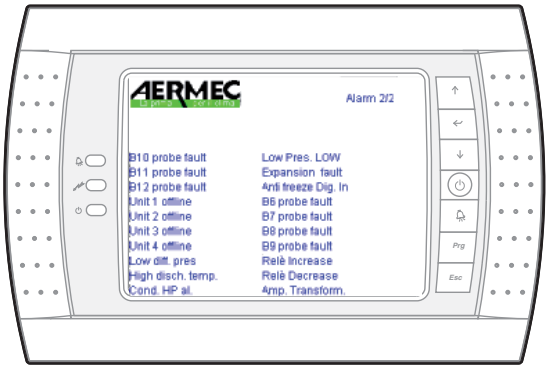
Note:
Chiller model
Serial address
Card selection : Master, Slave 1,2,3 if present
On/Off state of the chiller and functioning mode
Circuits 1 and 2 alarm summary, the symbol flashing LED indicates an alarm is present
Compressor state



Note:
Temperature and pressure inputs, the abbreviations correspond to those on the display

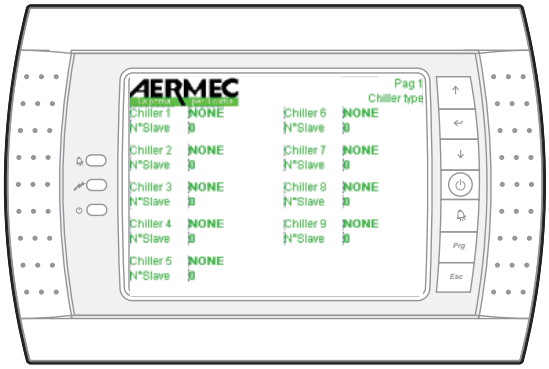


Note:
Alarms present (the symbol flashing LED indicates alarm presence) page 1



Note:
Alarms present (the symbol flashing LED indicates alarm presence) page 2

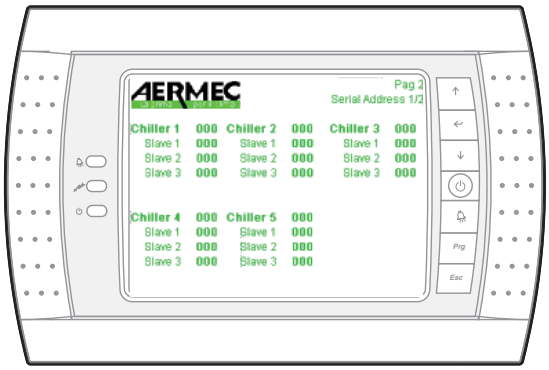
SETUP Menu

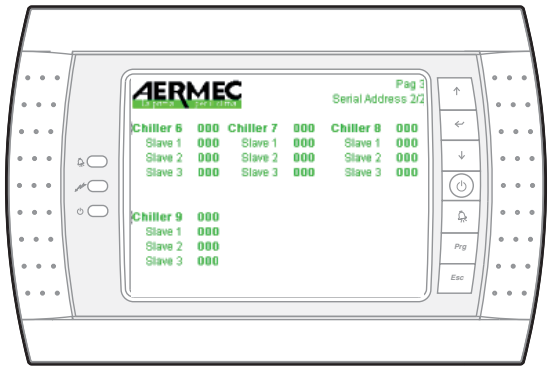


Note:

Chiller 1-9 selection of the presence and type of chiller up to a maximum of 9
NONE : no chiller
NRA: for NRA, NRC, NLW, NBW chillers, all those with GR3 circuit board
RV: for RV, NW, RVB, NSB, WSB chillers, all those with pCO2 circuit board

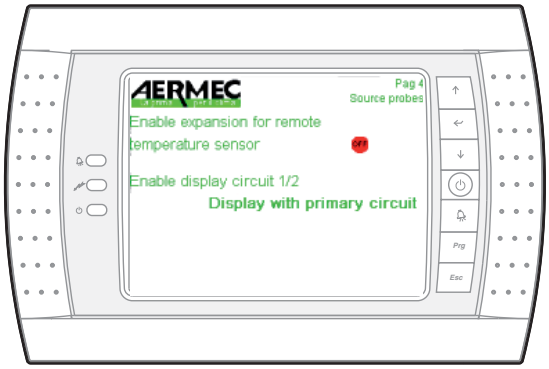
N° Slave: for RV-type chillers, it is possible to connect up to 4 compressors (1 Master + 3 Slave) therefore up to 4 pCO2 cards. If the slaves are also equipped with AER485P2 interface, it is possible to connect them to the network and visualise the data relative to them. In this case, the consequent parameter is set. However, connection of the slaves is not indispensable for correct functioning of the Multichiller.





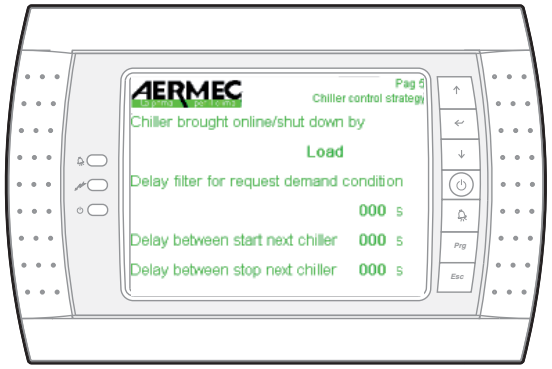
Note:

Setting of plant chiller serial addresses. The addresses that have been assigned to the chiller are set. For RV, RVB, NW, NSB, WSB series machines, it is also possible to set the addresses of the cards relative to the compressor slaves if they have AER485P2 interface. The valid addresses are from 1 to 255, the order or the adjacency have no influence.
N.B. The address 1 is reserved for the pCOE expansion card, if present, otherwise it can be used for a chiller.

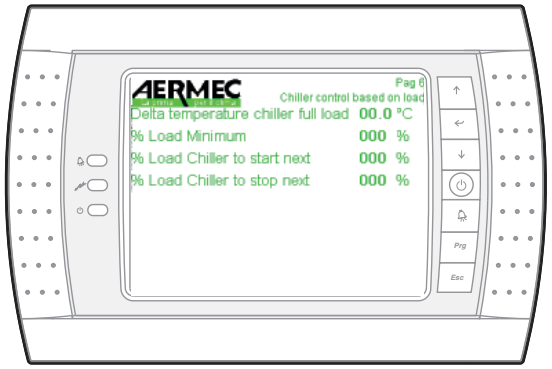


Note:

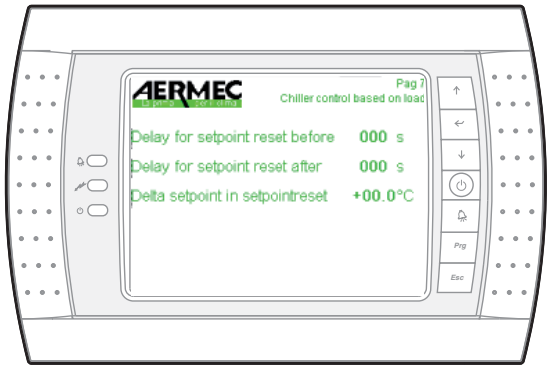
On = pCOE expansion enabled, SIW and SUW probes connected to the pCOE
Selection of the synoptic to be visualised in the Display Menu, with just primary circuit or primary and secondary circuits.



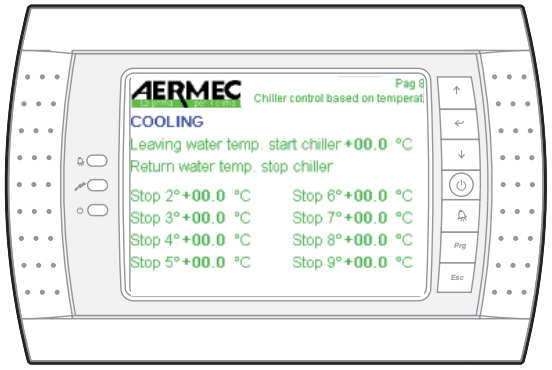
Note:
Adjustment selection for Load or Temperature)
Filter on the holding of the increase or decrease condition of the number of chillers.
Minimum delay between switch-on of two chillers
Minimum delay between switch-off of two chillers



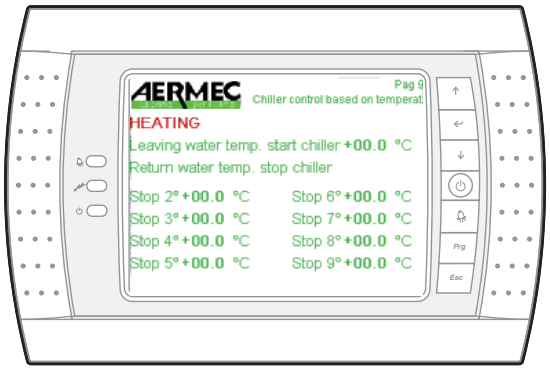
Note:
Check on the basis of the load:
Delta T of a chiller at full power
Minimum choke of a chiller
Choke of chillers switched-on, beyond which the next is introduced.
Choke within which the chillers must remain switched on after one has been disconnected.



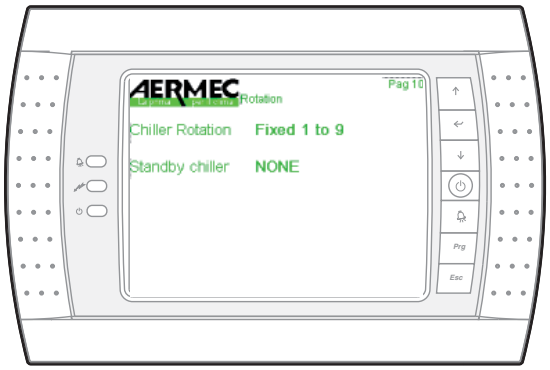
Note:
Check on the basis of the load:
Advance of the reset set point reset before switch-off of a chiller
Permanence of the reset set point after switch-off of a chiller
Value of the reset set point (to add to the set point)



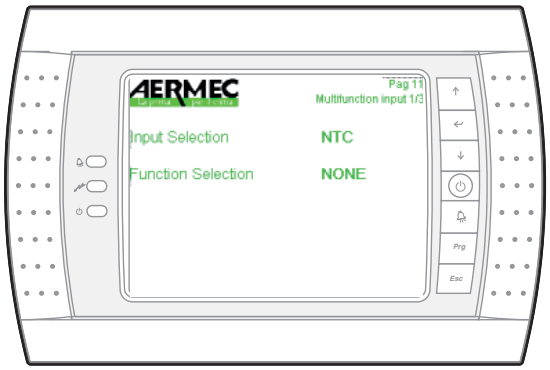
Note:
Check on the basis of the temperature: Settings for the functioning mode when cold
Temperature of the SUW probe/s (delivery) above which the introduction of a chiller is requested
Temperature of the SIW probe (return), below which the disconnection of a chiller is requested. This temperature is different depending on the number of chillers switched-on



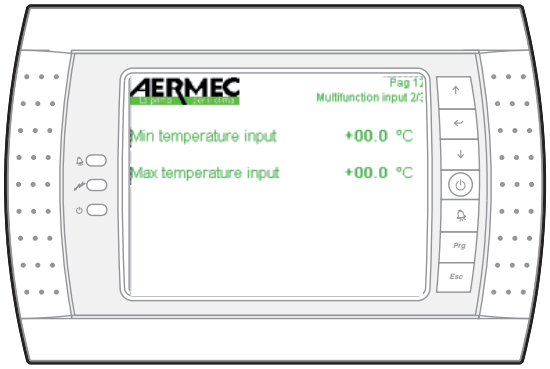
Note:
Check on the basis of the temperature: Settings for the functioning mode when hot
Temperature of the SUW probe/s (delivery), below which the introduction of a chiller is requested
Temperature of the SIW probe (return) above which the disconnection of a chiller is requested. This temperature is different depending on the number of chillers switched-on



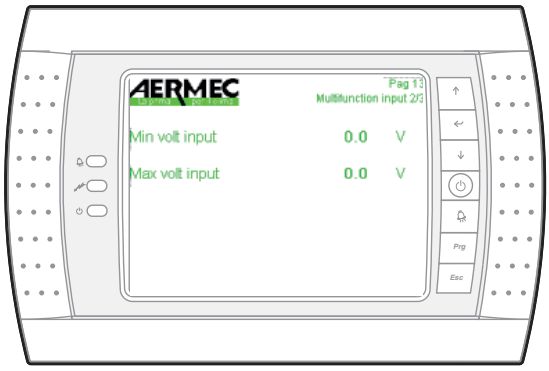
Note:
Rotation of fixed chillers from 1 to 9 or on the basis of working hours of the compressors
Selection of a reserve chiller from 1 to 9. It will only be introduced if one of the chillers goes into alarm



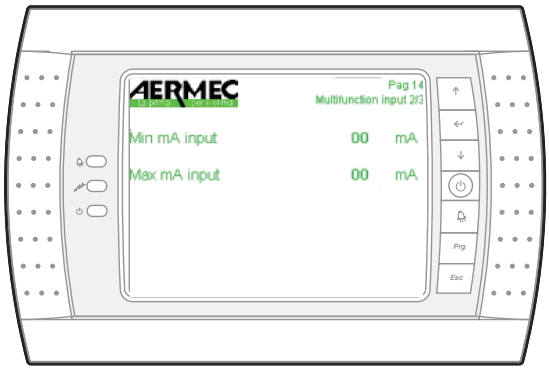
Note:
Type of analogue input malfunction: NTC, 0-20mA, 0-5V (NTC is a 10kohm temperature probe) Use of the analogue input: NONE Set point = set hot or cold Comp. Set point = hot or cold set point compensation Limit = setting a max number of chillers Demand = request number of chillers switched-on



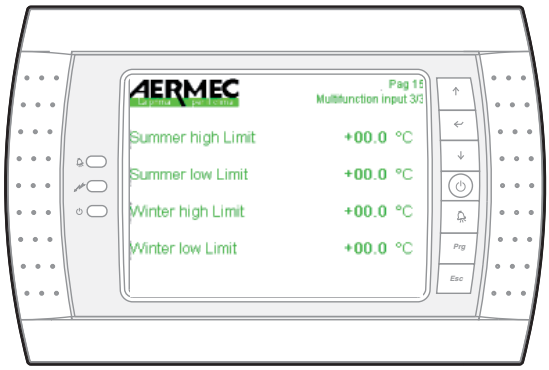
Note:
Type of analogue input malfunction: NTC
Minimum temperature
Maximum temperature



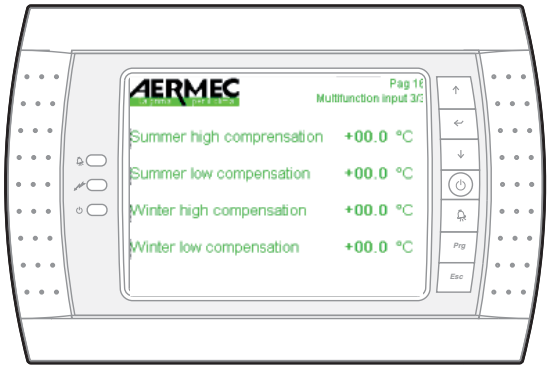
Note:
Type of analogue input malfunction: 0-5V
Minimum voltage
Maximum temperature



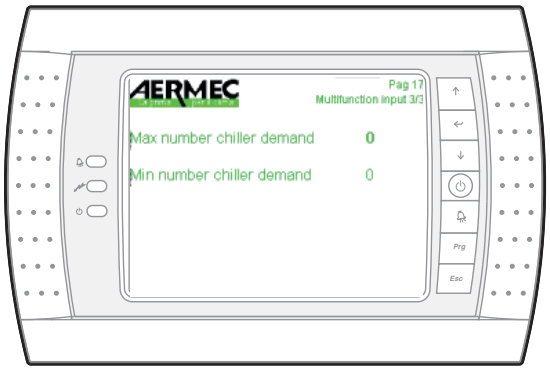
Note:
Type of analogue input malfunction: 0-20mA
Minimum current
Maximum current



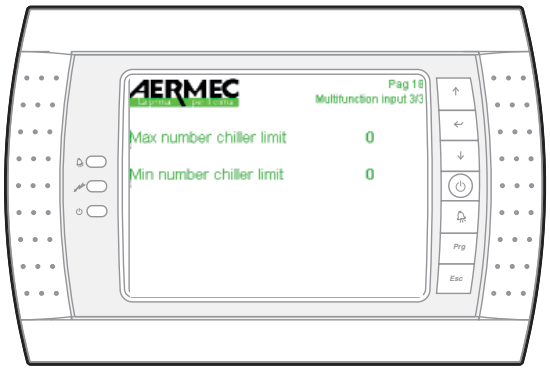
Note:
Use of the multifunction input as Set point
Cold set point when the input is at maximum
Cold set point when the input is at minimum
Hot set point when the input is at maximum
Hot set point when the input is at minimum



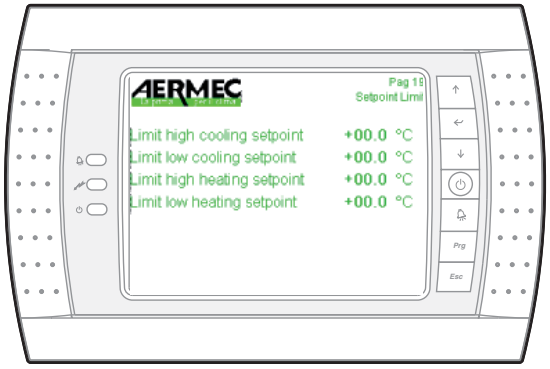
Note:
Use of the multifunction input as Set point
Cold set point when the input is at maximum
Cold set point when the input is at minimum
Hot set point when the input is at maximum
Hot set point when the input is at minimum



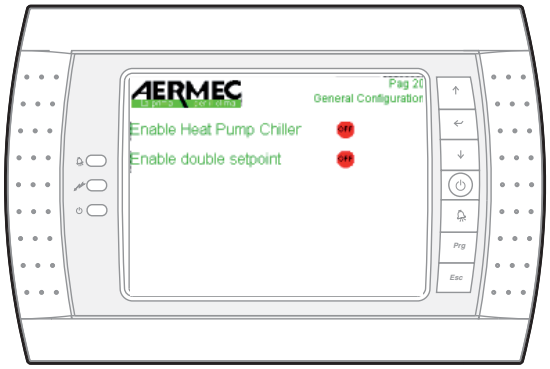
Note:
Use of the multifunction input as Demand
Request N° chiller with input at maximum
Request N° chiller with input at minimum (fixed at 0)



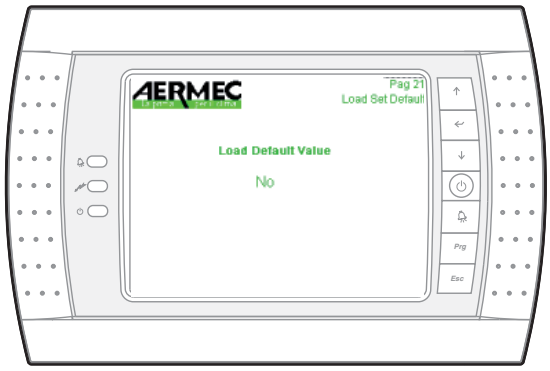
Note:
Use of the multifunction input as Limit
N° chiller limit with input at maximum
N° chiller limit with input at minimum



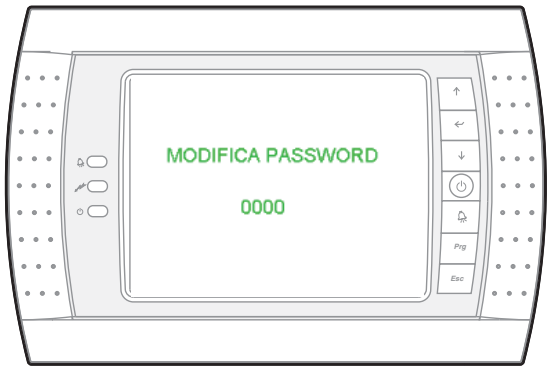
Note:
Cold/hot set point limits
Cold set point maximum limit
Cold set point minimum limit
Hot set point maximum limit
Cold set point minimum limit



Note:
Enabling of chiller heat pump
Enabling of double set point



Note:
Load set default

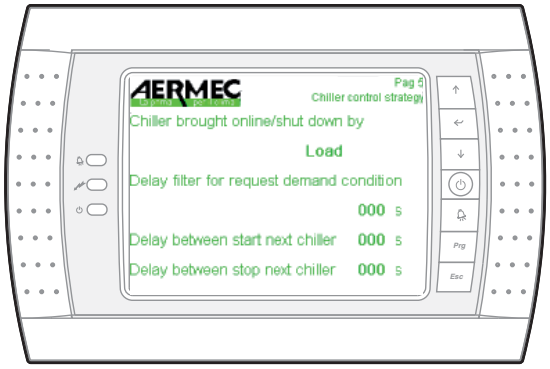


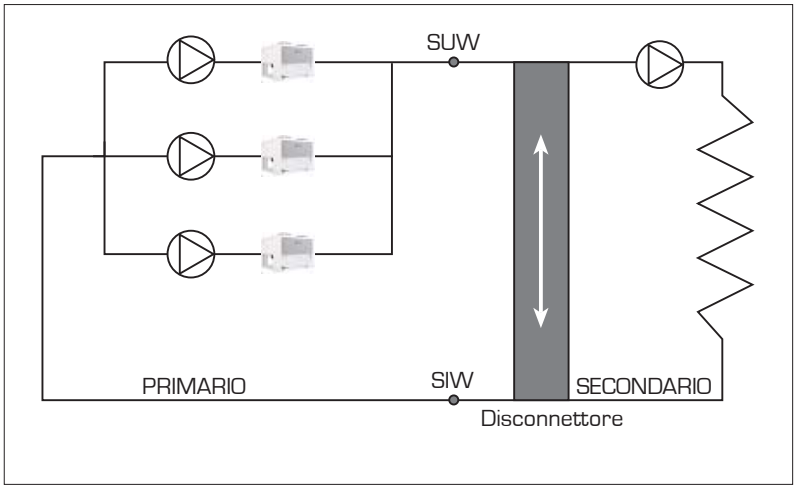
Note:
Modify password

Adjustment logics

Two adjustment logics can be used, one for optimisation of the temperature of the plant (Temperature) and one for optimisation of plant production (Load). These logics are used to give a chiller switch-on request condition and a chiller switch-off request condition. When a chiller is on it works autonomously with the steps (chokes or compressors) that are available on the basis of the adjustment and the setting. The logic envisions that a chiller is always left working, it eventually switches-off autonomously due to the thermostat. On the basis of the adjustment logic, the Multichiller increases or decreases the number of chillers switched on.

Load adjustment: LOAD





Probe position: both of the probes must be positioned on the primary circuit, before the disconnecting device, SUW on evaporator delivery collector, SIW on the return entry to the chillers.

Plant features: management is optimised for plants where each chiller controls its own pump (on/off together with the chiller) and with secondaries with variable flow in the basis of the load.
If these features are not present, it is recommended to use Homogeneous Mode for management of the chiller

The power of the chillers switched-on is calculated with this system, taking into consideration the temperature differential between SIW and SUW compared with the chiller full load Delta parameter that represents the DT between evaporator water input and output of a chiller at full power (parameter to be set in the basis of the project conditions). In this way, the choke level of the chillers switched-on is evaluated (% LOAD).
Conditions for switching-on a new chiller: when the % LOAD value calculated is greater than the % parameter, Load to start next.
Conditions for switching-off the next chiller: when the envisioned % LOAD value that the chillers currently switched-on will have, -1 is lower than the % parameter Load chiller to stop next.
Examples are given below (with 3-chiller plant) for the management of chillers in the three modes sequential, homogeneous and combined

Sequential mode

% Load to start next = 100 , % Load chiller to stop next = 85

Switch-on

The first chiller is always On. The second chiller is switched-on when the first is at 100%. The third chiller is switched-on when the other two are at 100%

Switch-off

The third chiller is switched-off when it is expected that the two remaining switched-on do not increase the power beyond 85%.

(by switching a chiller on the plant return temperature is decreased and therefore the power of the chillers that are switched-on. By switching a chiller off, the plant return temperature increases and therefore the power of the chillers that are switched-on).

The second chiller is switched-off when it is expected that the only chiller remaining on does not increase the power beyond 85%.

Homogeneous mode

% Load to start next = 0 , % Load chiller to stop next = 0 ()

RECOMMENDED FOR PLANTS WITH UNIQUE PUMP ON PRIMARY CIRCUIT

OR PLANT WITH FIXED CAPACITY SECONDARY CIRCUIT

The chillers must be switched-on and off all at the same time (the delays between set chiller switch-on/switch-off are however respected), they therefore work in parallel.

Combined mode

% Load to start next = 80 , % Load chiller to stop next = 60

Switch-on

The first chiller is always On. The second chiller is switched-on when the first is at 80%. The third chiller is switched-on when the other two are at 80%

Switch-off

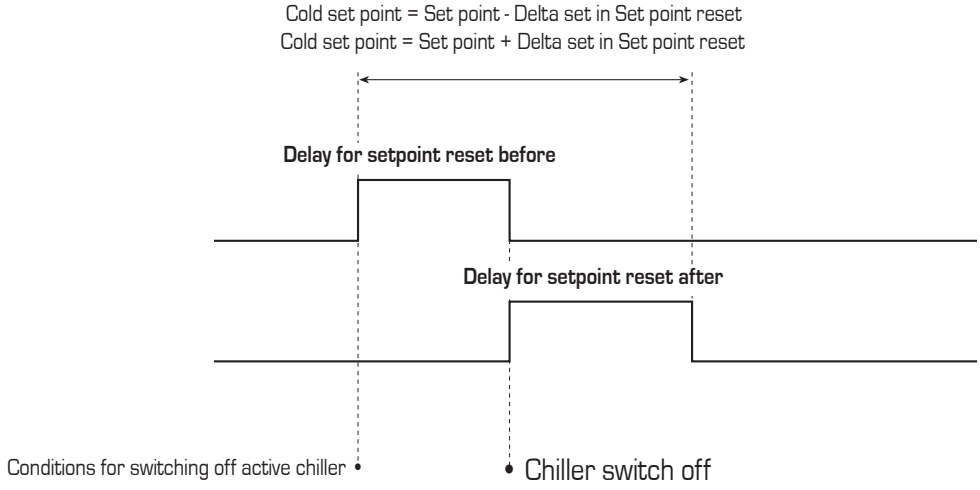
The third chiller is switched-off when it is expected that the two remaining switched-on do not increase the power beyond 60%.

(by switching a chiller on the plant return temperature is decreased and therefore the power of the chillers that are switched-on. By switching a chiller off, the plant return temperature increases and therefore the power of the chillers that are switched-on)

The second chiller is switched-off when it is expected that the only chiller that is switched-on does not increase the power beyond 60%.

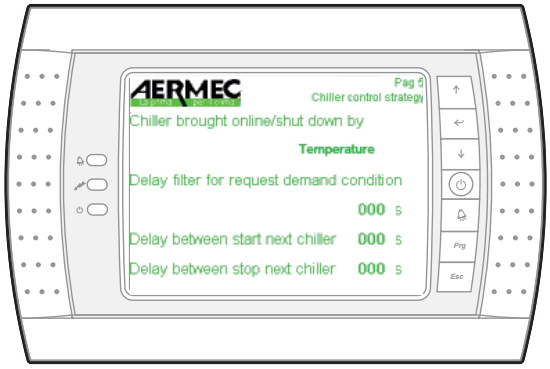
RESET SET POINT

In the case of LOAD type adjustment, when the chiller is in the condition to be switched-off, it is possible to anticipate the increase of power of the chillers that are still switched-on (switching a chiller off increases the plant return temperature and therefore the power of the chillers that are still switched on), by changing the chiller work set point for a time anterior and posterior to switch-off of the chiller (set point reset). This function helps to prevent significant rises in temperature in these transients.



The set point to which the delta set point reset is added/subtracted is that currently used by the cards depending on the functioning mode, multifunction inputs, double set points.

Load adjustment: TEMPERATURE



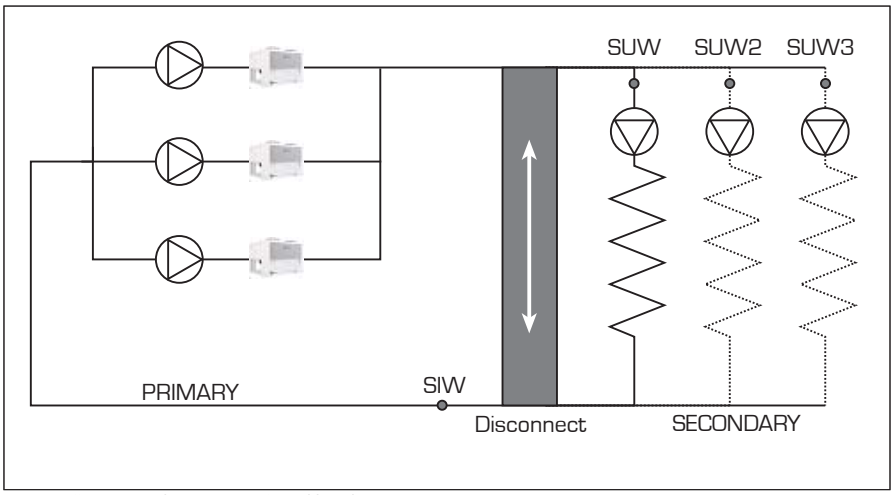
Probe position: the SUW probe (or probes) must be positioned on the secondary circuit delivery, after the disconnecting device; the SIW probe on the on the primary in the return input to the chillers after the disconnecting device.

Plant features: management is optimised for plants where each chiller controls its own pump (on/off together with the chiller) and with secondaries with variable flow in the basis of the load**.**

This Adjustment directly controls the delivery temperature to the secondary circuit and it is possible to check up to 3 branches of this circuit checking up to 3 temperature probes SUW, SUW2 and SUW3 (the latter only if the pCOE expansion is used). The SUW, SUW2,SUW3 delivery probes are considered for adjustment only if the relative Flow meter contacts (respectively FL1, FL2, FL3) are closed. In fact, the possibility that every branch of the secondary circuit is excluded due to stop of the relative pump is also managed.

Conditions for switch-on of a new chiller:

the switch-on of a new chiller is requested if one of the 3 delivery probes on the secondary (SUW,SUW2 or SUW3) reads a temperature greater than the Leaving water temp. start chiller parameter (there is one for cold functioning and one for hot functioning; the logic is opposite for hot functioning)



Conditions for switch-off of a new chiller:

the switch-on of the next chiller is requested if the SIW probe reads a temperature that is lower than the Return water temp. stop chiller parameter. An accurate calculation of the switch-off temperature is requested, so that the switch-off of a chiller sees to it that the remaining chillers can guarantee a SUW temperature that is less than the set Leaving water temp. start chiller switch-on set so as not to cause continuous switch-on/switch-off of the chiller (there is one for cold functioning and one for hot functioning; the logic is opposite for hot functioning)

Sequential mode

Plant with variable flow on secondary circuit and independent pumps for every chiller, Set point chiller 5.0°C, COLD functioning.

Chiller 1 always On

Chiller 2 starts if SUW greater than 5.2°C

Chiller 3 starts if SUW greater than 5.2°C

Chiller 4 starts if SUW greater than 5.2°C

Chiller 5 starts if SUW greater than 5.2°C

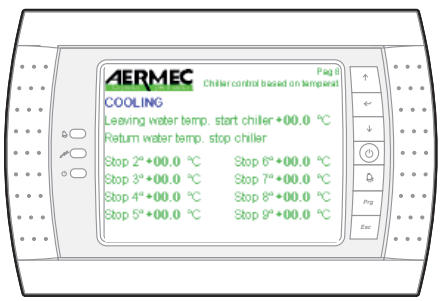
Chiller 1 switches the compressors off on the basis of its own thermostat

Chiller 2 switched-off if SIW less than 7.8°C

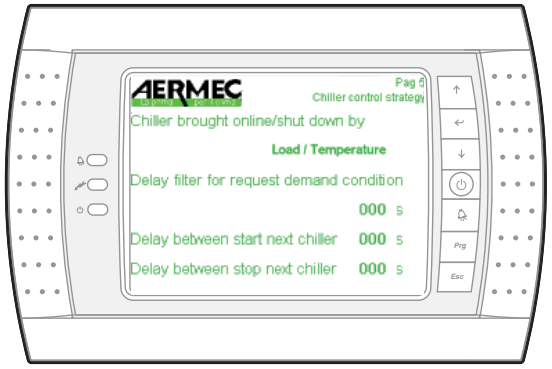
Chiller 3 switched-off if SIW less than 8.8°C

Chiller 4 switched-off if SIW less than 9.3°C

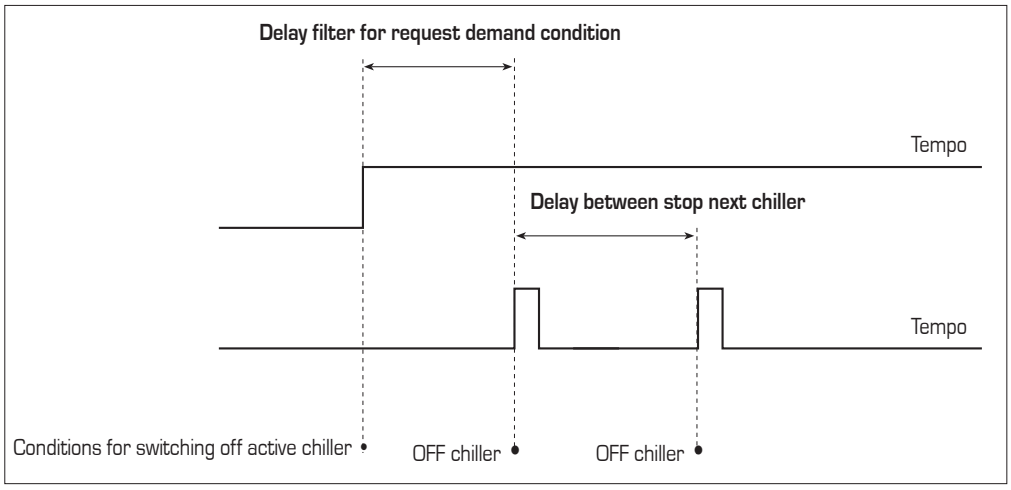
Chiller 5 switched-off if SIW less than 9.6°C

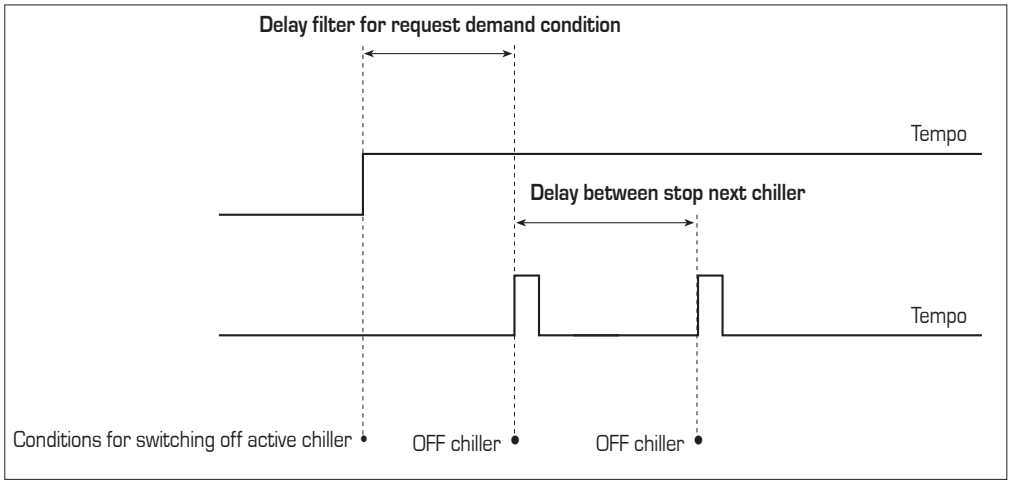


Timing

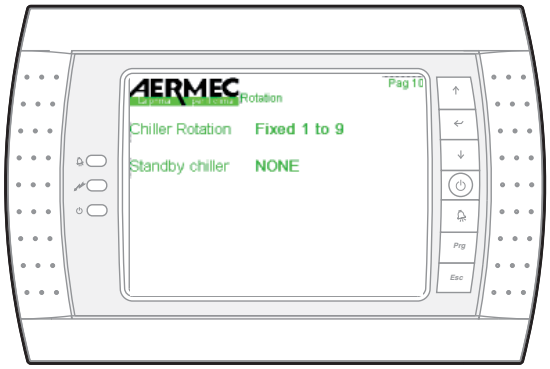


Independently from the type of adjustment used (Load or Temperature), delays and switch-on/switch-off filters are envisioned. This is to prevent sudden temperature changes and allow the chillers to switch-on, activate the compressors and stabilise themselves before carrying out other switch-ons, or on switch-off wait for the chillers to go to constant power before switching the others off.
Delay filter for request demand condition is the filter that the switch-on and switch-off conditions must exceed to be considered such
E.g. load adjustment supposing that the % parameter Load to start next= 50
Delay filter for request demand condition= 60
Means that the percentage of power of the % LOAD must remain above 50% for at least 60 sec. before being recognised as such.
Temperature adjustment
Leaving water temp. start chiller = 5.2°C
Delay filter for request demand condition= 60
Means that the SUW temperature must remain above 5.2°C for at least 60 sec. before being recognised as such.
Delay between start next chiller is the minimum delay time between the switch-on of one chiller and the other
Delay between stop next chiller is the minimum delay time between the switch-off of one chiller and the other



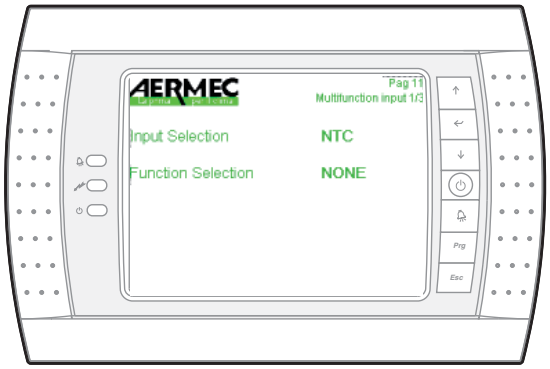


Rotation

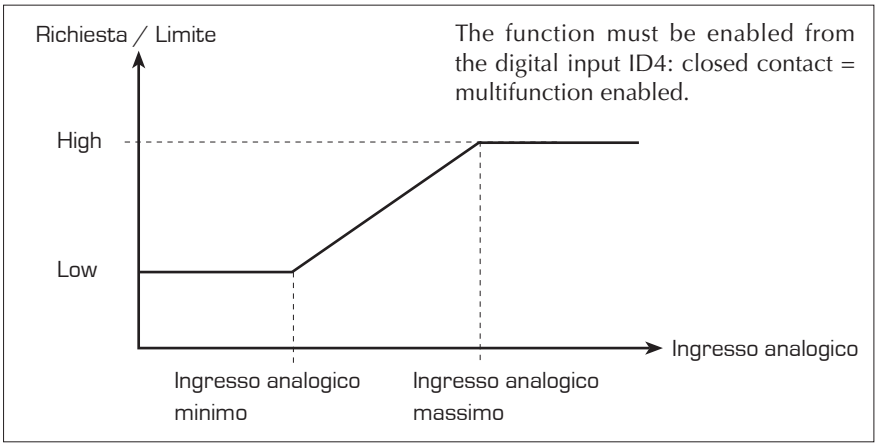


Chiller rotation : Rotation can be
Fixed 1 to 9 : fixed from chiller 1 (always ON) to chiller 9 (the last to switch-on, the first to switch-off)
By work hours: on the basis of the working hours of the compressors. The chiller with the compressor that has most working hours is the last to start-up and the first to switch-off. The chiller that has the compressor with least working hours is the fist to start-up and the last to switch-off. The hours of the individual compressors of each chiller divided by 10 are considered (a difference less than 10 hours is not considered).
A chiller with at least 2 circuits, of which 1 is in alarm, is considered the last to start-up and the first to switch-off
Standby chiller
It is possible to select a chiller that must only switch-on in the case of unavailability due to anomaly of any other chiller present in the plant and obviously requested.
Any chiller can be present from 1 to 9.
Replace any chillers that have all circuits in alarm. It is switched on last and switched-off first even with respect to other chillers with circuits partially in alarm.

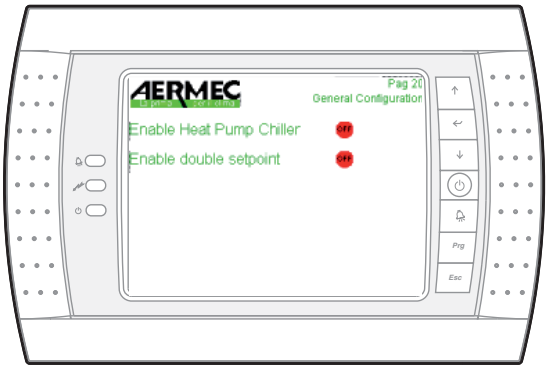
Multifunction inputs

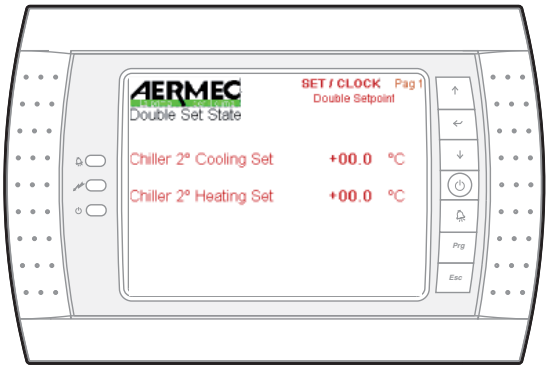


There are 3 analogue inputs present by means of which it is possible to carry out 4 types of function. The analogue signals available are
in current 0-20mA input B1
in voltage 0 -5 volt input B2
NTC 10kohm temperature probe of the same type used on chillers B3 input
The type of input can be selected from the Input Selection parameter.
Use the Function Selection parameter to select the desired function:
NONE
Set point = set cold or hot, the hot or cold set point is obtained from analogue input
Comp. Set point = hot cold set point compensation, algebraically adds the value obtained to the set point
Limit = limits the max. number of chillers that can be switched-on
Demand = request for number of chillers switched-on. The Multichiller no longer controls the number of chillers on the basis of the probes.



Double Set point





By enabling the double set point function (**Enable double set point**) by means of a contact that is not live, connected to the digital input ID3, it is possible to decide whether to use the normal set points or double set alternatively (e.g. night-time functioning).

ID3 closed = use 2nd set point
ID3 open = use normal set points

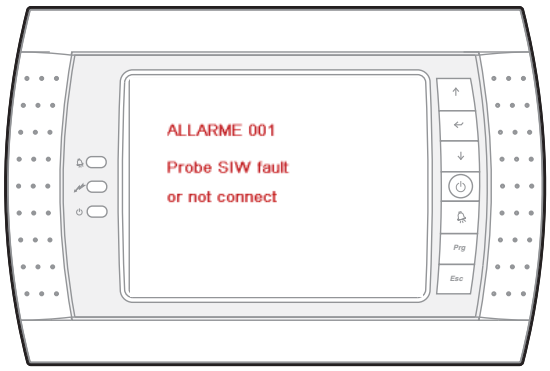
Priority set point

If several functions co-exist, the Multichiller will use the highest priority set point. The set points are listed below starting from the one with highest priority.

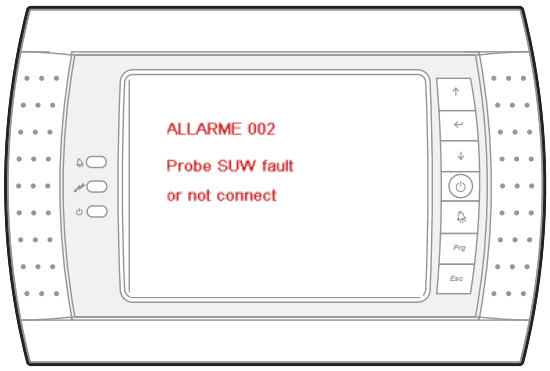
Double set
External compensation
External set
Set point (from dispaly)

Multichiller Alarms

The following alarms force the number of chillers requested switched-on, independently from other controls, to 1 (except Multichiller Enable = OFF that requests all switched on and Global On/Off = OFF that requires all switched off) They have automatic reset

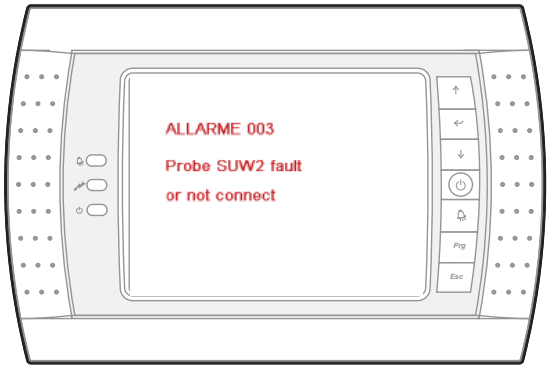


The value read by the SIW probe is out of range -35°C / 80°C independently if it is connected to the PCO1 or PCOE card

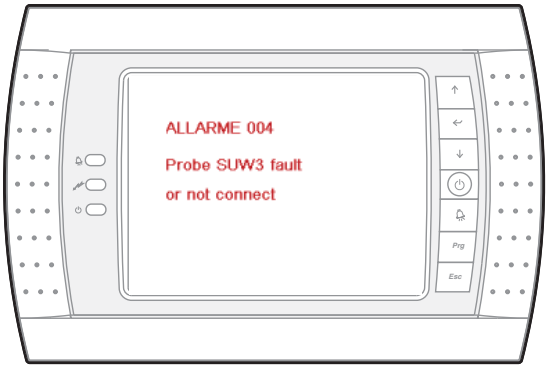


Il The value read by the SUW probe is out of range -35°C / 80°C independently if it is connected to the PCO1 or PCOE card

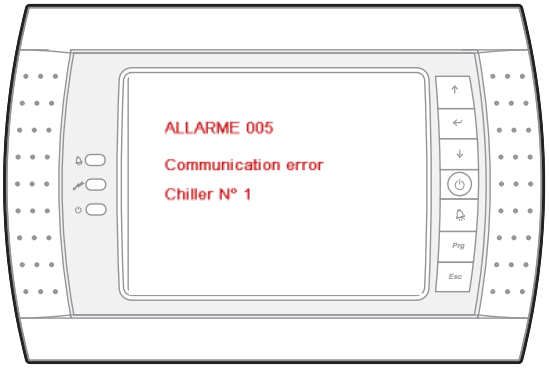
The flowing alarms are only used to signal a display anomaly, signal LED and alarms summary relay. They have automatic reset



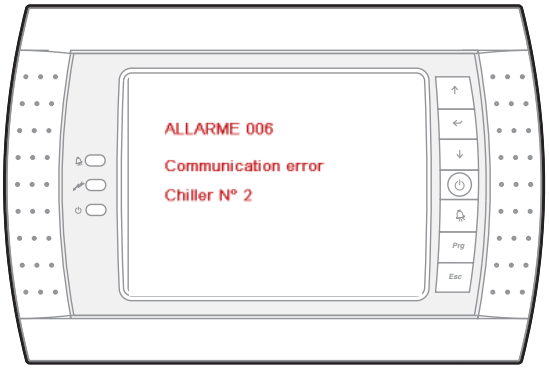
The value read by the SUW2 probe is out of range -35°C / 80°C independently if it is connected to the PCO1 or PCOE card



The value read by the SUW3 probe is out of range -35°C / 80°C independently if it is connected to the PCO1 or PCOE card



It is not possible to establish a connection with chiller N 1-9



It is not possible to establish a connection with the PCOE expansion card

PCOE2 (Chiller)

The following alarms force the number of chillers requested switched-on, independently from other controls, to 1 (except Multichiller Enable = OFF that requests all switched on and Global On/Off = OFF that requires all switched off) They have automatic reset

Enable On/Off by supervisor	Y
Enable summer / winter by supervisor	Y

Enabling On/Off commands and season change (for heat pump models) from supervisor

Identific. address for supervisor	XXX
Baud rate 9600	(RS 485 only)

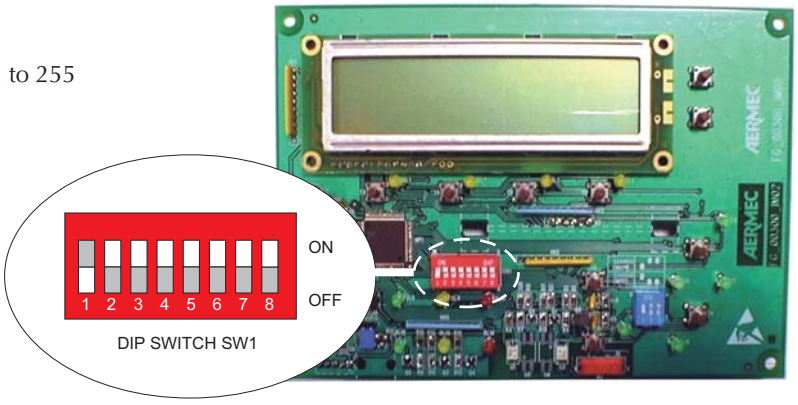
Address da 2 a 255 (1 è riservato per PCOE)
Baud rate 9600

Protocol	MODBUS

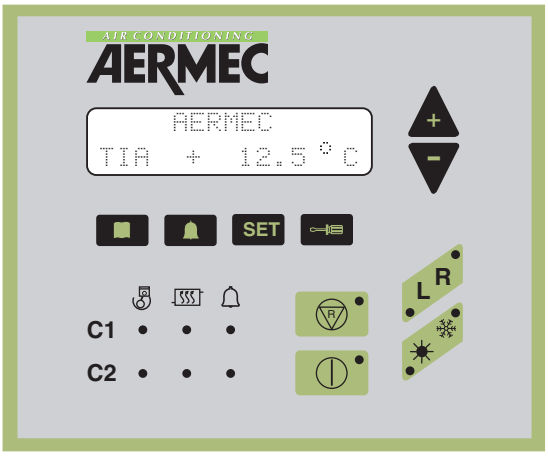
Modbus Protocol

GR03 (Chiller)

Setting address from 2 to 255

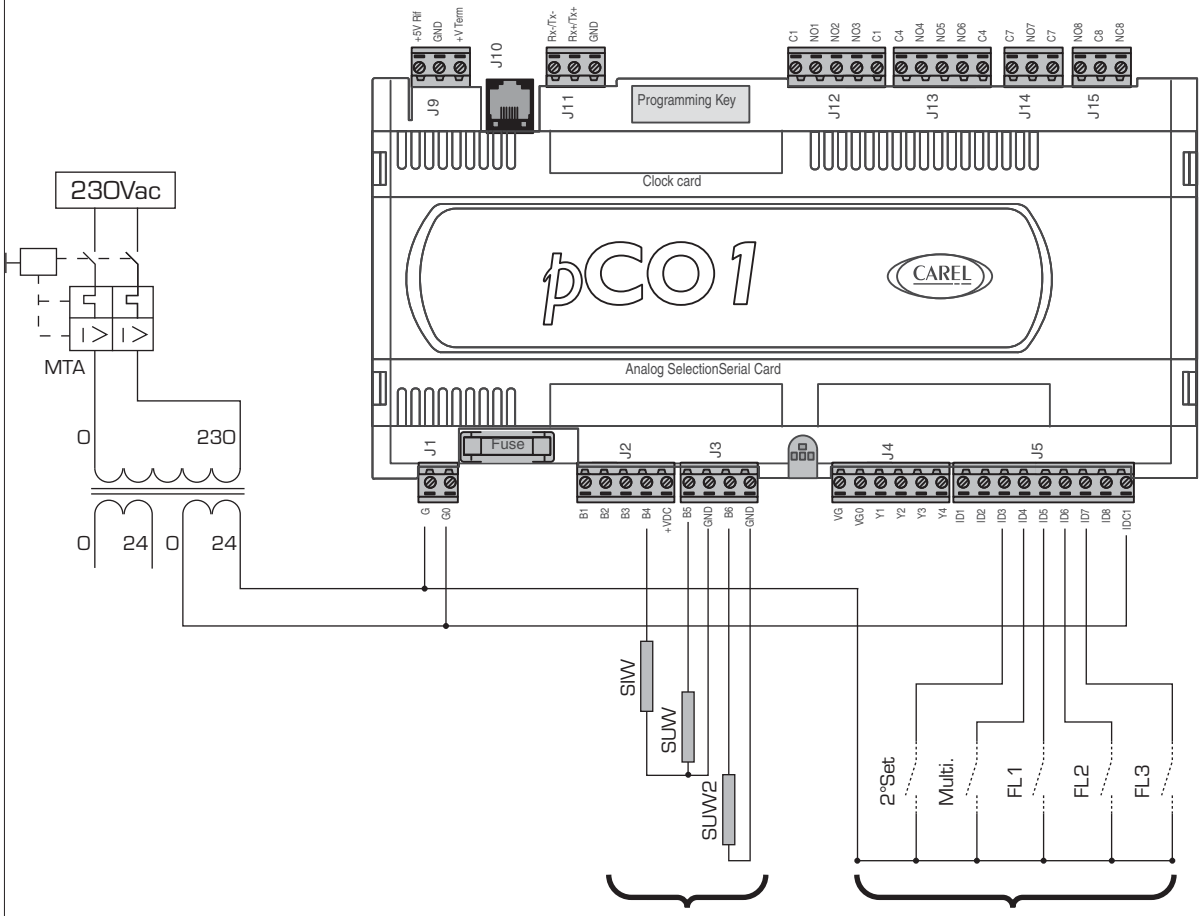


Disable any programmer timer, place the remote digital inputs at On and Hot respectively



PCO1 connection

Probes and digital inputs

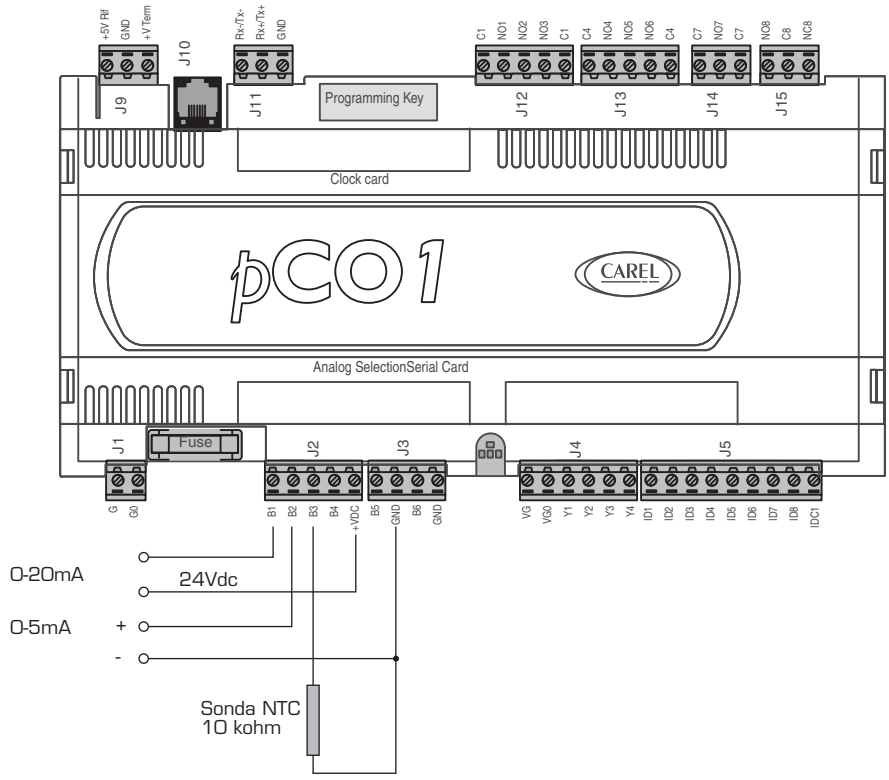


Cable section (mm2)	Max. distance (m)
0,5	50

Cable section (mm2)	Max. distance (m)
0,5	50
0,5	100

PCO1 connection

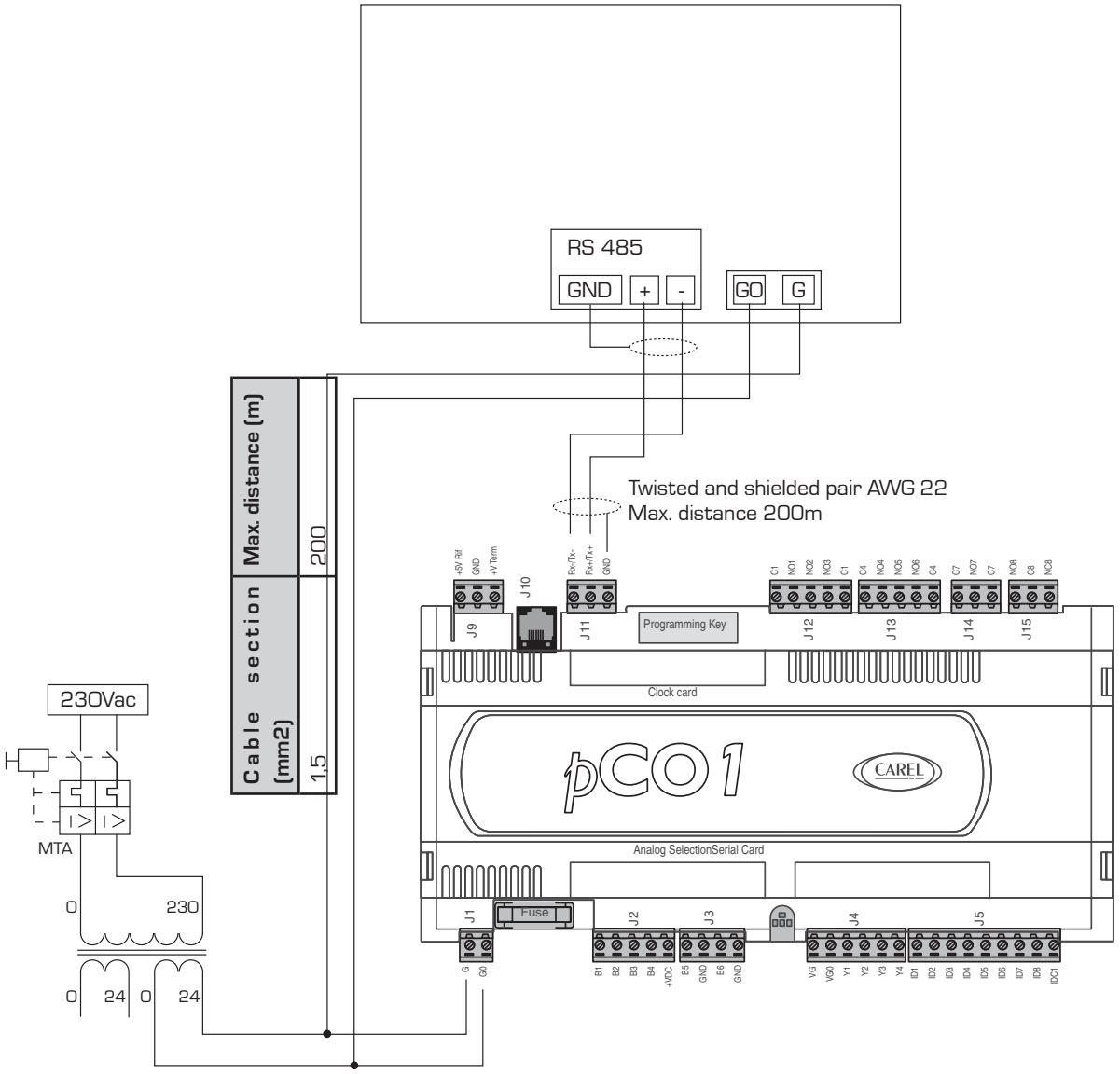
Multifunction input



Cable section (mm2)	Max. distance (m)
0,5	50

PCO1 connection

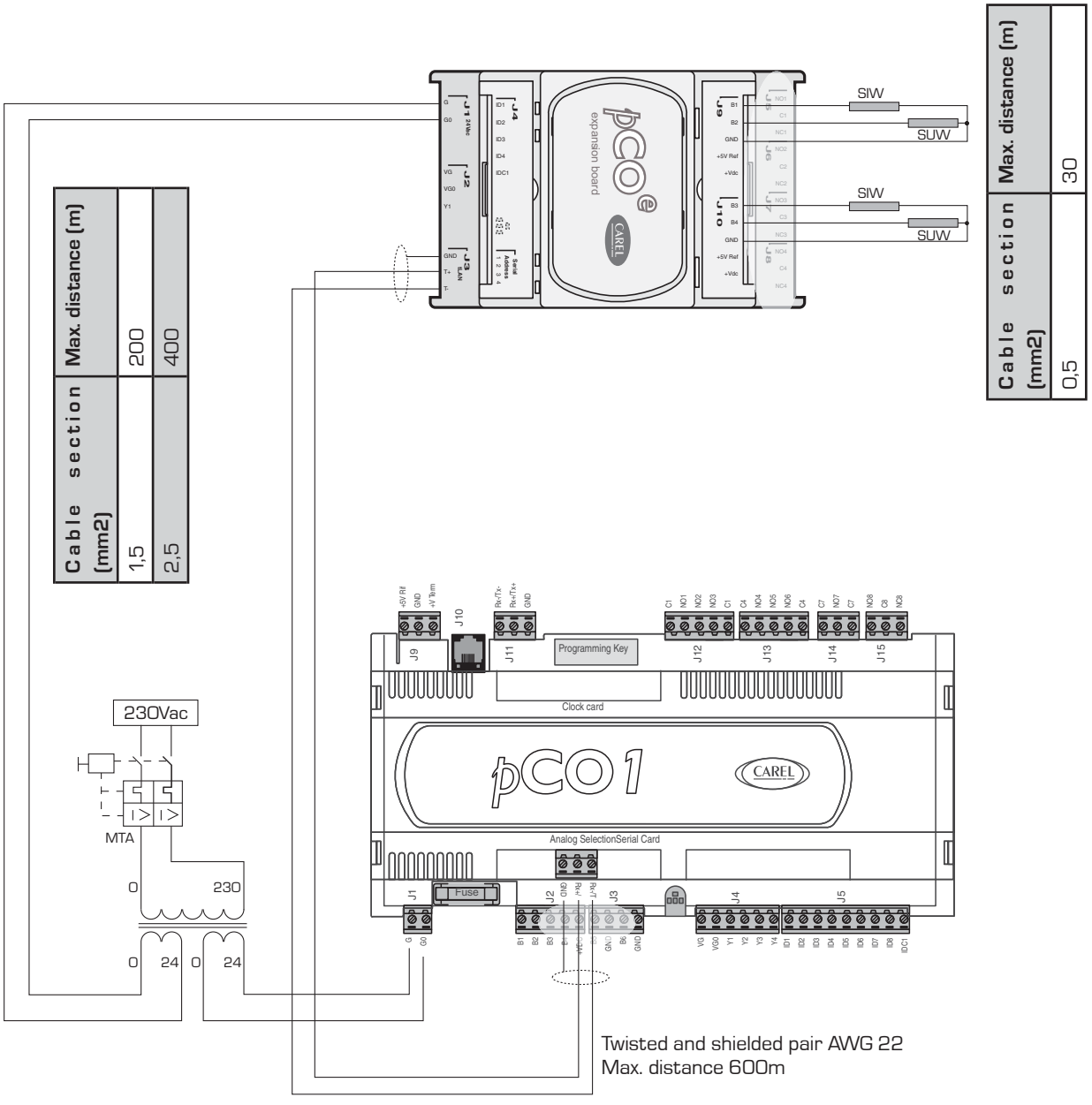
Connection to PDG03 display



N.B: Respect the G with G and GO with GO connections in the pCO1 and display power supply

PCO1 connection

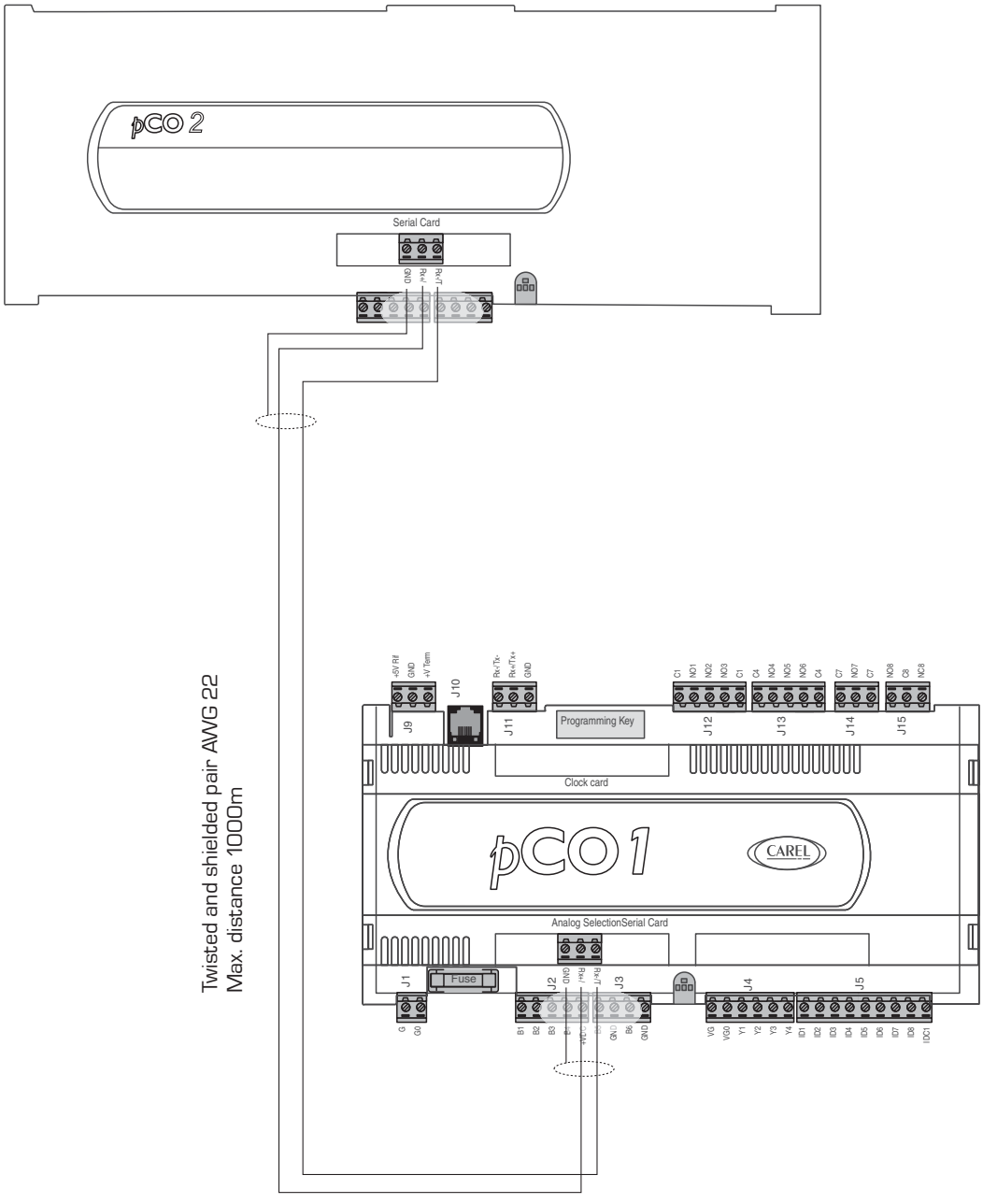
PCOE expansion connection



N.B: Remember to respect the G with G and G0 with G0 connections in the pCO1 and expansion power supply if the same secondary circuit is used in the transformer

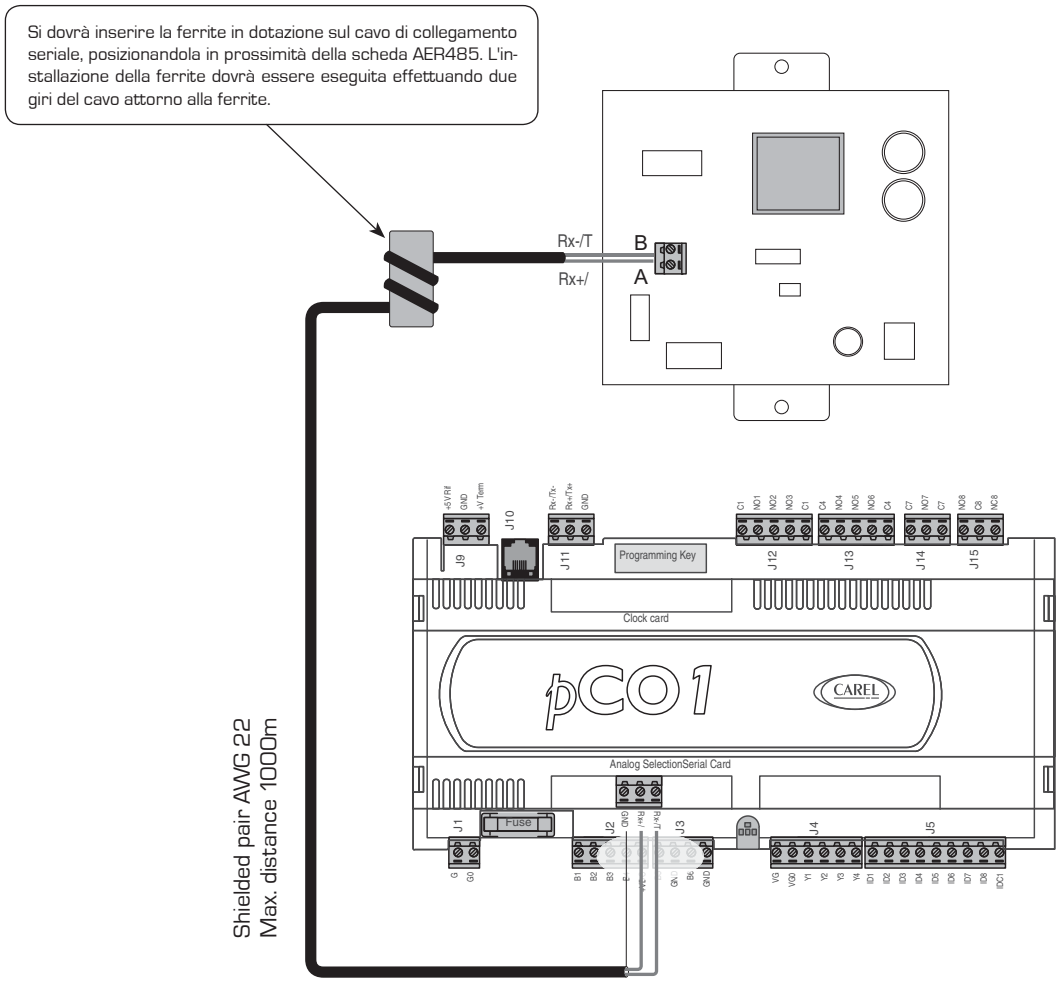
PCO1 connection

Serial chiller connections AER485P2 (series RVBH, NSB, WSB)



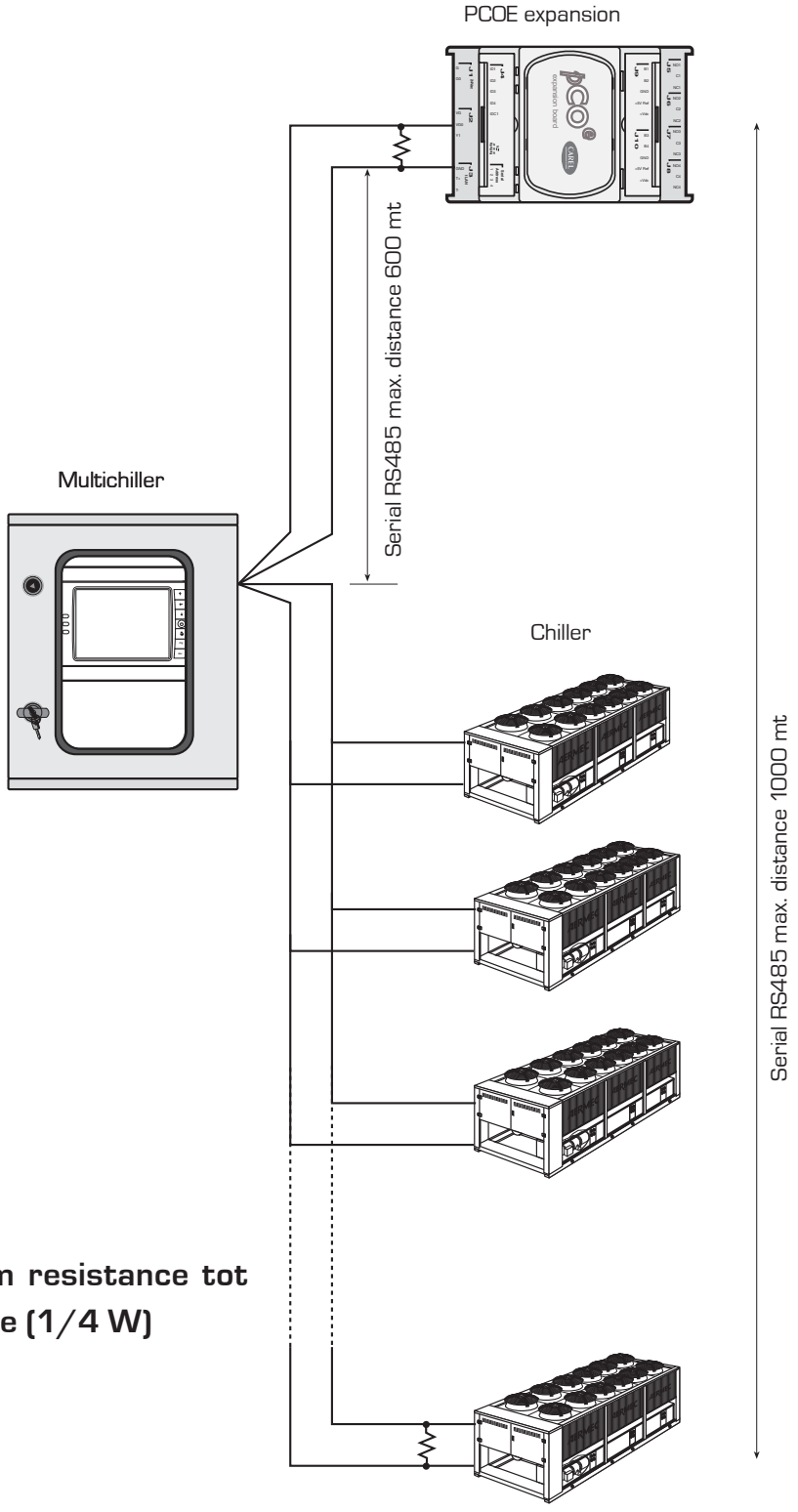
PCO1 connection

Serial chiller connections AER485 (series NRA, NRC, NLW, NRL)



Collegamento PCO1

Type of connection bus between multichiller and chiller



Connect a 120 ohm resistance tot he first and last node (1/4 W) (included in the kit)