

EN

25/04 - 5146811_04
Translation of Original instructions

HRB



■ CONTROL SYSTEM FOR RECOVERY UNITS



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Dear Customer,

Thank you for wanting to learn about a product Aermec. This product is the result of many years of experience and in-depth engineering research, and it is built using top quality materials and advanced technologies.

The manual you are about to read is meant to present the product and help you select the unit that best meets the needs of your system.

However, please note that for a more accurate selection, you can also use the Magellano selection program, available on our website.

Aermec, always attentive to the continuous changes in the market and its regulations, reserves the right to make all the changes deemed necessary for improving the product, including technical data.

Thank you again.

Aermec S.p.A.

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COMPANY CERTIFICATIONS



SAFETY CERTIFICATIONS



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In accordance with Italian Legislative Decree 116 / 2020, the machine's packaging is marked; for unmarked packaging parts, the composition is as follows: **Expanded polystyrene - PS 6**

All specifications are subject to change without prior notice. Although every effort has been made to ensure accuracy, Aer-mec shall not be held liable for any errors or omissions.

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1 GENERAL DESCRIPTION

The HRB accessory kit meets the installation needs of the RPLI recovery units, ensuring the recovery unit the control of:

- Exchange of air charged with carbon dioxide and pollutants
- Inflow of heat-treated fresh air (there must be no thermal shocks)
- Implement the free cooling bypass under favourable conditions.
- Contain the energy cost increase with the use of a system that recovers large part of the heat contained in the expelled air stream and transfers it to the fresh air.
- Double resistive load control to treat inflow air
- Control of modulating valves
- Air purification device management
- Modulation of inlet/outlet air flow rate through VOC probe control

1.1 CONTENT OF THE KIT

The accessory consists of a 300x220x120 mm plastic electric control board which ensures IP56 protection and so must be installed outside the recovery unit. The HRB accessory contains all the components necessary for managing the heat recovery units:

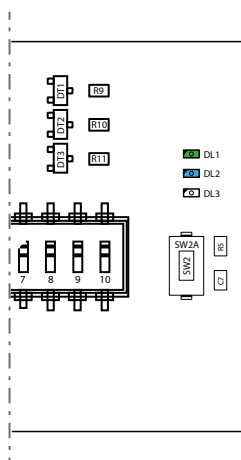
- Electronic control board of the loads inserted in an IP56 protection rating plastic board
- No.4 6m long NTC temperature probes
- 4-pole serial cable + screen for connecting the control board to the system user interface
- User interface panel used in the recovery units which has an aesthetic equal to that of the VMF-E4

2 CONTROL BOARD INPUT/OUTPUT

The following tables show the control board input/output: the input/output column indicates the input/output how it is called on the board wiring diagram, the Function column indicates how the inputs and outputs are used on the various machines in which the board will be installed, the Electrical characteristics column shows the type of electrical signal that characterises the input/output.

I/O	Function	Electrical characteristics
MC5 1-2	NTC probe input	$R(25^{\circ}\text{C}) = 10\text{Kohm}$, $B(25^{\circ}/50^{\circ}\text{C}) = 3950\text{K}$
MC5 3-4	NTC probe input	$R(25^{\circ}\text{C}) = 10\text{Kohm}$, $B(25^{\circ}/50^{\circ}\text{C}) = 3950\text{K}$
MC5 5-6	NTC probe input/ Analog input $0 \div 10\text{ V}$	$R(25^{\circ}\text{C}) = 10\text{Kohm}$, $B(25^{\circ}/50^{\circ}\text{C}) = 3950\text{K}$
MC5 7-8	NTC probe input/ Analog input $4 \div 20\text{mA}$	$R(25^{\circ}\text{C}) = 10\text{Kohm}$, $B(25^{\circ}/50^{\circ}\text{C}) = 3950\text{K}$
M7 1	Digital inputs DI1	$V \text{ max } 3.3\text{ [V]} / I \text{ max } 10\text{ [mA]}$
M7 2	COM digital inputs	---
M7 3	Digital inputs DI2	$V \text{ max } 3.3\text{ [V]} / I \text{ max } 10\text{ [mA]}$
M4	RS485 serial port	$V \text{ max } -9\text{ [V]} \div +14\text{ [V]}$
M3	TTL serial port	$V \text{ max } 5\text{ [V]}$
MC2 1	Relay output RL1	$V \text{ max } 230\text{ [V]} / I \text{ max } 5\text{ [A]}$
MC2 2	Relay output RL2	$V \text{ max } 230\text{ [V]} / I \text{ max } 5\text{ [A]}$
MC2 3	Relay output RL3	$V \text{ max } 230\text{ [V]} / I \text{ max } 5\text{ [A]}$
MC2 4	Relay outputs common contact	$V \text{ max } 250\text{ [V]} / I \text{ max } 15\text{ [A]}$
MC1	Board power supply input	$V \text{ max } 230\text{ [V]} / I \text{ max } 1\text{ [A]}$
MC6 1	Analog output AO1	$V \text{ max } 10.0\text{ [V]} / I \text{ max } 10\text{ [mA]}$
MC6 2	Analogue outputs common	---
MC6 3	Analog output AO2	$V \text{ max } 10.0\text{ [V]} / I \text{ max } 10\text{ [mA]}$

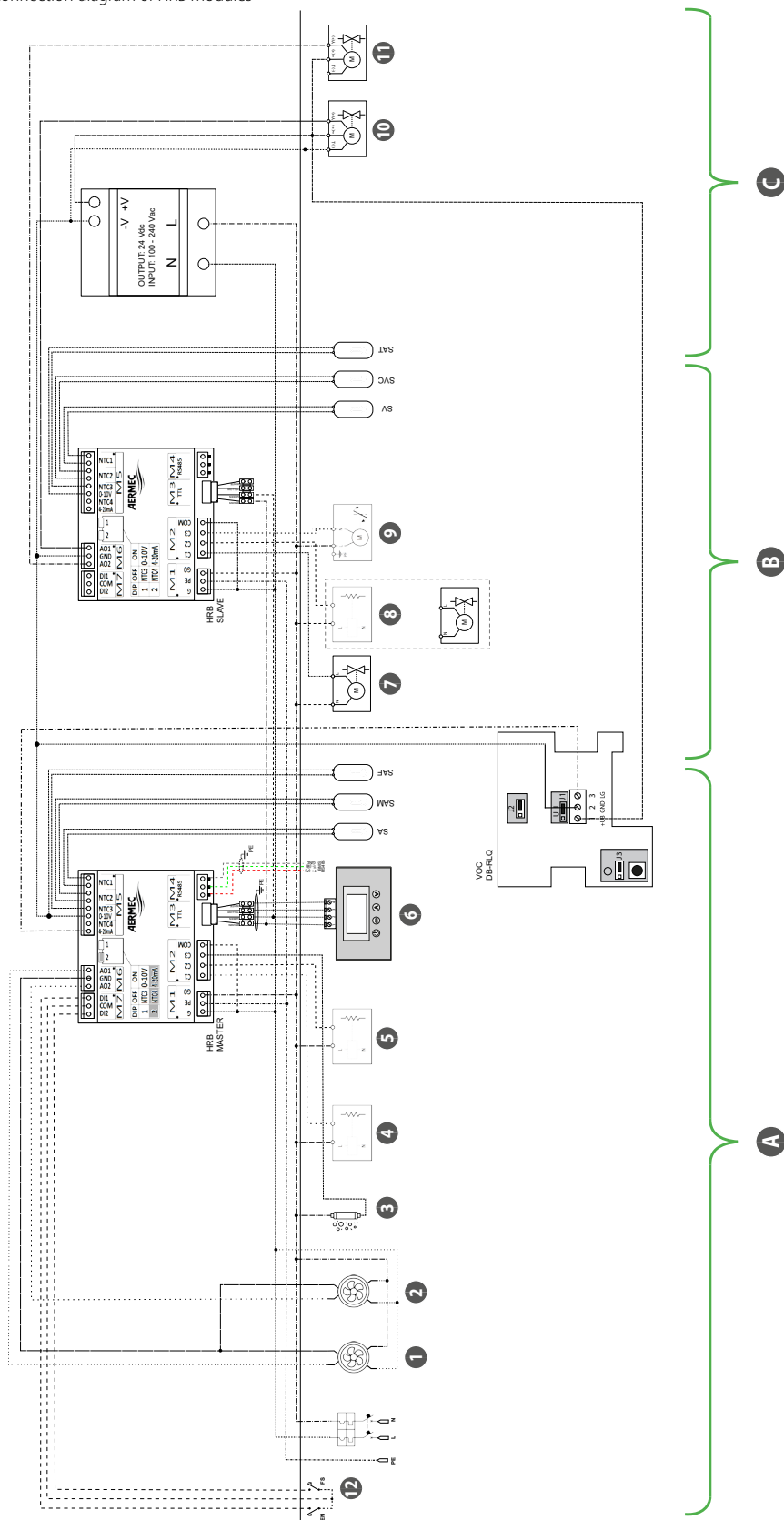
3 LED SIGNAL



LED	Master board	Slave board
DL1	Always on (indicates that the controller is a master) During the self-test it flashes indicating its status	Always off During the self-test it flashes indicating its status
DL2	Presence of alarms in the system	Presence of communication alarm with master board
DL3	Flashing indicates correct communication with the user interface	Flashing indicates correct communication with the master board

4 ADJUSTMENT LAYOUT

Electrical connection diagram of HRB modules



Key:

- 1 Air intake
- 2 Air discharge
- 3 Air purification
- 4 Pre-treatment resistance
- 5 Post-treatment resistance
- 6 User interface

7 Hot/cold valve or 4-pipe cold-side valve

8 2nd stage post-treatment resistance or 4-pipe hot-side valve

9 Freecooling by-pass damper

10 Hot/cold modulating valve or 4-pipe cold-side modulating valve

11 4-pipe hot-side modulating valve

12 Contact-control ON/OFF (setting DIP 10)

A Master Module (is determined by connecting the user interface)

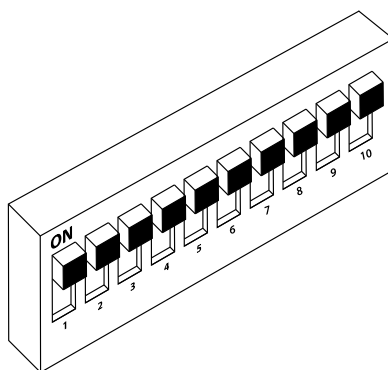
B Slave Module

C Power supply module (modulating valves)

5 USING THE SYSTEM

5.1 DIP SWITCH SETTING

The board has appropriate configuration DIP-switches to meet possible installations. There are 10 microswitches on both the master and slave boards and they have different functions, please refer to the tables below:



Configuration of the Master regulator DIP switches

DIP	Position	Function
DIP 1	On	Post-treatment resistance presence
	Off	Post-treatment resistance not present
DIP 2	On	Pre heating resistance presence
	Off	Pre heating resistance not present
DIP 3	On	Presence of expansion
	Off	Expansion not present
DIP 4	Maximum inlet fan speed	
DIP 5		
DIP 6		
DIP 7	Maximum exhaust fan speed	
DIP 8	On	VOC probe present
	Off	VOC probe not present
DIP 9	On	Force threshold OFF antifreeze at -10 °C
	Off	Force threshold OFF antifreeze at -15 °C
DIP 10	On	DI1 used as differential pressure switch input
	Off	DI1 used as presence sensor input

Maximum ventilation speed

Fan speed	DIP 5	DIP 4
	DIP 7	DIP 6
80%	0	0
90%	0	1
95%	1	0
100%	1	1

Configuration of the Slave regulator DIP switches

DIP	Position	Function
DIP 1	On	Activation differential according to 3°C electric load
	Off	Activation differential according to 2°C electric load
DIP 2	On	Freecooling differential with 5°C hysteresis
	Off	Freecooling differential with 2°C hysteresis
DIP 3	On	Freecooling through bypass damper
	Off	Freecooling through alternation of the air flow
DIP 4	On	Second resistive stage present
	Off	Second resistive stage not present
DIP 5	On	Valve present in the post-treatment coil
	Off	Valve not present in the post-treatment coil

DIP	Position	Function
DIP 6	On	4-pipe post-treatment coil
	Off	2-pipe post-treatment coil
DIP 7	On	Modulating valve heating operating range : 6°C
	Off	Modulating valve heating operating range : 4°C
DIP 8	On	Modulating valve cooling operating range : 3°C
	Off	Modulating valve cooling operating range : 5°C
DIP 9	Refer to the table "5.4 Freecooling thresholds in winter mode on page 10 "	
DIP 10		

Freecooling thresholds in winter mode

	DIP 10	DIP 9
No Freecooling	OFF	OFF
10°C	OFF	ON
13°C	ON	OFF
16°C	ON	ON

5.2 ACTIVATION OF SELF-TEST FUNCTIONALITY

To make it easier for installers or technical assistance personnel to test the system, a self-test function has been added. To access it, press the SW2 button for about 5 seconds. When the DL1 LED flashes every 2 seconds, the self-test procedure is activated. Each press of the SW2 button enables the operation of the following load:

SW2 key pressure	Load activated	Visualisation DL1
Activation of the procedure with 10 seconds pressure	AO1 output activation (100%)	2 flashes every 2 seconds
1st pressure	AO2 output activation (100%)	3 flashes every 2 seconds
2nd pressure	C1 activation	4 flashes every 2 seconds
3st pressure	C2 activation	5 flashes every 2 seconds
4th pressure	Activation C3	6 flashes every 2 seconds
5th pressure	End of self-test	DL1 off

NOTICE



At the end of the self-test procedure the controller will resume normal operation.

6 INTERFACE USE

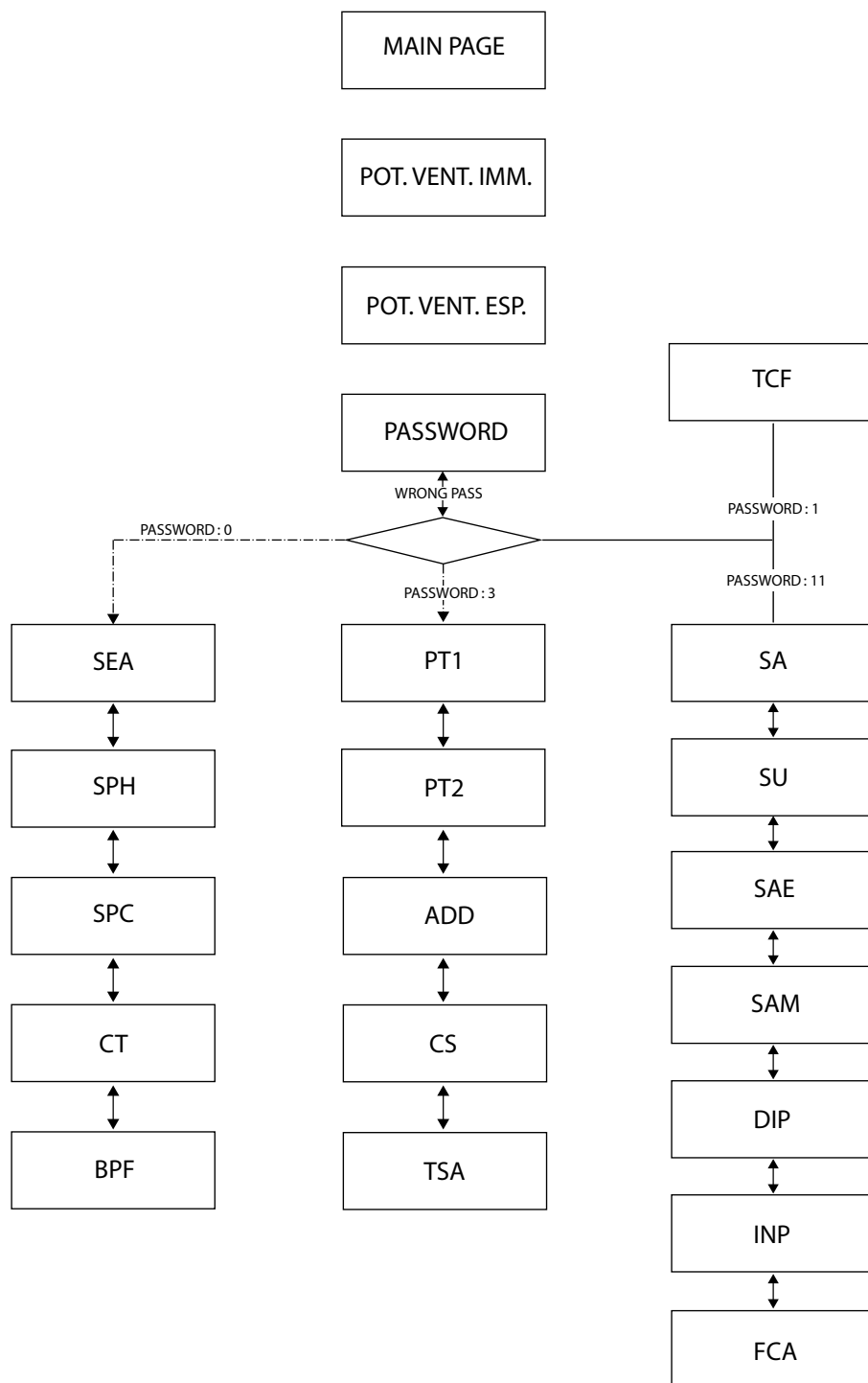
6.1 HARDWARE STRUCTURE

The user interface has a monochromatic display and 4 capacitive keys. From this interface one can:

- Set the operating mode
- Set the functioning parameters
- View the reading of all the installed probes
- Activate the manual forcing of the electric loads to simplify any troubleshooting

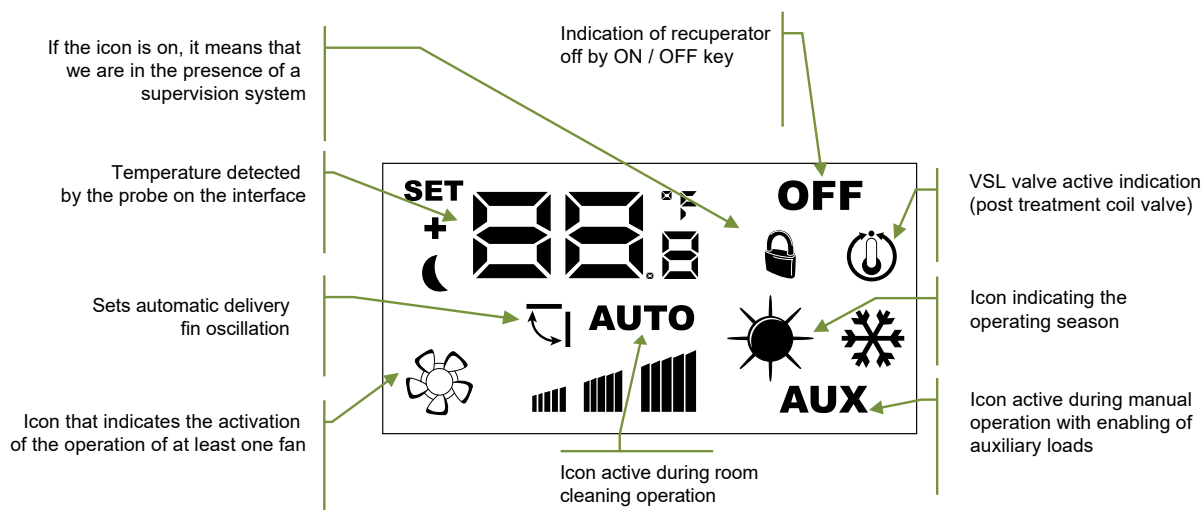


6.2 SOFTWARE STRUCTURE

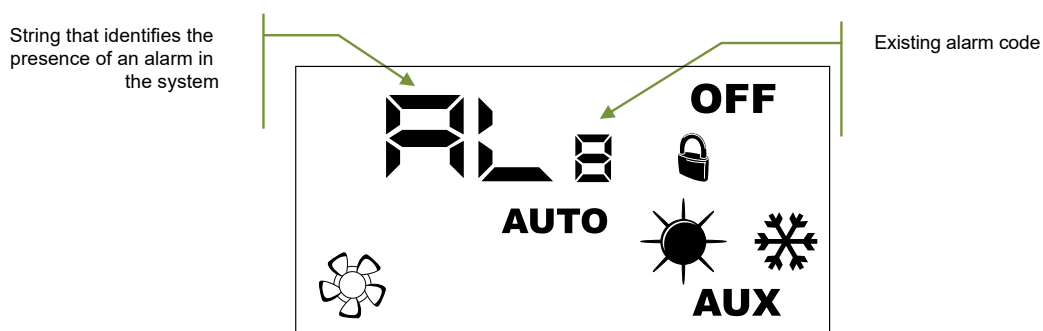


6.3 MAIN PAGE

The main page of the user interface provides essential information on the recovery unit functioning. The following images show all the possible displays on the main page.





Possible views of the Main Page



Possible views of the Main Page in the presence of an alarm

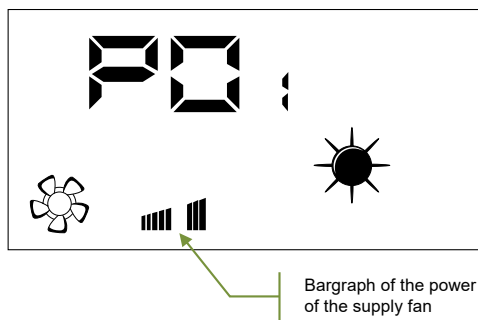
The list of alarms reported by the user interface is indicated in the "Alarms signal" section. Below is a table that identifies other possible signals that may appear during normal functioning:

		Meaning of the indication
		
Fixed	No present	Winter function
Flashing	No present	Anti-freeze
Fixed	Flashing	Winter function + open freecooling bypass
No present	Fixed	Summer function
No present	Flashing	Summer function + open freecooling bypass

6.4 INPUT FAN POWER PAGE

This parameter identifies the functioning power (expressed as a percentage) of the input fan during the Manual and AUX operating mode.

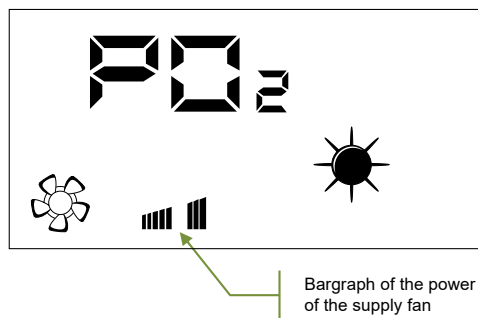
To enter the modification mode, press the key (the entire data  modification phase is highlighted by the flashing of the icon , change the value using the keys  o  and confirm the selection by pressing .



6.5 EXPULSION FAN POWER PAGE

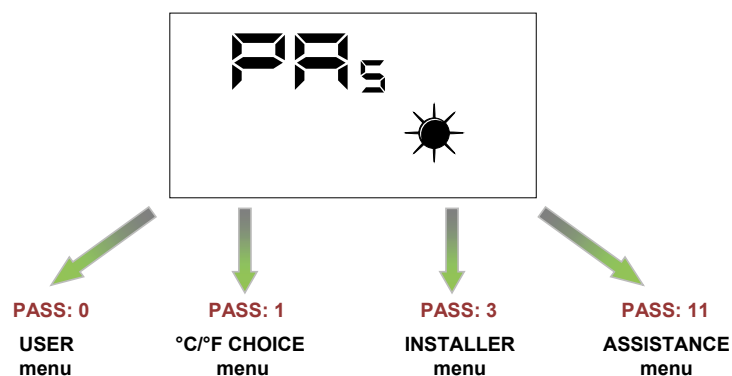
This parameter identifies the functioning power (expressed as a percentage) of the expulsion fan during the Manual and AUX operating mode.

To enter the modification mode, press the key (the entire data  modification phase is highlighted by the flashing of the icon , change the value using the keys  o  and confirm the selection by pressing .



6.6 PASSWORD PAGE

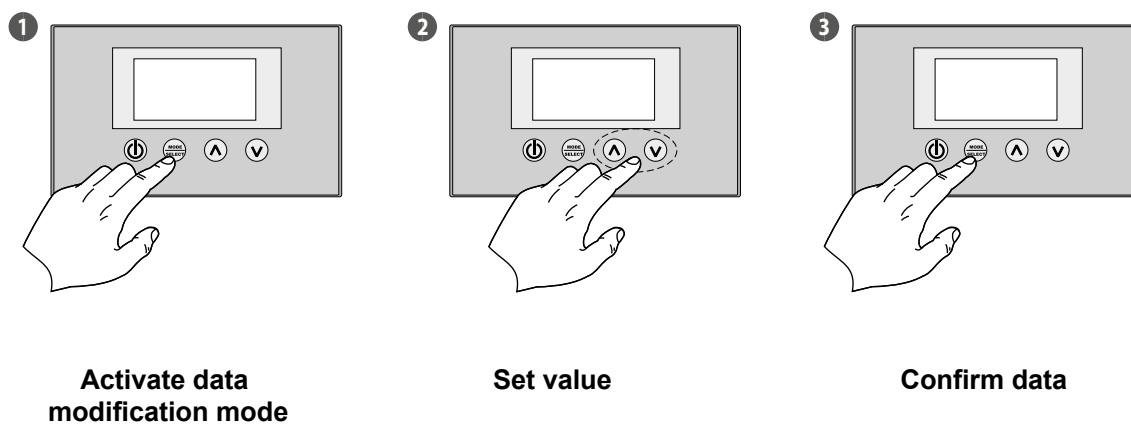
The user can access the submenu parameters through the password setting (see figure below)



NOTICE



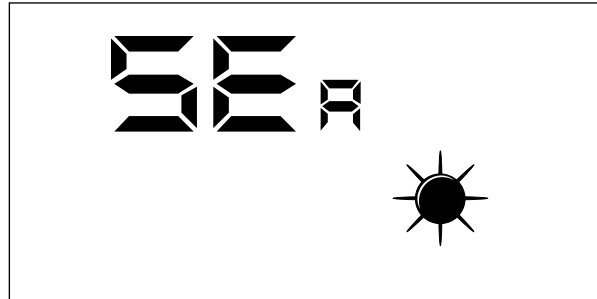
To modify all the parameters present in the user interface firmware, simply follow the sequence of operations shown in the figure:



6.7 USER MENU

6.7.1 SEA Parameter

This parameter is used to select the functioning season of the heat recovery unit.



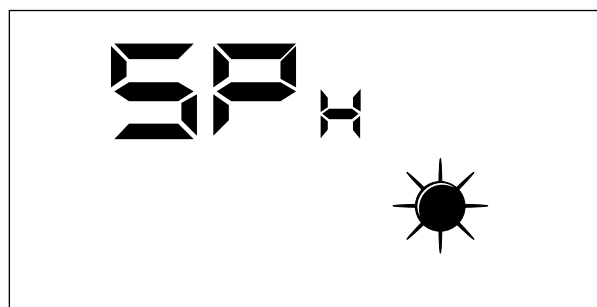
Key:

— SEA: 0 = Summer functioning

— SEA = 1 = Winter functioning

6.7.2 SPH Parameter

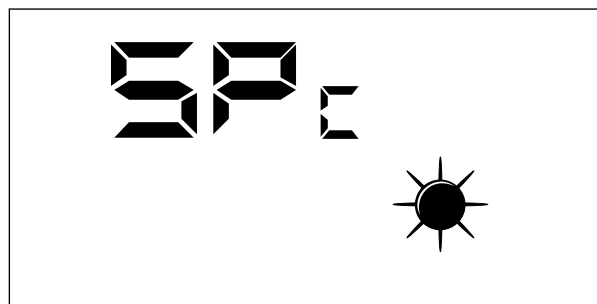
This parameter represents the room temperature set desired in the rooms during the winter functioning. This data is used in the function that manages the activation of the post-treatment resistance.



The range of values allowed for this parameter are: 12.0 - 40.0 °C

6.7.3 SPC Parameter

This parameter represents the room temperature set desired in the rooms during the summer functioning. This data is used in the function that manages the freecooling bypass door.



The range of values allowed for this parameter are: 8.0 - 33.0 °C.

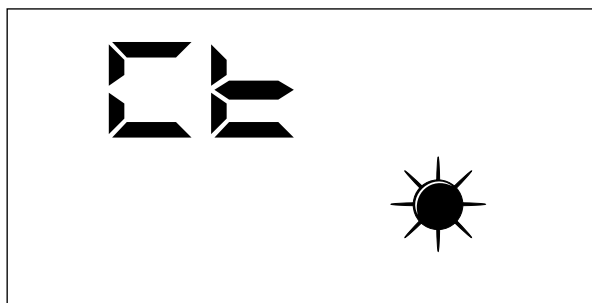
6.7.4 CT Parameter

This parameter (cleaning threshold) represents the threshold, expressed as a percentage, of pollutants in the air above which the modulation of the air flow rate processed by the heat recovery unit intervenes to ensure healthy environments.

NOTICE



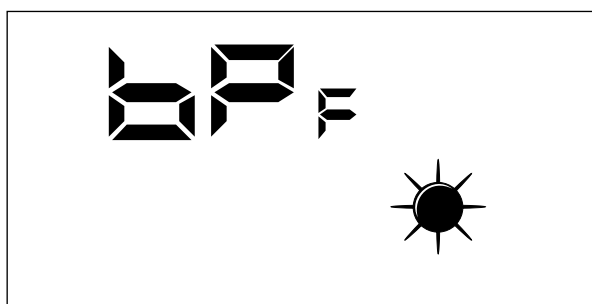
This parameter is only used when the VOC probe is present.



The range of values allowed for this parameter are: 1 ÷ 100%.

6.7.5 BPF Parameter

This parameter enables the user to select the management mode of the freecooling bypass door.



Freecooling bypass management mode:

- BPF: 0 = Freecooling bypass not active
- BPF: 1 = Bypass with 20 minute period (*)
- BPF: 2 = Bypass with 40 minute period (*)

NOTICE

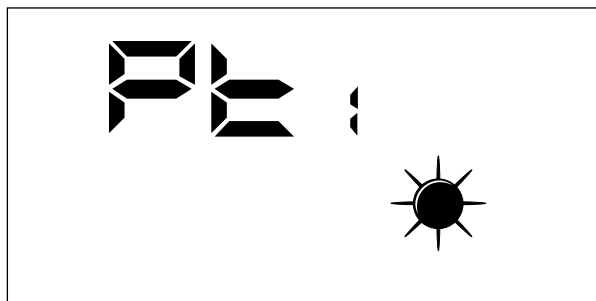


(*) in the presence of a Freecooling damper, the parameter BPF= 1 or 2 indicates active Freecooling.

6.8 INSTALLER MENU

6.8.1 PT1 Parameter

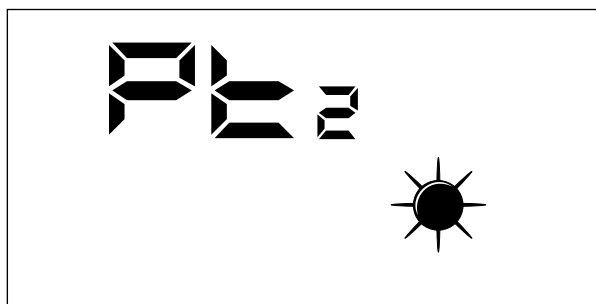
This parameter is the functioning speed (expressed as percentage value) associated with the input fan when intervening on the CE digital input (fan functioning state forcing input).



The range of values allowed for this parameter are: 0 ÷ 100%.

6.8.2 PT2 Parameter

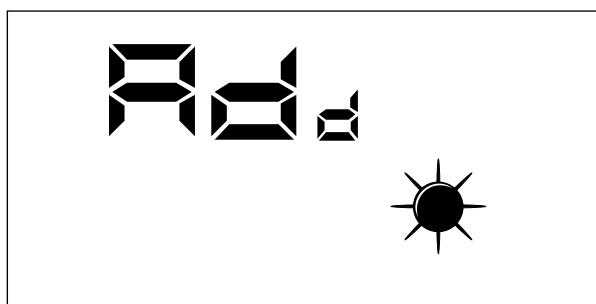
This parameter is the functioning speed (expressed as percentage value) associated with the expulsion fan when intervening on the CE digital input (fan functioning state forcing input).



The range of values allowed for this parameter are: 0 ÷ 100%.

6.8.3 ADD Parameter

This parameter is the serial address of the device for connection to a ModBus RS485 network (the recovery unit can be seen as a slave node of the serial communication).



The range of values allowed for this parameter are: 0 - 255.

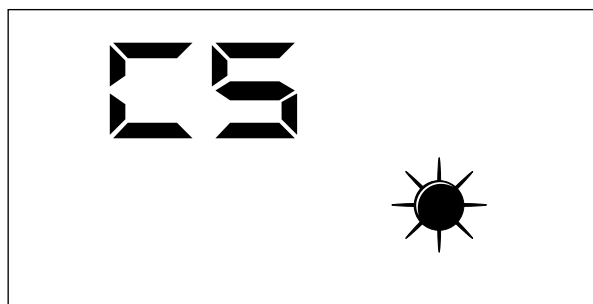
NOTICE



The value "0" must not be considered as a usable modbus address, but as a value that disables the serial port of the control board.

6.8.4 CS Parameter

This parameter allows you to select the type of resistance and/or air post-treatment coil control.

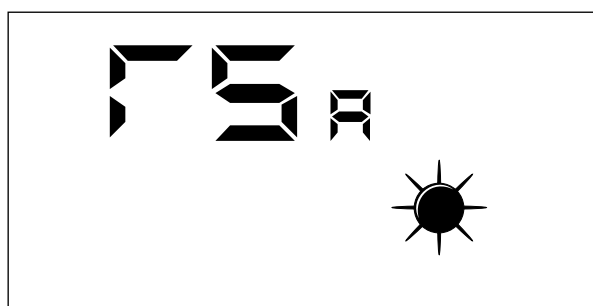


The CS parameter values can be:

- CS: 0 = Control of post-treatment air via coil/resistance according to the air input logic at a predefined setpoint value (SP_c and SP_H)
- CS: 1 = Control of post-treatment air via coil/resistance according to the neutral air input logic

6.8.5 TSA Parameter

This parameter allows you to select the operating cycle of the AUTO mode, which concerns air cleaning (forcing the fans to maximum power).



The TSA parameter values can be:

- TSA: 0 = AUTO cycle period of 30 minutes
- TSA: 1 = AUTO cycle period of 60 minutes

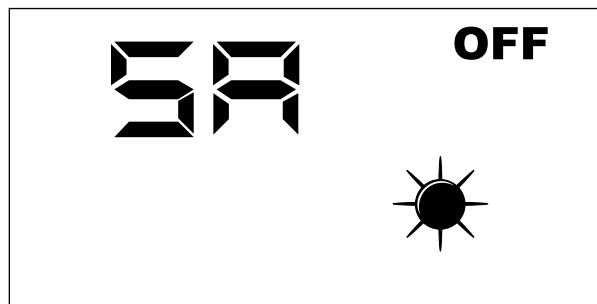
6.9 AFTER-SALES ASSISTANCE MENU

The displays that have been introduced in the after-sales assistance menu are addressed to a competent user who knows the hardware structure and the functioning principles of the recovery unit. The display and iteration of the pages in this section allow you to verify the following recovery unit components during the functional testing or machine start-up:

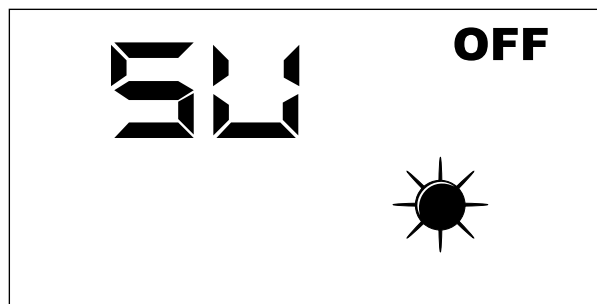
- NTC Probes
- DIP switch setting
- Status of digital inputs
- Forcing of load activation and verification of their functioning

6.9.1 SA Parameter

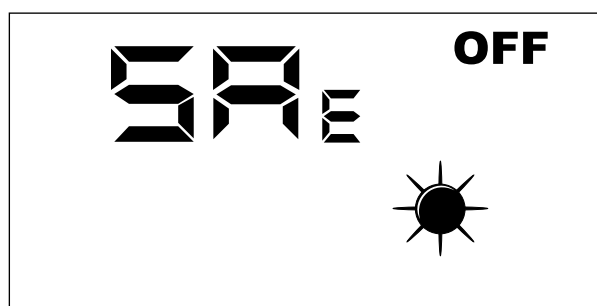
Page for displaying the value detected by the SA probe at room intake.

**NOTICE****Read only parameter.****6.9.2 SW Parameter**

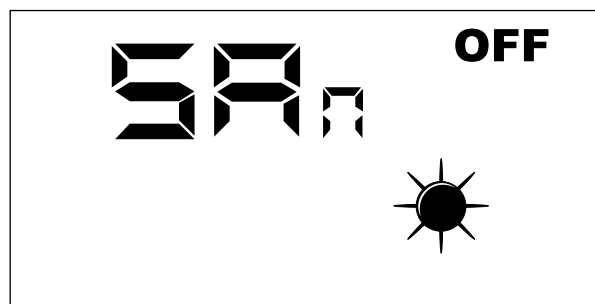
Page for displaying the value detected by the SW probe (accessory) in the post-treatment coil of the air introduced into the rooms.

**NOTICE****Read only parameter.****6.9.3 SAE Parameter**

Page for displaying the value detected by the SAE probe for reading the outdoor air temperature.

**NOTICE****Read only parameter.****6.9.4 SAM Parameter**

Page for displaying the value detected by the SAM probe for reading the temperature of the air introduced into the room.



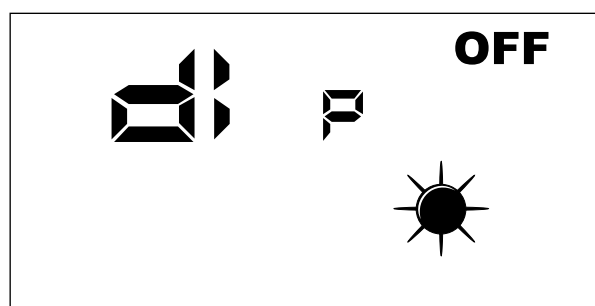
NOTICE



Read only parameter.

6.9.5 DIP Parameter

Page for displaying the setting, in decimal format, of the DIP switches on the circuit board.



NOTICE



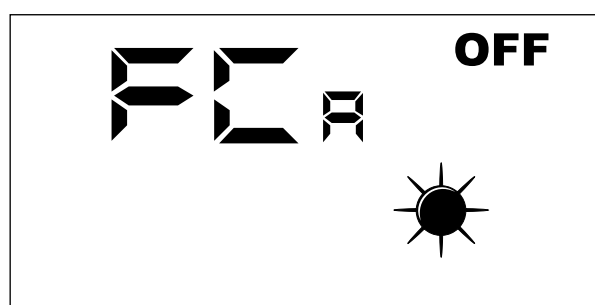
Read only parameter.

6.9.6 INP Parameter

Page not used in this application.

6.9.7 FCA Parameter

Page for the forced activation of the electric loads in the recovery unit and for the reset of the working hours control of the filters.

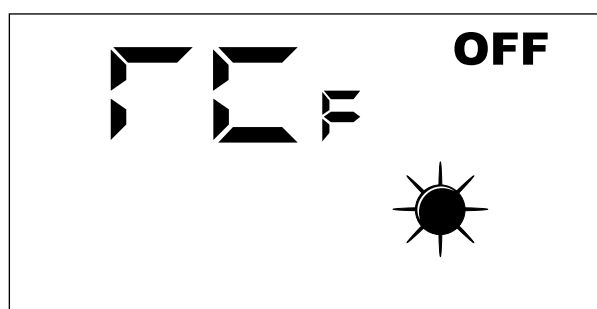


To activate the desired load, the operator must set the associated value (see the table below). The display shows the data set for the entire duration of the forcing (set by default at 5 seconds). At the end of this time, the FCA value goes back to zero and the load switches off.

Correspondence between FCA parameter and manually activated load

FCA Value	Load activated for 5 seconds
1	Fan 1 at maximum speed
2	Fan 2 at maximum speed
3	Reset filter func. hours alarm
4	Not used
5	Not used
6	RXPOST
7	RXPRES
8	LAMP

6.10 °C/°C CHANGE MENU



Key:

— 0 = °C

— 1 = °F


6.11 ALARMS SIGNAL

The user interface panel shows some system anomalies with an alphanumeric string, the following table contains all the alarm signals foreseen in the system.

Alarm code	Description
RL0	No communication between the RepControl board and user interface
RL1	Room air probe present in the faulty interface panel
RL2	NOT USED
RL3	VOC probe alarm
RL4	Faulty SA probe
RL5	Faulty SAM probe
RL6	Faulty SAE probe
RL7	Communication error between master board and slave board
RL8	Filter cleaning

7 OPERATING MODE

7.1 AUTO MODE

This functioning mode involves the renewal of room air using the maximum flow rate of inflow and expulsion fans. In order to activate this procedure the user must press the  Mode/Select key on the interface panel until the "AUTO" icon appears.


The duration of this function depends on the TSA parameter (sanification time) settable from the user interface panel of the machine.

TSA = 0 (30 minutes)

TSA = 1 (60 minutes)

When this time expires, the system goes back to the functioning mode that was set prior to the room cleaning procedure.

7.2 MANUAL MODE

This functioning mode involves the activations of inflow and expulsion fans according to the Po1 and Po2 parameters. In order to activate this procedure the user must press the  Mode/Select key on the interface panel until the "AUTO" and "AUX" icons appear.

The Po1 and Po2 parameters indicate a flow rate percentage (referred to the maximum of the installed fans) to be ensured in a one-hour functioning cycle. These parameters can, therefore, be linked to the air renewal (moved air volume) that is to be ensured to the room.

The control will provide a constant functioning reference such as to ensure a constant instantaneous flow rate:

$$\text{PISTx} = \text{Pox} * \text{PMAX}$$


Key:

PISTx: inflow or expulsion instantaneous flow rate

Pox: it can be Po1 or Po2 depending on whether it is the inflow or expulsion fan

PMAX: maximum fan flow rate

7.3 AUX MODE

This functioning mode is entirely similar to manual mode, but allows the user to enable any resistive loads present in the machine for the anti-freeze function and production of neutral air (the inflow air temperature must tend to that of the expelled air). In order to activate this procedure the user must press the  Mode/Select key on the interface panel until the "AUX" icon appears

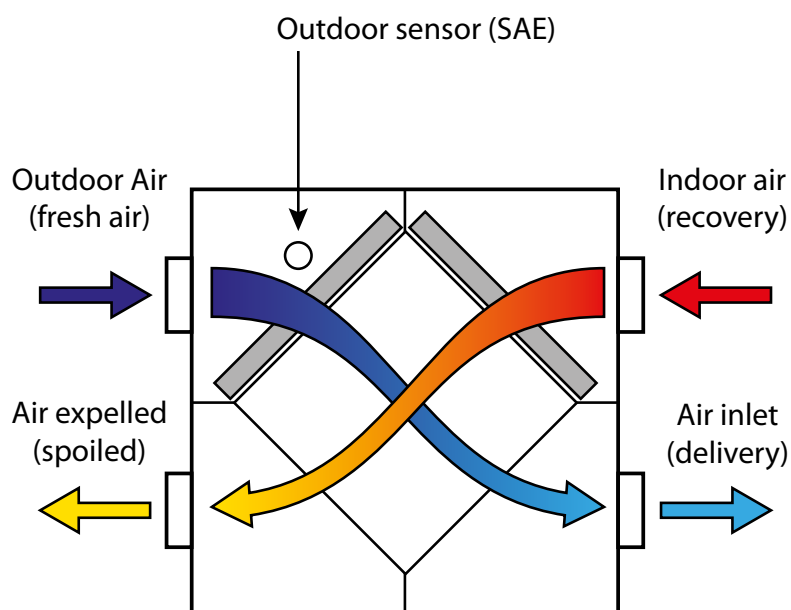
8 CONTROL LOGIC

The table below highlights the control logics enabled for each heat recovery unit functioning mode:

FUNCTION	OPERATING MODE		
	Auto	Manual	Aux
Anti-freeze through flow rate modulation	x	x	x
Anti-freeze through electric resistance			x
Freecooling		x	x
Steriliser lamp activation	x	x	x
Coil control for air post-treatment	x	x	x
Post-treatment coil modulating valve management	x	x	x
Resistance control for air post-treatment			x
Room air cleaning function	x		
CF contact ventilation forcing		x	x
Door modulation via VOC probe signal		x	x

8.1 ANTI-FREEZE THROUGH FLOW RATE MODULATION

During winter functioning, the recovery unit provides for the modulation of the air flow rate introduced so as to prevent the formation of frost in the exchanger and the extension of the operating limit up to -10 [°C] of outdoor air.



NOTICE

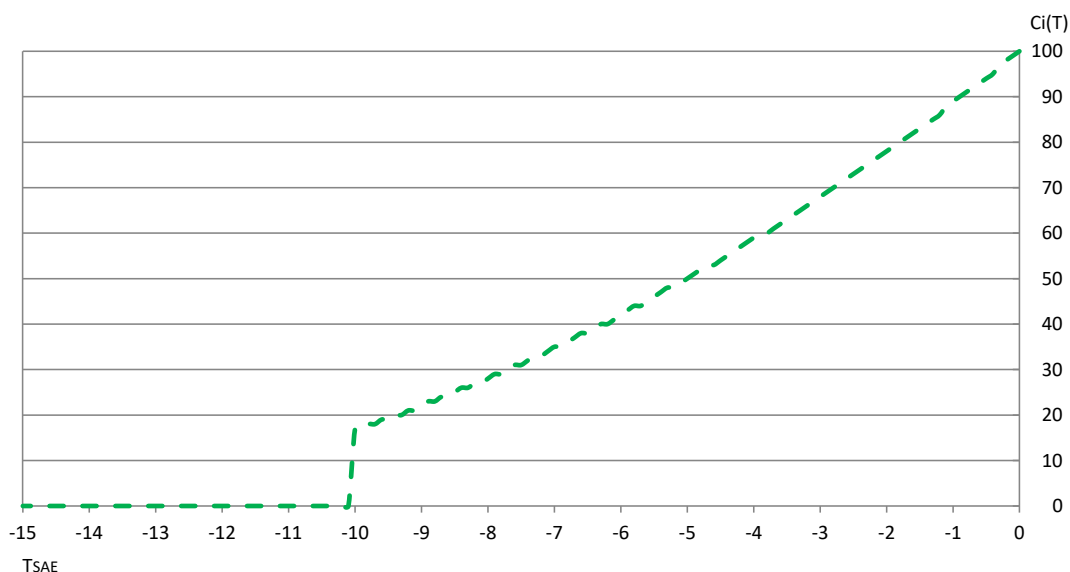


The image shows the unit RPLI, but only for illustrative purposes. The operating logic remains unchanged.

The fresh flow rate modulation is functionally linked to the TSAE according to the following relationships:

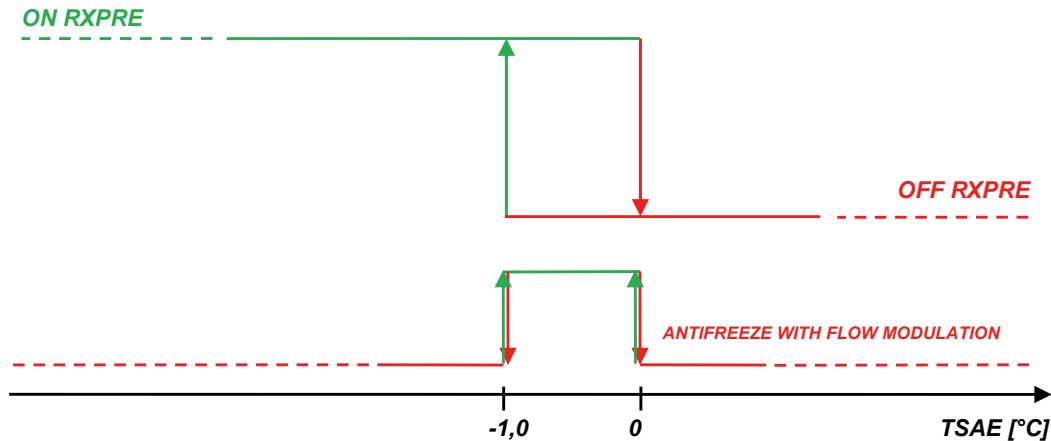
$$PI = Po1 * PMAX * Ci(T)$$

Where "Ci" is the correction of the inlet flow rate in relation to the outdoor air temperature (curve highlighted in the following paragraph)



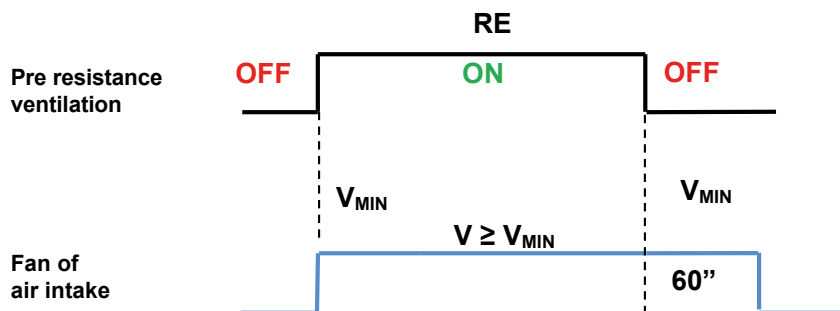
8.2 ANTI-FREEZE THROUGH ELECTRIC RESISTANCE

The heat recovery units that require the presence of the pre heating electric resistance (DIP 2: ON) can integrate the anti-freeze function seen previously, by activating the electric load in relation to the outdoor air temperature and the operating mode. As previously mentioned, the resistive electric loads can only be enabled during the AUX operating mode.



The previous figure shows the activation thresholds of the pre heating resistance.

To reduce overheating risks, the logic for switching on the resistance requires a post-ventilation time period in relation to its switch-off. The following figure shows these timings.



Ventilation logics in the presence of electric heaters

As shown in the diagram indicating the pre heating resistance activation thresholds, there are outdoor air temperature ranges in which the electric resistance is forced to OFF, under these functioning conditions, the recovery unit anti-freeze is equally ensured through the modulation of the input air flow rate. Therefore, this control is disabled with the activation of the RXPRES.

8.3 FREECOOLING

The regulation logic provides for the cooling function through the intake of untreated outdoor air, this function can only be performed through air intake and exhaust cycles if there is no expansion.

If the second electronic module is present, the free cooling function can be managed in two different ways according to customer requirements and can be selected via DIP 3 in the expansion.

- DIP 3 at ON => freecooling by opening the freecooling bypass damper
- DIP 3 at OFF => freecooling through air input and ejection cycles

For the freecooling function to activate, the regulation must instantly control the 3 variables:

- ROOM TSET: room set
- T_{SAE}: outdoor air temperature
- T_{AMBIENTE}: room temperature

If the indoor temperatures exceed the set and, if the T_{SAE} is lower than the TSET, the recovery unit tends to restore the conditions wanted by the user through the inlet of untreated outdoor air, to meet this requirement the control board provides for:

1. (DIP 3 Slave expansion in OFF and absence of Slave expansion) alternating operation cycles of intake and exhaust fans. The functioning period of the fans can be 20/40 minutes and can be selected through the BPF parameter.

2. (DIP 3 Slave expansion in ON) activation of the freecooling bypass damper

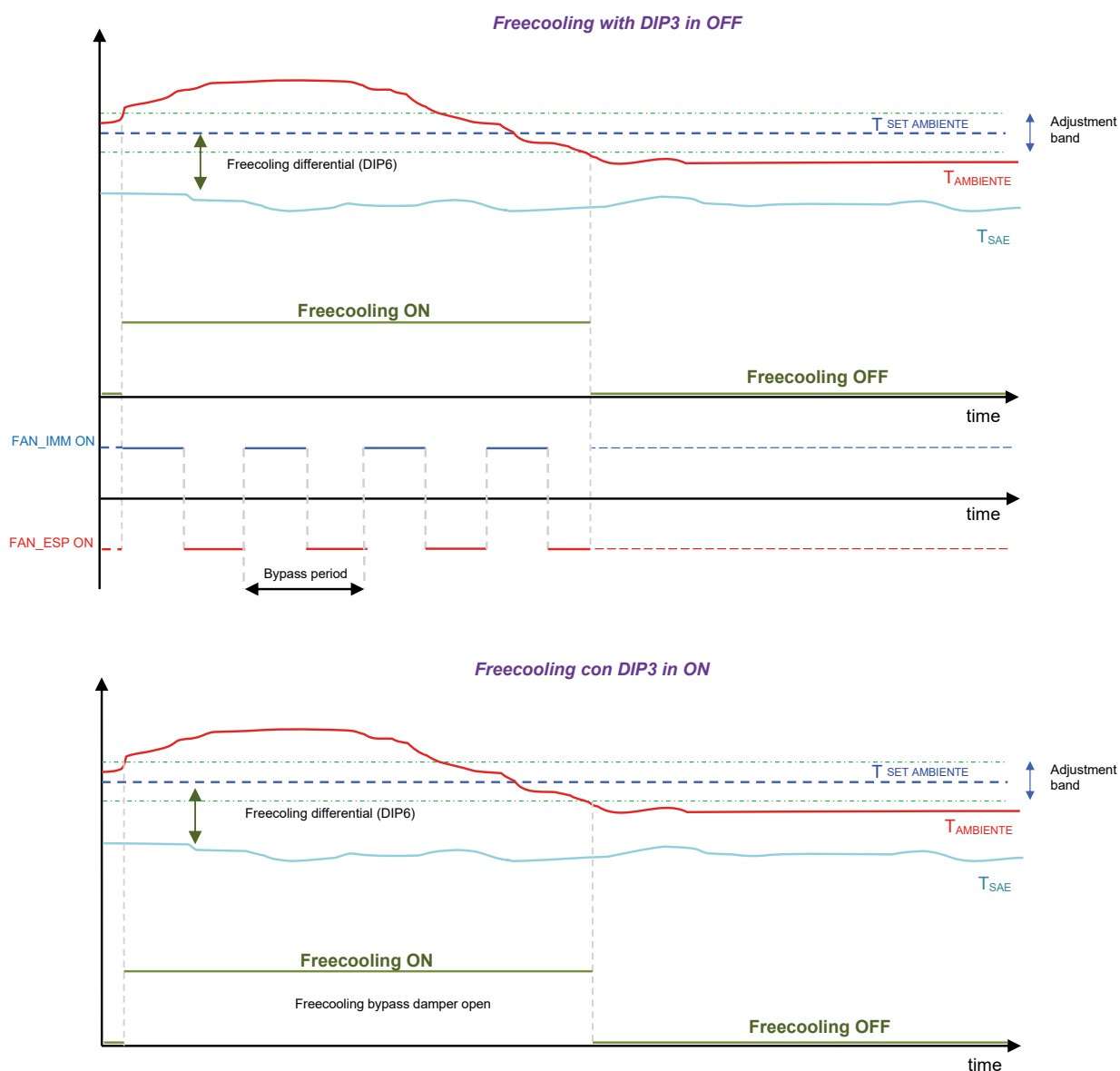
8.3.1 Winter Freecooling

To enable winter Freecooling, DIP switches 9 and 10 on the slave board must be activated (refer to Table "5.4 Freecooling thresholds in winter mode [on page 10](#)").

During all winter operation, the regulator checks the outdoor air temperature and disables the cooling procedure if "TSAE" falls below the threshold selected with the DIP switches.

A master+slave configuration is required for winter Freecooling.

Freecooling operation

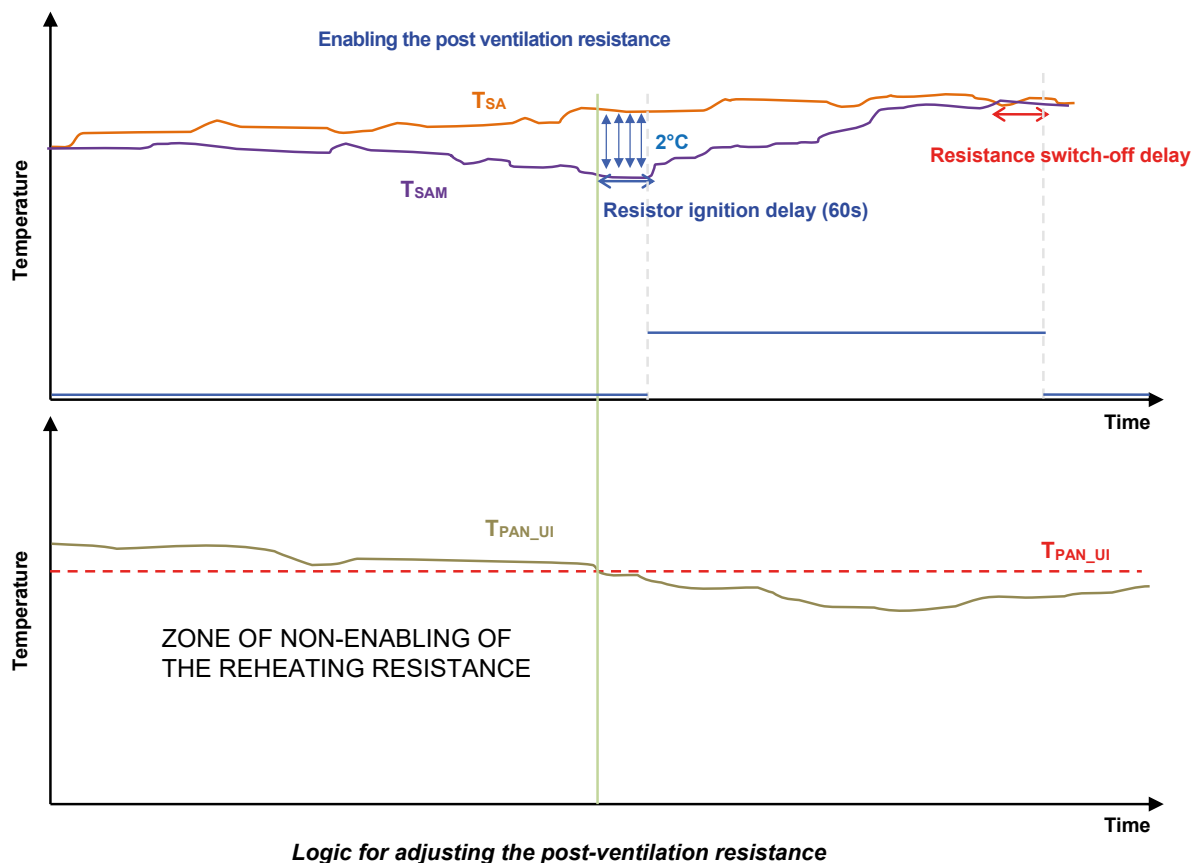
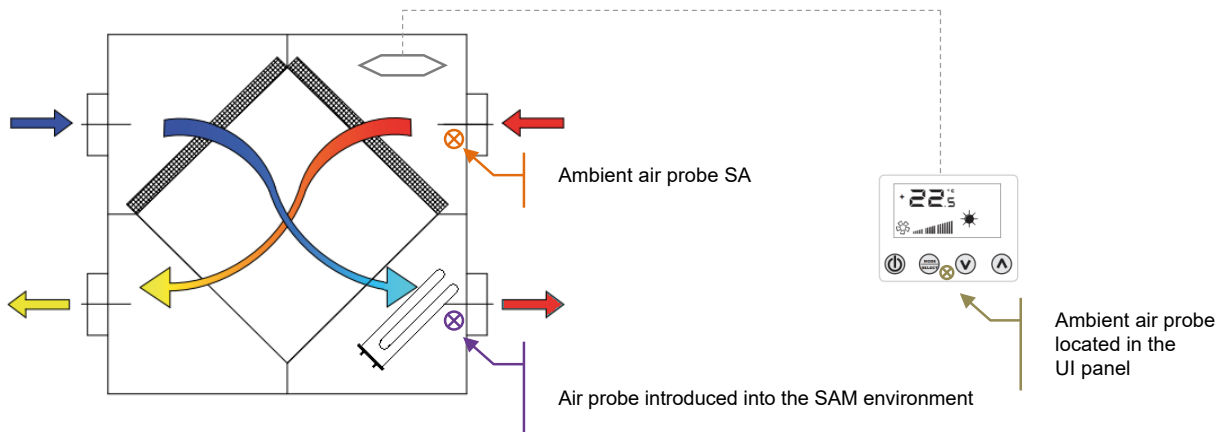


8.4 STERILISER LAMP

The air purification accessory is turned on when the inlet fan is activated to ensure sanitising of the air flowing into the environment.

8.5 POST-TREATMENT RESISTANCE

The post-treatment resistance (DIP 1: On) can be used by the recovery unit during winter functioning to further treat the air introduced into the room to avoid unwanted cooling phenomena.



NOTICE



The image shows the unit RPLI, but only for illustrative purposes. The operating logic remains unchanged.

To enable the functioning of the post ventilation resistance, the user must work on the user interface panel by setting the AUX mode. The electronic board verifies the presence of any post treatment coil of the air and performs the following check:

- if DIP5: ON = enable the RXPOST if there are insufficient water conditions
- if DIP5: OFF = no condition in relation to the water state

This inspection is intended to make the recovery unit use the heat source with greater thermal efficiency.

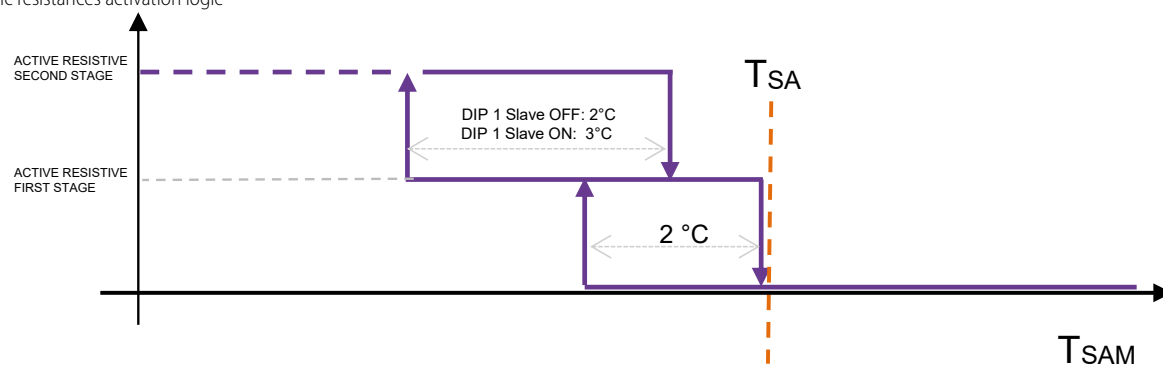
Neutral air input mode ($\zeta S = 1$)

The control, when conditions permit and if the parameter ζS is set to 1, tries to supply “neutral air” into the room while maintaining the T_{SAM} close to the value of T_{SA} . The constraint to be observed concerns the T_{SA} temperature which must not exceed the room setpoint value. This forcing is dictated by the principle that the post ventilation resistance must not be used to heat the rooms and by a safety device in the control that tries to avoid continuous “tracking” of the T_{SA} .

It should be noted that even in this functioning mode, the activation logic of the post-treatment resistance requires a post ventilation phase in relation to its deactivation.

To control the post-treatment resistive load, the regulator will be able to control the activation of the two electric loads in order to modulate the supplied heating capacity. The activation of the electric loads follows the logic described in the following figure:

Electric resistances activation logic

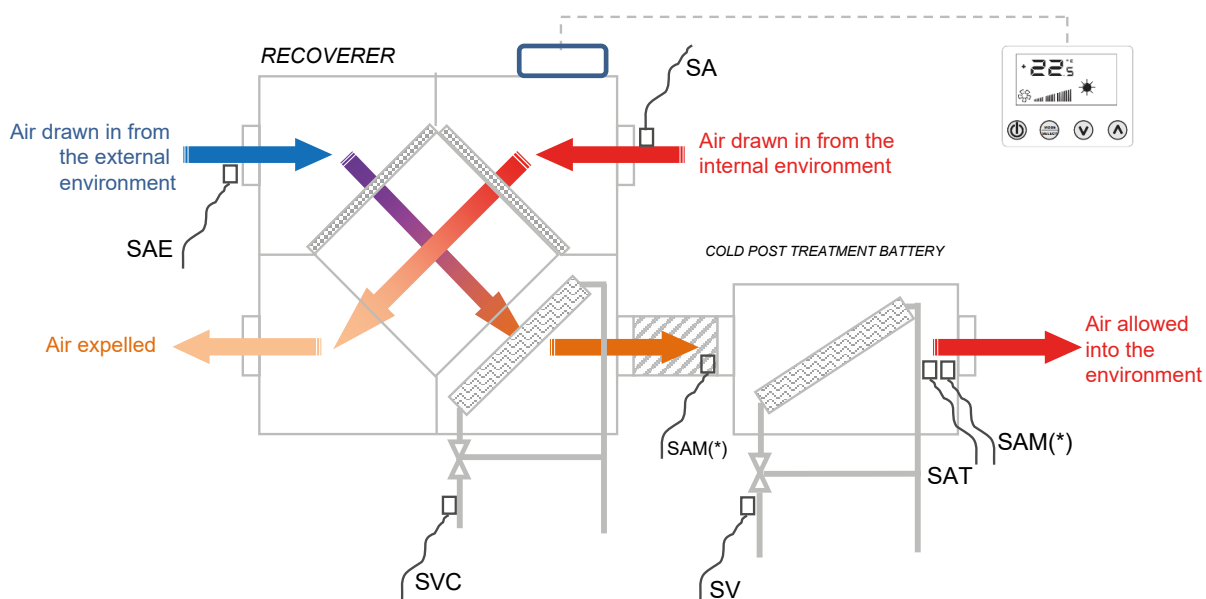


Air input mode at a certain temperature set ($\zeta S = 0$)

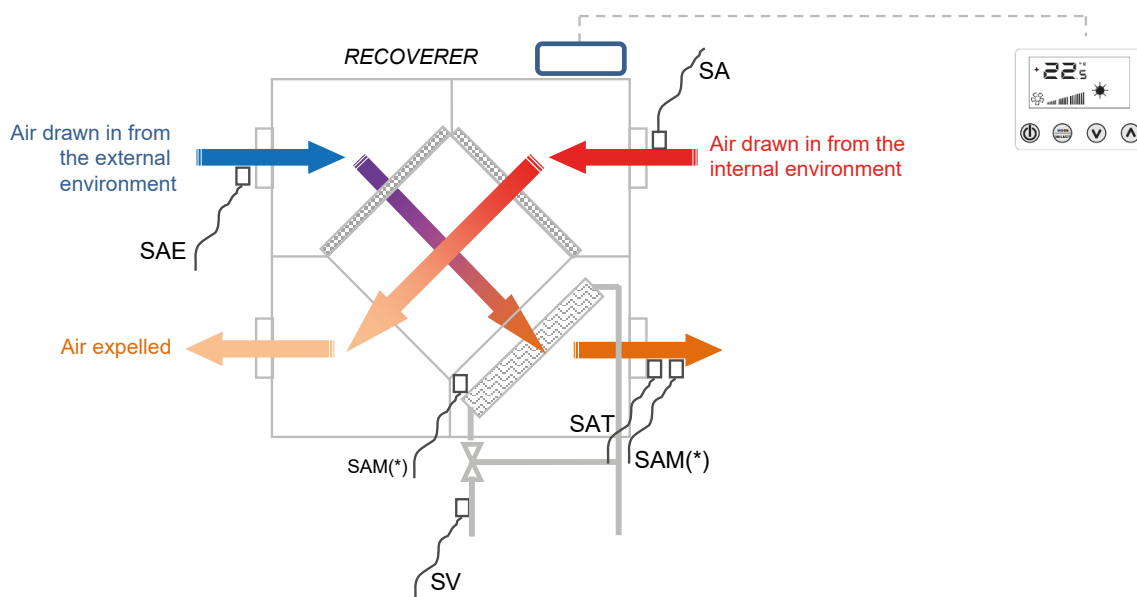
If the parameter ζS is set to 0, the control tends to manage the activation of the electrical load so that the temperature of the input air (temperature detected by T_{SA}) approaches the setpoint indicated by the parameter SPH . The conditions for the management of electrical loads mentioned in the previous paragraph are also complied with in this air post-treatment control mode.

8.6 POST TREATMENT COIL

They can be used by the recovery unit through the post-treatment coils to treat hot/cold air ensuring the introduction of neutral air inside the rooms to be cooled.



example of installation with two post treatment batteries



example of installation with a single post treatment battery

NOTICE



(*) In special installations, in order to avoid problems with the positioning of the temperature sensor, it is permissible to install the "SAM" temperature probe in the air flow duct near the "SAT" probe. Even in this case, the proper functioning of the unit is guaranteed.



The image shows the unit RPLI, but only for illustrative purposes. The operating logic remains unchanged.

The above figures show the two possible solutions for managing the fresh air, where:

— DIP5 ON and DIP6 ON (Slave Board) = internal coil for heating and external coil for cooling (or 4-pipe system).

— DIP5 ON and DIP6 OFF (Slave board) = internal coil for heating and cooling (2-pipe system).

Neutral air input mode ($\Sigma 5 = 1$)

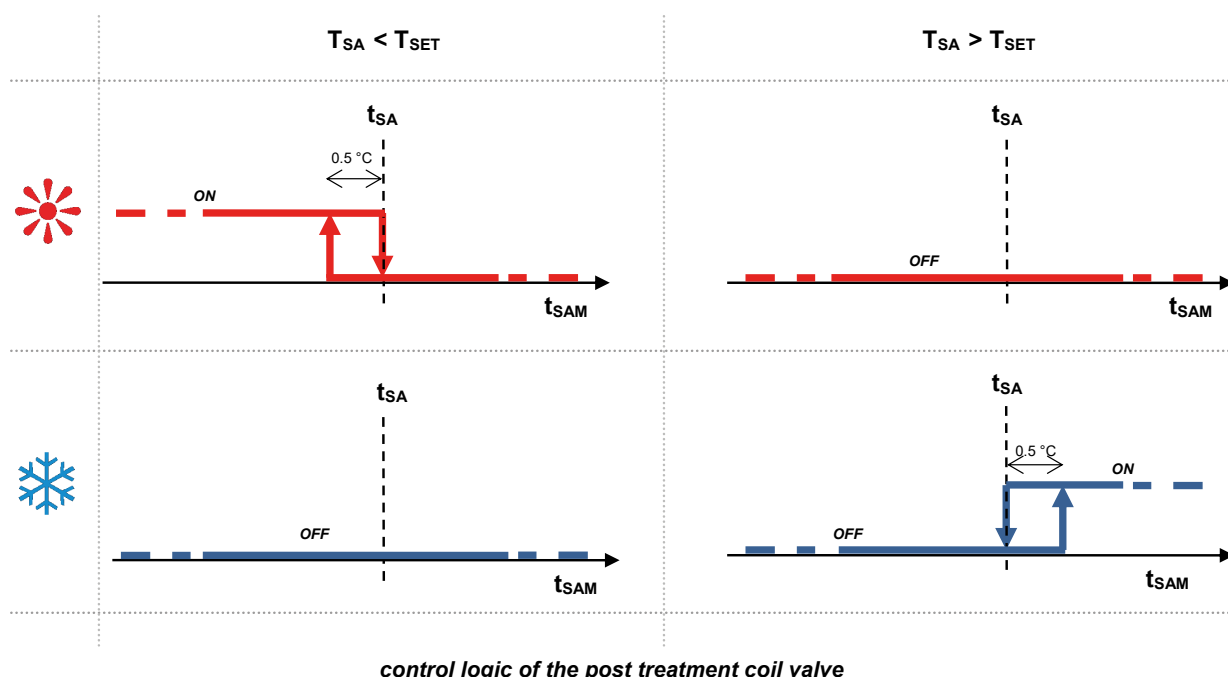
The regulator attempts to supply “neutral air” into the room while maintaining the T_{SAM} close to the value of T_{SA} in both functioning seasons. Even with the use of post-treatment coil, the condition of “neutral air input” must be observed.

NOTICE



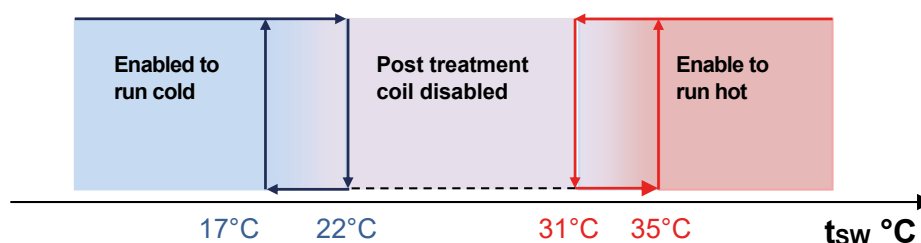
The recovery unit must only be used to treat the air (exchange) and not for cooling the rooms.

The activation of the coil valve follows the logic described in the previous figure.



To avoid inefficient use of the post-treatment coil, especially during winter operation, the recovery unit monitors the water temperature through SV and SVC probes (hot side in 4-pipe systems) that can be installed upstream or downstream of the valve.

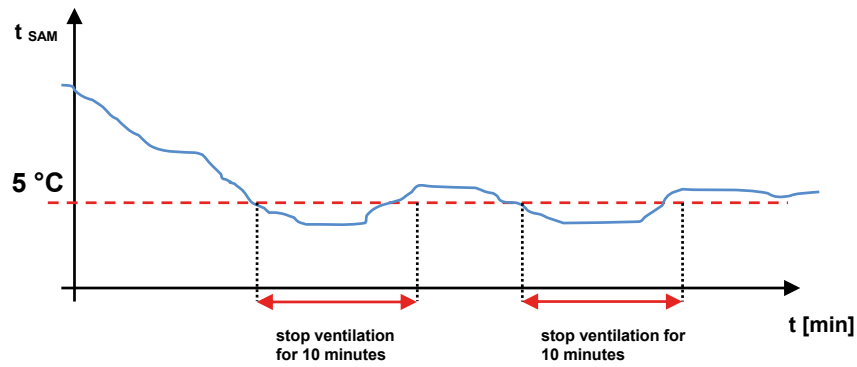
The water status check always takes place 3 minutes after the valves have been activated and the suitability thresholds are shown in the following figure.



If the water temperature is found to be unsuitable, the regulator forces the valve off for four minutes. At the end of this “Force OFF” valve interval, the stand-by cycle for water status determination is resumed.

During winter functioning, the system provides for an anti-freeze control of the post-treatment coil in relation to the temperature detected by the SAM probe:

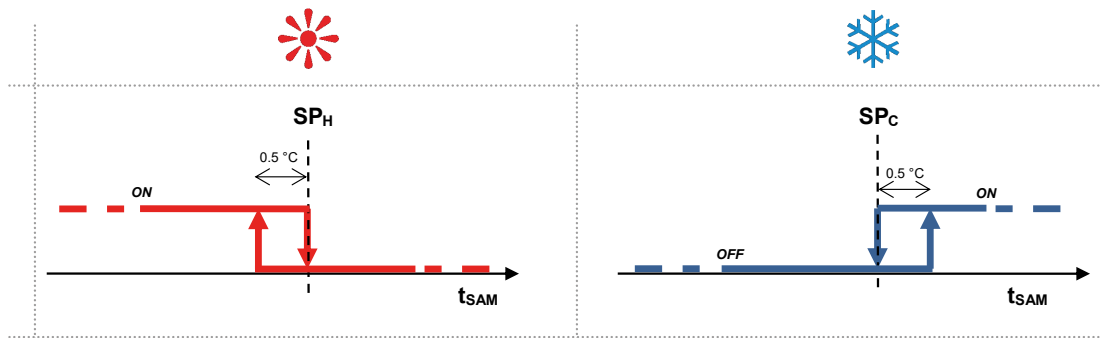
$t_{SAM} < 5\text{ °C}$ = recovery unit ventilation block for 10 minutes.



ventilation cycles in anti-freeze conditions

Air input mode at a certain temperature set ($\zeta S = 0$)

If the parameter ζS is set to 0, the regulator attempts to manage the air post-treatment coils to ensure an outlet air temperature set by the setpoint SP_H (in winter mode) and SP_C (in summer mode).

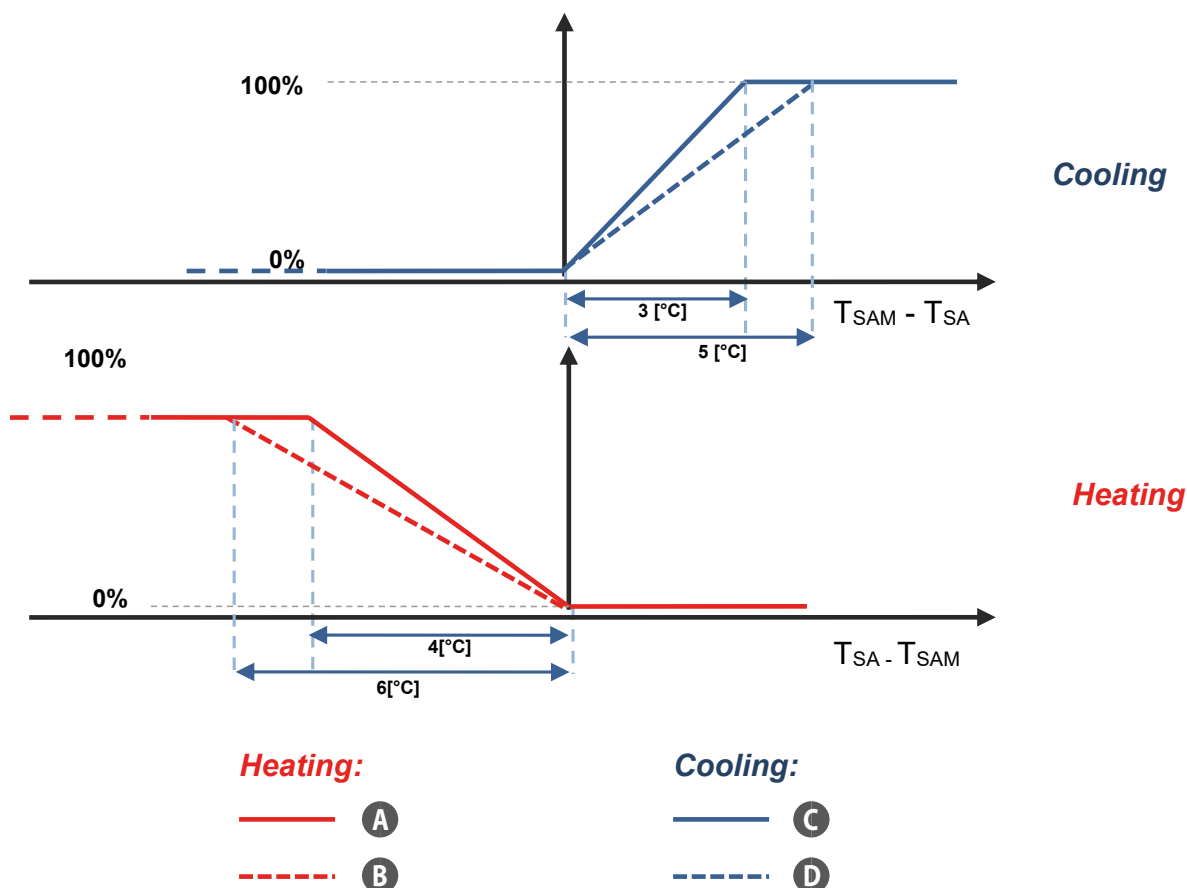


8.7 MODULATING VALVE OPERATION

As can be seen from the wiring diagram, the slave HRB module can manage on/off valves and modulating valves simultaneously.

The operating curves of actuators accepting a 0-10 V signal are described in the figure below.

Check of the modulating valves



- A** Hot branch valve operating curve with DIP 7 (Slave module) in OFF position
- B** Hot branch valve operating curve with DIP 7 (Slave module) in ON position
- C** Cold branch valve operating curve with DIP 8 (Slave module) in OFF position
- D** Cold branch valve operating curve with DIP 8 (Slave module) in ON position

8.8 VENTILATION MODULATION

To optimise the power consumption required for the air exchange in rooms, the regulator HRB, in the presence of a VOC probe, can activate an air flow modulation function in relation to air quality.

This function can be used:

1. In the presence of the VOC probe
2. When the regulator is operating in manual or AUX mode.

The algorithm provides for a one-minute interval:

- To increase the flow rate of intake and exhaust air if the air quality data (expressed in %) is higher than the threshold value set in parameter "L E".
- Gradually bring the flow rate of intake and exhaust air back to the values defined by the parameters P01 and P02 if the air quality data (expressed in %) is below the threshold value set in parameter "L E".

Benefits of the function: energy saving and acoustic comfort as intake and exhaust flow rates can be parameterised (parameters P01 and P02) at very low values that ensure minimal turnover.

Only when the rooms have occupancy and utilisation conditions that make the room air unhealthy and with pollutant gas concentrations above the desired threshold is the flow rate of air processed by the recovery unit increased.

9 SUPERVISION SERIAL

This adjustment standard requires the management of the RS485 serial with which they can be connected as slave to a modbus network. The communication parameters are:

- Modbus RTU
- Baud Rate 19200 bit/s
- Stop bits 2
- No Parity

The following modbus data can be read/written by a supervision system:

Modbus variables in the application

LABEL	Description	Use		Values		Unit	ADD
		0x03	0x10/0x06	Min	Max		
STATO_BMS	Machine status	Yes	Yes	0	1	---	0
MODE_BMS	Locally set functioning mode value	Yes	Yes	1	3	---	1
SEASON_BMS	Operating season	Yes	Yes	0	1	---	2
POW1_BMS	Parameterised fan 1 power	Yes	Yes	0	100	%	3
POW2_BMS	Parameterised fan 2 power	Yes	Yes	0	100	%	4
SETC_BMS	Cold adjustment setpoint value	Yes	Yes	80	330	°C/10	5
SETH_BMS	Hot adjustment setpoint value	Yes	Yes	120	400	°C/10	6
FREECOOLING_BMS	Freecooling Parameter	Yes	Yes	0	2	---	7
VOC_THRESHOLD	VOC activation threshold	Yes	Yes	0	100	%	8
SA_BMS	Exhaust ambient air probe	Yes	No	-99	700	°C/10	9
SAE_BMS	External air sensor	Yes	No	-99	700	°C/10	10
SAM_BMS	Intake air probe	Yes	No	-99	700	°C/10	11
SAEXIT_BMS	Exhaust outdoor air probe	Yes	No	-99	700	°C/10	12
VOC_BMS	Air quality probe	Yes	No	0	100	%	13
SV_BMS	Water probe (4-pipe cold side)	Yes	No	-99	700	°C/10	14
SVC_BMS	Water probe (4-pipe hot side)	Yes	No	-99	700	°C/10	15
SAT_BMS	Air probe after the coil	Yes	No	-99	700	°C/10	16
SINT_BMS	Value read by the probe in the user interface	Yes	No	-99	700	°C/10	17
HH_FILTRO	Filter operating hours	Yes	No	0	65536	Hours	18
ALARM_BMS	Alarms found on the recovery unit	Yes	No	0	127	---	19
DIP_BMS	DIP switch configuration	Yes	No	0	1023	---	20
DIP_EXP_BMS	Expansion board DIP switch configuration	Yes	No	0	1023	---	21
DIGIN_BMS	Status of digital inputs	Yes	No	0	119	---	22
RELE_BMS	Status of electronic board relays	Yes	No	0	119	---	23
OUT_A01_BMS	Analogue output A01	Yes	No	0	100	%	24
OUT_A02_BMS	Analogue output A02	Yes	No	0	100	%	25
OUT_A01_EXP_BMS	Analogue output exp A01	Yes	No	0	100	%	26
OUT_A02_EXP_BMS	Analogue output exp A02	Yes	No	0	100	%	27
S_V_BMS	Software version	Yes	No	0	999	---	28
PT1_BMS	Fan 1 power from PT1 parameter	Yes	No	0	100	%	29
PT2_BMS	Fan 2 power from PT2 parameter	Yes	No	0	100	%	30
TSA_BMS	Selection of ambient air cleaning time 0 -> 1/2 hour 1 -> 1 hour	Yes	No	0	1	---	31

NOTICE



Each data modification made by BMS is followed by the storage in eeprom of the value.

STATO_BMS

The variable "BMS_STATUS" indicates the enable status of the regulator and can take on two values:

- 0: Not enabled to function
- 1: Enabled to function

MODE_BMS

The variable "BMS_MODE" represents the operating mode of the regulator and can take on three values:

- 1: Manual mode
- 2: AUX mode (enabling electrical loads)
- 3: AUTO mode

SEASON_BMS

The variable "BMS_SEASON" indicates the operating season of the regulator and can take on two values:

- 0: Summer functioning mode
- 1: Winter functioning mode

POW1_BMS

The variable "BMS_POW1" represents the operating speed at which you want the inlet fan to work when in manual or AUX mode.

POW2_BMS

The variable "BMS_POW2" represents the operating speed at which you want the exhaust fan to work when in manual or AUX mode.

SETC_BMS

The variable "BMS_SETC" represents the operating setpoint used by the regulator to interrupt the use of the post-treatment coil during summer operation.

SETH_BMS

The variable "BMS_SETH" represents the operating setpoint used by the regulator to interrupt the use of the post-treatment coil or electric resistances during winter operation.

FREECOOLING_BMS

The variable FREECOOLING can take 3 values:

- 0: Freecooling not enabled
- 1: Freecooling enabled and in the case of freecooling on flow alternation, the 2-minute running period is imposed
- 2: Freecooling enabled and in the case of freecooling on flow alternation, the 4-minute running period is imposed

ALARM_BMS

The variable "BMS_ALARM" indicates the faults in the system, with each bit being associated with a precise indication:

- Bit 0: Filter cleaning or pressure switch input alarm
- Bit 1: Communication alarm with slave board
- Bit 2: Outdoor air probe alarm
- Bit 3: Intake air probe alarm
- Bit 4: Exhaust air probe alarm
- Bit 5: VOC probe alarm

DIGIN_BMS

The variable "BMS_DIGIN" indicates the status of the digital inputs on the master and slave boards, with each bit being associated with a precise indication:

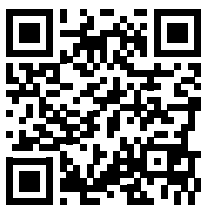
- Bit 0: DI1 master board
- Bit 1: DI2 master board
- Bit 2: Master board key status
- Bit 8: DI1 slave board
- Bit 9: DI2 slave board
- Bit 10: Slave board key status

RELE_BMS

The variable "BMS_RELAY" indicates the status of the digital inputs on the master and slave boards, with each bit being associated with a precise indication:

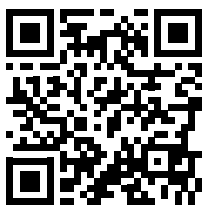
- Bit 0: Relay 1 master
- Bit 1: Relay 2 master
- Bit 2: Relay 3 master
- Bit 8: Relay 1 slave
- Bit 9: Relay 2 slave
- Bit 10: Relay 3 slave

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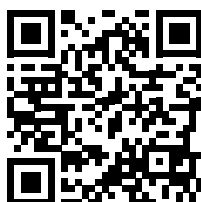
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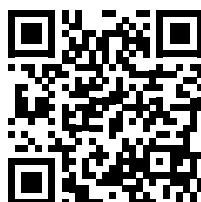
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