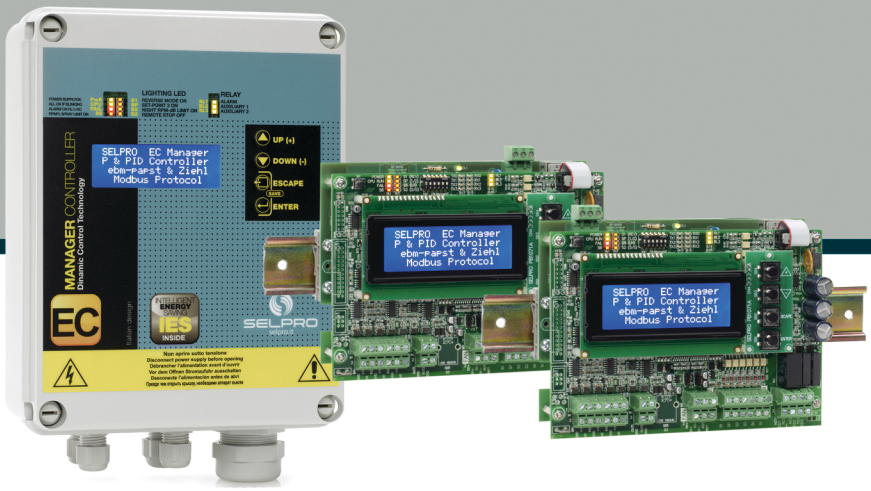

ECM

MULTIPURPOSE CONTROLLERS FOR EC FANS WITH MODBUS OR 0–10 V CONTROL

Instruction manual | v. 2.02-2

PPECMEN-R02.02-2

Instructions translated from the original

Carefully read every part of this manual. You will find useful information to take full advantage of the product's potential, use it safely and obtain the best results.

RECORD YOUR SYSTEM PARAMETERS!

A space is provided in each parameter table to note set values

SELPRO

Fan Speed Controllers Specialist

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Getting started

Obligations with this instruction manual



This manual is an integral part of the product and must be kept for its entire working life. It must be consulted for all situations related to configuration, use, and maintenance. For this reason, it must always be accessible to the operators.

Instruction manual limits

This manual is intended for the sole device and not for the entire plant! It has been drafted carefully and the consistency between the manual and the product has been verified. Any inconsistencies, errors or omissions must be reported to SELPRO Srl who will integrate them in a new version.

Online manual availability

This instruction manual can be downloaded from the www.selpro.it website. SELPRO Srl reserves the right to keep online information updated to improve use and clarity. In the event of discrepancies between this printed document and the online version, always refer to the latter.

Instruction manual updates

Publication date	Code	Firmware version	Updates
FEB 2024	PPECMEN-R02.02-2	8.0	Function modified for **SW1** switch 2 to set up the display of the temperature and pressure values with Imperial units of measure (°F and psi). Added RS458 Modbus signal for reading/writing data to the EC fan command system that uses 0-10 V signal.
APR 2022	PPECMEN-R02.02-1	7.3	Modified operation switch 2 of **SW1** from "dead band activation" to "fan emergency speed activation". Addition of new status messages in "Home page with Modbus fan control" on page 64 and "Home page with fan 0–10 V output fan control and reading/writing data by Modbus" on page 65. Modified topic order in chapters "Special functions" on page 53 and "Set the common and special functions" on page 96 Modified options for parameters **C7** and **C8** from **output SLAVE 1-10 V** to output **SLAVE 0.75-10 V**. Modified high switching threshold value for Slave Safety mode from 23 mA to 23.5 mA. Other minor changes.
JAN 2022	PPECMEN-R02.02-0	7.1	Recognition of software version on ebm-papst fans enabled and consequent Modbus-0-10V switching management. Updated correlated documents. Updated chapter "Conformity" on page 109 Added “SafeSlave KO” message in the note in "Alarm signal" on page 104 Added image in "Product identification" on page 11 Replace the wording “PC-host” and “supervisor” with “PC-BMS”-
APR 2021	PPECMEN-R02.01-2	6.6	Updated correlated document. Corrected description for TX0, TX1, RX0, and RX1 in "Modbus communication LED" on page 17 Added paragraph "Interrogation frequency from PC-BMS" on page 23 Deleted potentiometer from the illustration in "Connection IN3 for operation in Slave Safety mode" on page 32 Timed cleaning and timed washing of the heat exchanger functions only for ebm-papst fans Updated relay RL1 load data
FEB 2020	PPECMEN-R02.01-1	6.6	First publication

Models described by the manual

This manual applies to the following models:

ECM 230-460 V with IP55 ECM housing
ECM 230-460 V IP00 for DIN Omega or DIN G bars
ECM 20-24 V IP00 for DIN Omega or DIN G bars

Related documents

Document	Code	Date	Format
Instruction manual (this manual)	PPECMEN-R02.02-2	FEB 2024	hard copy
MODBUS parameters specification for “ebm-papst series 84/112/150/200” V.5.00	Alg000566818_ENG	Mulfingen 2007-2010 10th May 2016	hard copy PDF on line
MODBUS parameter specification for “ebm-papst product range” V6.3 Excerpt	-	Mulfingen 2007-2020, July 9, 2020	hard copy PDF on line
Description MODBUS Communication EC blue MODBUS	L-BAL-E076-GB 1517 Index 013	-	hard copy PDF on line
Ziehl-Abegg AM-MODBUS/AM_MODBUS-W, Communication Module for ECblue fans	L-BAL-E075-GB 1012 Index 002	-	hard copy PDF on line
Description MODBUS Communication EC Blue BASIC_MOSBUS Software version: EC blue firmware from 1.00	L_BAL_E311_GB 1934 Index 001	-	hard copy PDF on line
MODBUS (RTU) Description & Connections ECM from release SW 6.5 Version 3.15	-	NOV 2021	Hard copy PDF online

Style conventions

Following are a few style conventions used in this manual:

Path to reach the starting point of the procedure described or to enable the necessary settings to activate the described function. The ">" symbol separates the steps in the path.

Unit of measure

From version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas:

- temperature: °F = 32+ (°C x 9/5)
- pressure: psi = bar x 14.5

Support

Ask for support

In case of malfunction or fault and requests for assistance, contact SELPRO Srl or the distributor in your country.

How to return the product

If necessary, **ship the product at your own expense and in its original packaging** to the local distributor or directly to SELPRO Srl.

Zone distributor	Customer support service	
Note distributor information here:	SELPRO Srl Via Piamarta, 5/11 25021 Bagnolo Mella (BS) Italy	info@selpro.it www.selpro.it +39 (0)30 6821611

Warranty

To know the warranty terms, exclusions, warranty forfeiture, and how to apply the warranty, please refer to the enclosed sheet.

1. Safety information

1.1 SAFETY MESSAGES

Below are the warnings regarding user safety and the damage to the device provided in this document:

DANGER indicates a dangerous situation which, if not avoided, will cause death or serious injury.

WARNING indicates a dangerous situation which, if not avoided, may cause death or serious injury.

CAUTION indicates a dangerous situation which, if not avoided, may cause slight injury.

NOTICE *indicates obligations that if not met, may cause device damages.*

1.1.1 Qualified staff

This device should only be installed, started and used by qualified technical personnel who are familiar with the technical standards to be followed, in accordance with personnel safety and security standards, able to understand all signs of danger. Incorrect installation can result in damage to people and/or property.

WARNING! Live parts. Electric shock. If you have to work on the powered controller, always do it in the presence of a second person. Block remote controls and any power switches.

1.1.2 Worker skills

Below are the minimum skills required to operate the device safely:

Icon	Target	Activities	Skills
	Installer Electrician	■ System electrical dimensioning ■ Installation ■ Start-up ■ Maintenance ■ Service calls	Has substantial knowledge in the electrical field. Can understand wiring diagrams and work on live electrical panels, shunt boxes and control devices. Has been certified to work on live parts. Suitable conditions are guaranteed by the application of current standards and regulations on occupational safety in the country of installation. Knows the safety regulations, community directives and all national, regional and corporate rules. This individual must be accompanied by expert personnel if unskilled or young.

1.1.3 Installer and electrician obligations

The installer and the electrician must:

- make sure that the device is installed in systems that comply with all safety and electrical regulations.
- always close the protective cover.

- make sure that the device is used properly and as indicated in chapter "Intended use" on page 9.
- periodically check that the device safety elements are in good condition, replace damaged cables.

1.2 GENERAL WARNINGS



This chapter contains information on your safety but does not assume to be thorough. Contact customer service SELPRO for questions or problems.

1.2.1 Intended use

The device should only be used for the purposes stated in the purchase contract. Other uses or use beyond that specified in the contract are not authorized and the manufacturer cannot be held liable for damages. Foreseen use requires the user carefully reads this instruction manual and especially the safety messages.

1.2.2 Product safety

The product is the result of SELPRO current experience. It must be installed, with any accessory modules, in good working order according to this instruction manual. Use must be within the technical limits stated on the ID plate. Otherwise, faults and damages may occur.

1.2.3 Fault management

Check faulty functions to prevent damages to people or property. For delicate or high value products, consider installing backup controllers with alarm contacts. Faults in farms could harm animals. The system design must meet current directives in the country of installation.

1.2.4 Installation



WARNING! Live parts. Electric shock. Do not work near power and load terminals with the device on.

***NOTICE**: Malfunction. Do not connect two wires to the same input terminal. Request the MEI-4 expansion module.*

Install the controller away from direct sunlight so as not to overheat the case.

DO NOT install the device in environments that could reach high temperatures, higher than the foreseen maximum room temperature.

Assemble the device vertically, with cable input at the bottom, to promote natural heat dissipation and avoid water infiltration; make sure there is sufficient air circulation and free space above and below the controller.

Only use the set holes for connection cable input, always on the bottom, power terminal board side, to avoid external agent infiltration and maintain the controller protection grade. Use the supplied cable clamps, sheath and cables with suitable quality and size.

In the event of disturbed power mains, we recommend installing supplementary anti-disturbance filters directly on the controller power supply.

Only start the controller when the machine that incorporates it is declared compliant with current legislation.

1.2.5 Start-up



WARNING! Electric shock. Risky conditions can be created in the system during start-up due to incorrect settings, defective components or incorrect electrical connections. Keep people away from the work area.

Any faulty fuses must be replaced with new fuses of the same type. Any system fault must be resolved immediately. The system can be potentially dangerous if the system works poorly.

1.2.6 Use

***NOTICE**: before turning on the device, always check that it is correct grounded according to current standards. This is also essential for correct anti-disturbance filter operations.*

If applicable, reassemble and make sure the external protection lid is fully closed.

NEVER touch electrical circuit parts when the power is on.

DO NOT alter or damage the device ID labels.

Avoid continuously turning controller power on/off. Constant power maintains the controller at working temperature and eliminates the problem of condensation forming inside the protective case.

1.2.7 Maintenance

DO NOT tamper with or remove internal controller parts. This voids the warranty and can cause damages to people and property. The controller does not contain parts that can be repaired by the user.

1.2.8 Accessories and spare parts



CAUTION! Only use accessories and spare parts manufactured or recommended by SELPRO. Changes to this device and the use of devices not authorized by SELPRO can create unforeseen and hard to evaluate risks. Contact SELPRO experts to solve your system needs.

2. Receiving and storage

2.1 Handling and storage

2.1.1 Handling

***NOTICE**: device damages. Always use packaging. Avoid bumps, strong vibrations and exposure to very high temperatures.*

2.1.2 Storage warnings

***NOTICE**: device damages. Consult the manufacturer and check the warranty conditions if the device is to be stored for a long period of time. Protect against vibration, moisture and shock. Store with a well-closed lid in a dry place. Avoid exposure to very low or very high temperatures.*

2.1.3 Environmental storage conditions

See chapter "Electrical specifications" on page 108.

2.2 Product identification

2.2.1 Package contents

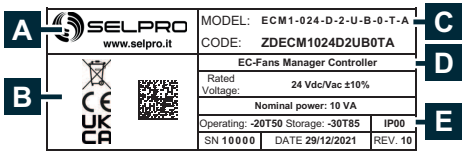
Below are the items provided in the sales package:

- one ECM
- this manual
- for models with case, four brackets for wall mounting
- for models with case, cable clamps or plugs (as per order)

Always check the integrity of the product. In case of damage, contact SELPRO technical support.

2.2.2 Identification label

Model, product code and serial number must be communicated to SELPRO technical support for service calls.



Part	Description
A	Logo and site
B	Matrix code to identify model and serial number, CE marking conformity with directives
C	Model, code and product revision
D	Device description
E	Technical specifications

3. Product description

3.1 Description

3.1.1 ECM controllers

Multifunctional and multi-input ECM controllers simultaneously command multiple EC fans with Modbus control or 0–10 Vdc control. Connected to transducers, the sensors can receive signals (pressures, temperatures, etc.) that, together with the set parameters, control motor speeds. This control ring can be connected to a spray unit, too, with a 1–10 Vdc signal.

3.1.2 Applications

ECM controllers are suitable for applications in HVAC/R environments with EC motors; for example, ventilated heat exchangers used in air conditioning and refrigeration systems.

3.1.3 Inputs

The controller has the following inputs:

- three analog inputs that can be configured to read the voltage/current signals or NTC resistance (can be amplified with expansion modules)
- if On/Off for remote activation of functions

3.1.4 Outputs

The controller has the following outputs:

- two analog outputs with voltages that can be configured for external units for analogue control 0–10 Vdc or 1–10 Vdc
- three relays, for alarm signals and other auxiliary functions that can be configured.

3.1.5 Communications port

The controller has two RS485 ports managed with Modbus RTU protocol:

- one for control of up to 32, ebm-papst or Ziehl-Abegg EC fans
- one to communicate with a supervisor system

3.1.6 Controls

The control of the speed command transmitted to the output can be:

- **Slave proportional**: the input signals are generated by an external controller or a manually controlled potentiometer. The value of the control command can vary in proportion to the prevalent input value.
- **Master proportional**: input signals are generated by temperature sensors or transducers of other magnitudes. The control command changes to maintain the value of the prevalent input within the proportional band.
- **Master PID**: input signals are generated by temperature sensors or transducers of other magnitudes. The control command value changes to maintain the value of the prevalent input close to the setpoint.

Proportional control can be direct, if increasing the input the control value increases, or reverse, if it decreases.

3.1.7 Setpoints and associated parameters

Two different control setpoints and two sets of associated parameters are available (**Bank 1** and **Bank 2**). You can select one or the other setpoint, and its parameter set, using an On/Off input.

Within each set of parameters there is an additional setpoint and proportional band dedicated to signal regulation for slave units.

3.1.8 Inputs and outputs

The controller has two expandable analog inputs with expansion module and a relay output that can be used both to activate external alarm devices and to control external units (i.e., slave units, sprays).

Regulation may occur considering the only connected input or one of the two (the largest or the smallest). If you choose to use only one input, the other will remain visible from the display or from the Modbus protocol and can be connected, for example, to a probe.

3.1.9 Functions that can be activated with On/Off inputs

The following controls are possible via the On/Off inputs:

- enabling reverse mode: the output voltage decreases as the input increases
- start according to setpoint and relative set of parameters
- enabling night limit
- stop regulation signal
- read motor overheat protection status

3.1.10 Default configurations

To facilitate installation, the ECM controller has 13 configurations that can be customized by editing a single parameter. There are configurations for Master or PID proportional control (temperature, pressure, current and voltage) and configurations for Slave proportional control (current and voltage).

3.1.11 EC fan functions

If connected to the Modbus network, the controller manages the following functions for EC fans:

- reading of the main fan data
- setting the emergency and maximum speeds
- speed control of a single fan
- update of the address map for the fans present
- manual and automatic generation of sequential addresses for the fans
- changing the direction of rotation of the fans
- fan release
- error or malfunction messages for the fan

3.1.12 Special functions

The controller also manages the following special functions:

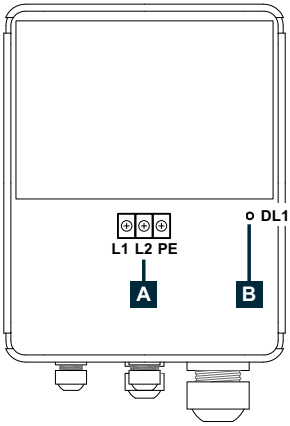
- output overload safeguarding (function always active)
- timed washing of the heat exchanger
- timed cleaning of the heat exchanger
- management of the heat exchanger power by gradually deactivating/activating fan units
- fan anti-locking
- night limits for speed using internal clock and/or On/Off input
- switching of setpoint following the ambient temperature and/or On/Off input
- external setpoint control with 0-10 V signal
- adjustment of the setpoint following the ambient temperature
- Slave Safety mode

3.2 Presentation

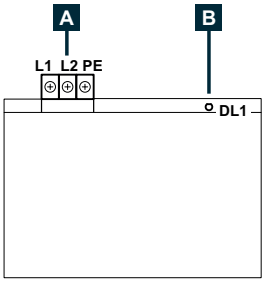
3.2.1 Power supply terminal board

The position of the power supply input terminal board depends on the model.

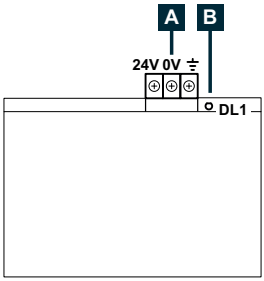
ECM 230–460 V IP55



ECM 230–460 V IP00

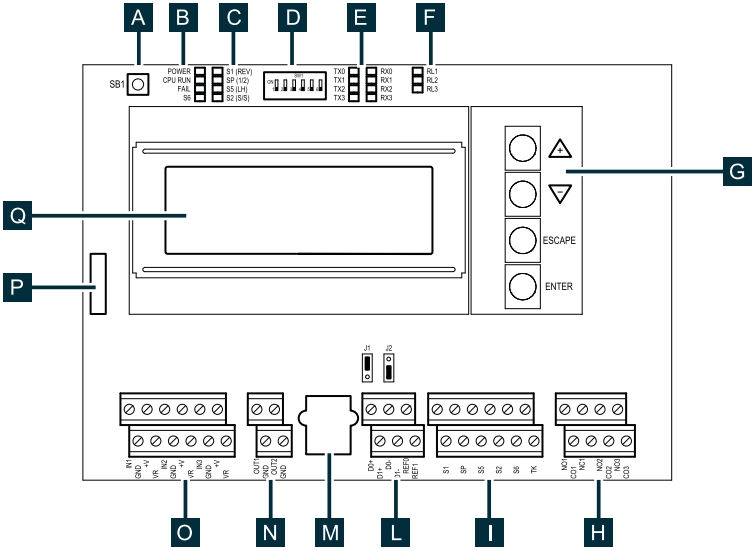


ECM 20–24 V IP00



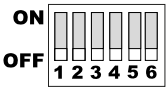
Part	Description	Reference in the manual
A	Power input terminal board.	"Power supply" on page 19
B	LED **DL1** presence of external power supply (230–460 V/20–24 V)	-

3.2.2 Main components



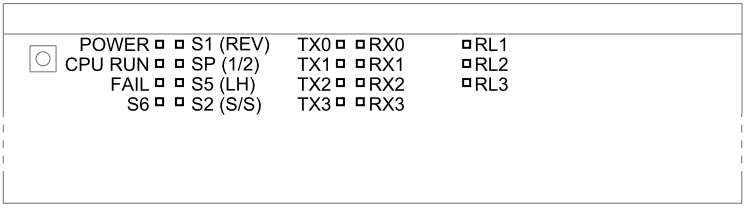
Part	Description	Reference in the manual
A	Reset button. Restarting the controller (for ex.: after being locked), allows one of the predefined configurations to be chosen.	"Select a configuration" on page 69
B	Device status LED.	"Status LED" on page 17
C	On/Off input LEDs active.	"On/Off inputs LED" on page 17
D	DIP switch SW1 to turn functions on/off.	"DIP switch SW1" on page 16
E	Modbus communication status LED.	"Modbus communication LED" on page 17
F	Relay status LED.	"Relay status LED" on page 17
G	Keyboard to scroll parameters and set them.	"Programming display keyboard" on page 18
H	Terminal board M5 with relay output.	"Relay outputs" on page 24
I	Terminal board M4 for remote On/Off inputs or from motor overheat protections.	"On/Off inputs" on page 23
L	Terminal board M3 with serial outputs (COM0 to PC-BMS, COM1 to EC motors) and relative serial terminal jumpers.	"Modbus Ports" on page 22
M	TTL serial line connector for connection with external devices.	-
N	Terminal board M2 with analog regulation outputs.	"Analog outputs" on page 21
O	Terminal board M1 with analog inputs.	"Analog inputs" on page 19
P	Back lit LCD display.	-
Q	Connector for remote key pad (ZCKEY.01.0100020)	-

3.2.3 DIP switch SW1



Switch	Function
1	Enables/disables reserved parameter editing ■ On: enables editing of all parameters. ■ Off: it is only possible to modify the basic parameters (menu **1: BASIC**), with the exception of the parameter **Working Fan Direction**.
2	Set temperature and pressure units of measure ■ On: display temperature in °F and pressure in psi ■ Off: display temperature in °C and pressure in bar
3	Sets the alarm management and EC fan behavior when the On/Off input **TK** = Off (contact open). ■ On: alarm disabled and speed of EC fans not modified, but the status of the **TK** input can be read by the PC-BMS on the Modbus present. Typical for installations with several fans. ■ Off: enables alarm and forces EC fans to the set emergency (if set).
4	Defines the duration of non standard Modbus forcing received by the PC-BMS (Clima-Sinergy or third party). ■ On: the received control is kept until the next control that cancels/changes it or until the controller is turned off or reset. ■ Off: the received control is kept for no more than 10 minutes
5	Selects the control mode for the EC fans: ■ On: control using analog output (0-10 Vdc) ■ Off: control with Modbus COM1 ***Note**: if off, select the manufacturer with switch 6.* See "Change from Modbus control to analog output control" on page 87.
6	Only for Modbus control. Selects the EC fan manufacturer: ■ On: Ziehl-Abegg ■ Off: ebm-papst ***Note**: with control over analog output, the position of the switch has no effect.*

3.2.4 LED overview



3.2.5 Status LED

Name	Description
POWER	Power supply present for output components (+5 V) from the power supply on the board
CPU RUN	■ Blinking: micro controller running ■ Steady (on or off): micro-controller fault, contact SELPRO customer service
FAIL	One or more errors, check alarm message on the display
S6	Current maximum % RPM limit with spray unit on

3.2.6 On/Off inputs LED

Name	Description
S1	Reverse mode active ■ on: reverse control mode active ■ off: direct control mode active
SP	Setpoint 2 on ■ on: setpoint 2 on ■ off: setpoint 1 on
S5	Maximum night limit % RPM on ■ on: limit active ■ off: limit not active
S2	Regulation consent status: ■ on: regulation consent on ■ off: regulation consent off

3.2.7 Modbus communication LED

Name	Description
TX0	Flashing: transmitting data on serial line COM 0 (Host/BMS).
TX1	Flashing: transmitting data on serial line COM 1 (EC Fan).
TX2	Flashing: transmitting data on serial line COM 2 (not used).
TX3	Flashing: transmitting data on serial line COM 3 (not used).
RX0	Flashing: receiving data on serial line COM 0 (Host/BMS).
RX1	Flashing: receiving data on serial line COM 1 (EC Fan).
RX2	Flashing: receiving data on the serial line COM 2 (not used).
RX3	Flashing: receiving data on the serial line COM 3 (not used).

***Note**: serial lines 2 and 3 are not used.*

3.2.8 Relay status LED

Name	Description
RL1	Alarm relay status. ■ on: relay energized (closed between **COM**-**NO**) ■ off: relay at rest (closed between **COM**-**NC**)
RL2	Warning relay status. ■ on: relay energized ■ off: relay at rest
RL3	Heat exchanger washing relay status. ■ on: relay energized ■ off: relay at rest

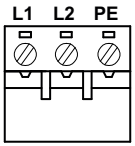
3.2.9 Programming display keyboard

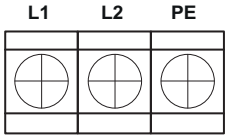
Key	Function
ENTER	Confirms the selection. With the **ESCAPE** key, enters the menu or saves the new settings.
ESCAPE	Cancels the selection. With the **ENTER** key, enters the menu or saves the new settings.
+	Increases the value read, scrolls upwards through the parameter list or confirms the address manually.
-	Decreases the value read or scrolls the parameter list down.

4. Inputs and outputs

4.1 Power supply

4.1.1 Power supply terminal board (230-460 V version)

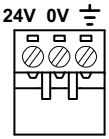


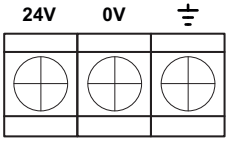


Terminal	Description
PE	Protection circuit breaker connection terminal **(*)**.
L1	Phase input 1
L2	Phase input 2

***Note** (*): the device can be installed in TT (e.g., domestic users in Italy), IT (to ensure maximum operating continuity) and TN (users with their own transformer cabin) voltage distribution systems. Each of these systems provides different ways to ground the power source and the metal system masses.*

4.1.2 Power supply terminal board (24 V version)





Terminal	Description
⏚	Protection circuit breaker connection terminal.
24 V	Phase input 24 V
0 V	Phase input 0 V

4.1.3 Power supply wiring diagram

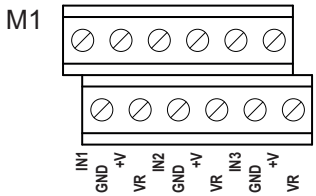
See "Power supply wiring" on page 28.

4.2 Analog inputs

4.2.1 Terminal board M1

Analog inputs for reading NTC current/voltage/resistance signals from sensors and transducers

***Note**: MEI-4 module is available to expand inputs. Contact SELPRO customer service.*



Terminal		Description	Specifications
1	**IN1**	Analog Input 1.	V dc/m A/kΩ
2	**GND**	Grounding.	-
3	**+V**	Non-stabilized power voltage output for transducers.	22 V dc 10–20% Max 40 mA
4	**VR**	Stabilized voltage output for raziometric sensors and potentiometers. Switching between 5 V and 10 V is automatic according to the set configuration.	5–10 V dc Max 10 mA
5	**IN2**	Analog Input 2.	V dc/mA/kΩ
6	**GND**	Grounding.	-
7	**V**	Non-stabilized power voltage output for transducers.	22 V dc 10–20% Max 40 mA
8	**VR**	Stabilized voltage output for raziometric sensors and potentiometers. Switching between 5 V and 10 V is automatic according to the set configuration.	5-10 V Max 10 mA
9	**IN3**	Analog Input 3.	V dc/mA/kΩ
10	**GND**	Grounding.	-
11	**+V**	Non-stabilized power voltage output for transducers.	22 V dc 10–20% Max 60 mA
12	**VR**	Stabilized voltage output for raziometric sensors and potentiometers. Switching between 5 V and 10 V is automatic according to the set configuration.	5-10 V Max 10 mA

***NOTICE**: the same type of sensors must be connected to inputs **IN1** and **IN2**.*
***Note**: outputs **V+** and **VR** are protected against short-circuit to **IN1**, **IN2**, **IN3** and **GND**.*

4.2.2 Analog inputs IN1 and IN2

The analog inputs IN1 and IN2 are dedicated to process controls and closing the control ring. Signals can be received from different types of transducers, sensors and controllers. The number of inputs and the prevalent input selection mode are automatically set when one of the configurations is loaded. The input that is not used for control remains visible on the display and RS485 Modbus port.

***Note**: for special applications, the configuration or inputs **IN1** and **IN2** can be set from menu **4: SETUP** > parameters **C0**, **C1**, and **C2**.*

4.2.3 Analog input IN3

Analog input **IN3** can perform the following functions:

- reading of a transducer or sensor value that is identical to those in IN1 and IN2
- setpoint control with 0–10 Vdc (**SP from IN3**)
- 4-20 mA input for Slave mode operation in the absence of the automatic switch signal from Slave to the Master configuration previously defined (**Slave Safety**)

- using a transducer to read the ambient temperature:
  - switching between setpoint 1 and 2 parameters based on the ambient temperature (**Bank switch**)
  - adjustment of the setpoint following the external temperature (**Floating SP**)

***Note**: the **SP from IN3**, **Slave Safety**. and **Floating SP** functions are only available in Master mode.*

For details on the special functions, see "Switching of setpoint following the ambient temperature from IN3 (Bank Switch)" on page 57.

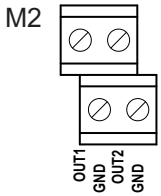
4.2.4 Wiring diagrams for analog inputs IN1, IN2, and IN3

See "Analog input connections IN and IN2 in Slave mode" on page 28, "Analog input connections IN1 and IN2 in Master mode" on page 29 and "Analog input IN3 wiring" on page 31.

4.3 Analog outputs

4.3.1 M2 terminal board

Analog outputs with 0–10 Vdc voltage to control EC fans (or power slave unit, motorized actuators) and spray units.



Terminal		Description	Specifications
1	**OUT1**	Analog output for controlling EC fans or slave units. Settable with parameter **C7**.	0–10 Vdc (default)/1–10 Vdc Max 20 mA
2	**GND**	Grounding.	-
3	**OUT2**	Analog output for controlling spray units. Can be configured with parameter **C8(*)**.	0–10 Vdc/1–10 Vdc (default) Max 20 mA
4	**GND**	Grounding.	-

***Note** (*): in applications where only switching spray units on and off is required, use the relay output RL1 (terminal board M3).*

4.3.2 Command limits of the analog outputs.

The **OUT** analog outputs control one or more EC fans (or power slave units, motorized actuators) via the 0-10 V/1-10 V signal. The number of slave units that can be connected is limited by the maximum current of 20 mA that can be supplied with the signal.

4.3.3 Slave unit, and spray unit wiring diagram

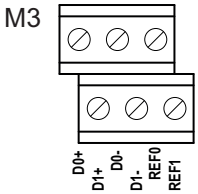
See "Analog outputs OUT1 and OUT2" on page 33.

4.4 Modbus Ports

4.4.1 Terminal board M3

RS485 serial ports managed with Modbus RTU protocol:

- **COM0**: to communicate with a PC-BMS, in Slave mode.
- **COM1**: to control up to 32 EC fans, in Master mode.



Terminal		Description
1	**D0+**	RS485 straight (non inverting) COM0
2	**D1+**	RS485 straight (non inverting) COM1
3	**D0-**	RS485 negative (inverting) COM0
4	**D1-**	RS485 negative (inverting) COM1
5	**Ref0**	Isolated transceiver reference grounding COM0
6	**Ref1**	Isolated transceiver reference grounding COM1

4.4.2 J1 and J2 terminal jumpers



Jumper position	Description
J1 2-3	OFF: termination serial line COM0 excluded
J1 1-2	ON: termination serial line COM0 with 120 Ω inserted
J2 2-3	OFF: termination serial line COM1 excluded
J2 1-2	ON: termination serial line COM1 with 120 Ω inserted

4.4.3 Forcing from PC-BMS

The following can be forced from PC-BMS:

- fan speed, via Modbus control or **OUT** analog output
- control of the spray unit or other external units, using the **OUT** analog output.
- the controls on the On/Off inputs, using the **TK** input.

With switch 4 = Off (DIP switch SW1) the forcing automatically terminates after 10 minutes. The lit LED indicates the presence of one or more non-standard Modbus forcing.

***Note**: forcing can be canceled by a subsequent Modbus command or by turning off the controller or resetting it.*

4.4.4 Interrogation frequency from PC-BMS

***NOTICE**: to avoid malfunctions, limit the interrogation frequency to 1 Hz (one interrogation per second).*

4.4.5 RS485 Modbus RTU COM0 and COM1 network wiring diagram

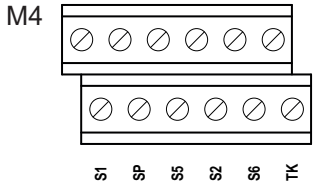
See "Correct connection steps between PC-BMS and ECM (COM0 port)" on page 35 and "Correct connection steps between ECM and EC fans (COM1 port)" on page 37.

4.5 On/Off inputs

4.5.1 Terminal board M4

Terminal board with On/Off inputs for remote commands or for reading overheat protections. Contact activity is indicated by On/Off input LEDs.

***Note**: these contacts activate some of the parameters in the default settings. They may vary for specific customer needs. Refer to the project documentation.*



Contact	Terminal	Function
S1	**1, 2**	Selects control mode ■ closed: reverse control ■ open: direct control
SP	**3, 4**	Selects the set setpoint (basic parameters **SP1** or **SP2**) ■ closed: setpoint 2 on ■ open: setpoint 1 on
S5	**5, 6**	Turns the % RPM night limit on/off (basic**LNight** parameter) ■ closed: limit active ■ open: limit not active
S2	**7, 8**	Enables/disables the controller operation. ■ closed: disables the control, sets: ○ the control command value of the fans = 0% ○ the value of analog outputs **OUT** 0/1 Vdc, based on parameters **C7** and **C8** ■ open: enables control based on settings and inputs
S6	**9, 10**	Forces EC fans to work at constant speed (basic parameter **SSpray**) with spray unit operating. ■ closed: forcing active ■ open: forcing not active ***Note**: if connected, the AWS unit directly manages the input.*
TK	**11, 12**	Normally closed contact to connect motor overheat protections of the connected fans. ■ closed: no alarm, consent to regulation ■ open: alarm, no consent to regulation ***NOTICE**: the overheat protection of one or more fans or an alarm coming from an electrical cabinet can be connected to the TK input but must be normally closed logic.* ***Note**: with switch 3 = On (DIP switch SW1) the alarm is only readable by Modbus, the regulation consent remains and the relay remains energized.*

4.5.2 Forcing via Modbus

Some of these inputs can be forced from PC-BMS. See "Forcing from PC-BMS" on page 22.

4.5.3 On/Off input wiring diagram

See "On/Off inputs connection" on page 33.

4.6 Relay outputs

4.6.1 M5 terminal board

On/Off relay outputs with the following functions:

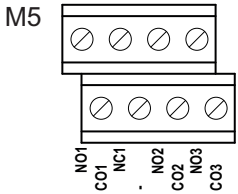
- RL1: two-logic relay for controlling alarm devices (i.e., sirens), a spray unit or other external units.

  Note**: function can be set from menu **4: SETUP** > parameter **C6

- RL2: indicates the presence of a warning message for the EC fans, see "Warning messages" on page 106.

  ***Note**: the caution messages are managed only if the regulator communicates with the EC fans by Modbus.*

- RL3: enables the washing cycle for the heat exchanger, see "Timed washing of the heat exchanger" on page 53.



Terminal		Description
1	**NO1**	Contact closed with **CO1** with relay energized.
2	**CO1**	Shared.
3	**NC1**	Contact closed with **CO1** with relay de-energized.
4	**-**	Not enabled.
5	**NO2**	Contact closed with **CO2** with relay energized.
6	**CO2**	Shared.
7	**NO3**	Contact closed with **CO3** with relay energized.
8	**CO3**	Shared.

4.6.2 Alarm signal settings

Alarms can be managed differently, for example, if a controller error occurs during regulation.

***Note**: if switch 3 = On (DIP switch SW1), in case of alarm relay **RL1** remains energized.*

4.6.3 Relay wiring diagram

See "Relay output connection" on page 35.

5. Installation

5.1 Wall mount

5.1.1 Outdoor installation

The controller can withstand temperatures below zero only if it is powered. Avoid exposure to direct sunlight.

***NOTICE**: temperature changes. Defective operation. Store the controller at room temperature before installation to avoid condensation.*

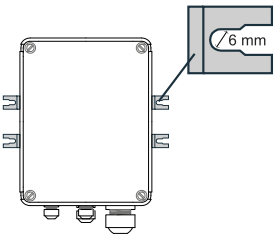
5.1.2 Installation in farms

***NOTICE**: ammonia vapors. Avoid installing the controller in the stable. Install it in a separate room.*

5.1.3 Warnings

***NOTICE**: secure the device closed to prevent screws from falling and remaining inside. Always close the unused holes with the plugs. Install the controller vertically with the cable clamps at the bottom.*

5.1.4 Secure the device to the wall



1. Insert the cable clamps or plugs.
2. Drill holes at the areas shown in the image.
3. Mount the mounting brackets
4. Secure the appliance using four screws (not supplied) suited to the wall thickness.

5.2 Installation inside panel

5.2.1 Outdoor installation

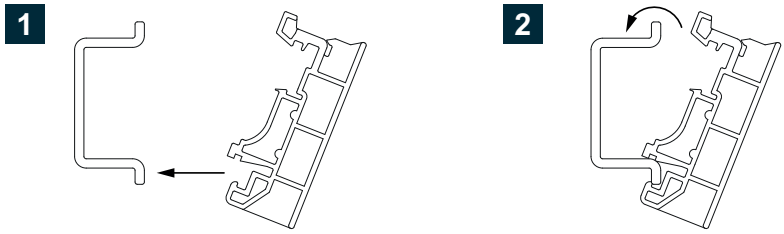
The controller can withstand temperatures below zero only if it is always powered. Avoid exposure to direct sunlight.

***NOTICE**: temperature changes. Defective operation. Store the controller at room temperature before installation to avoid condensation.*

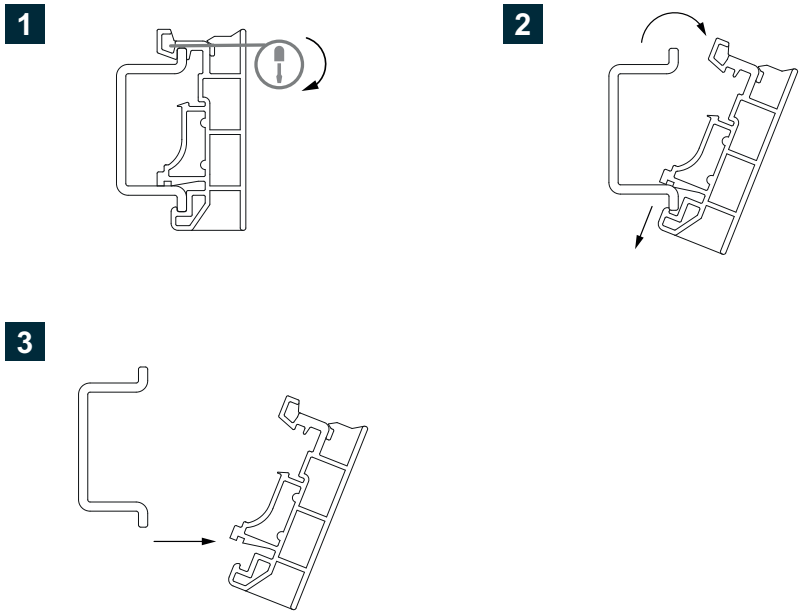
5.2.2 DIN bar installation

The controller can be installed on DIN Omega or DIN G bars. Following is the procedure for DIN Omega bars.

5.2.3 Assemble the device on the DIN Omega rail



5.2.4 Disassemble the device from the DIN Omega rail



5.3 Electrical installation

Operation reserved for an electrician. Has substantial knowledge in the electrical field. Can understand wiring diagrams and work on live electrical panels, shunt boxes and control devices.

5.3.1 Warnings (230–460 V models only)

WARNING! Live parts. Electric shock. If you have to work on the powered controller, always do it in the presence of a second person. Block remote controls and any power switches.



WARNING! Electrocution. Do not power the controller if it is not grounded.

5.3.2 Power cables separate from signal cables

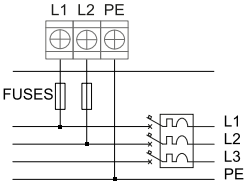
Install the power cables separately from the signal cables and keep the maximum distance possible between cables.

In case of intersection, install with a 90° angle.

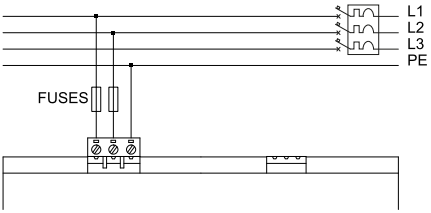
6. Connections

6.1 Power supply wiring

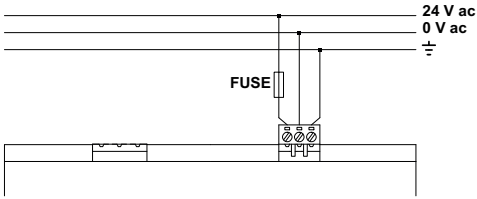
6.1.1 Power supply wiring ECM 230–460 V IP55 Fuse 2A



6.1.2 Power supply wiring ECM 230–460 V IP00 Fuse 2A



6.1.3 Power supply wiring ECM 20–24 V IP00 Fuse 2A

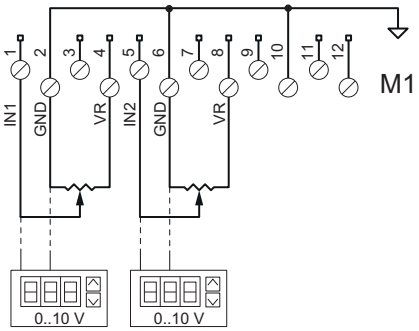


6.2 Analog input connections IN and IN2 in Slave mode

6.2.1 Connection for Slave unit with 0-10 V dc input

The connection of a potentiometer for manual control or, alternatively, a remote controller with 0–10 Vdc output is illustrated in the diagram. If you use a shielded cable, ground the shield directly.

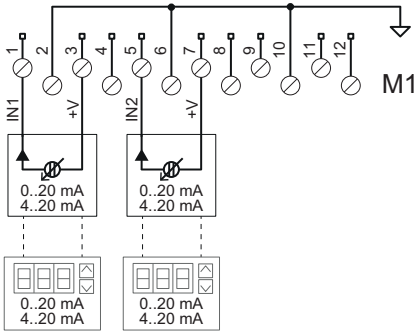
This connection requires the use of the configuration **rS 010**.



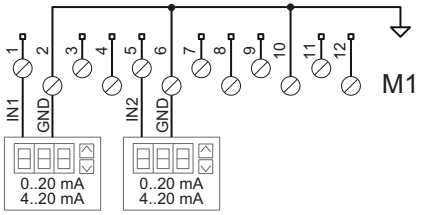
6.2.2 Connection for Slave unit with input 0-20 mA/4-20 mA

The diagram shows the connection to a remote controller with output 0-20 mA/4-20 mA or, as an alternative, to a 0-20 mA/4-20 mA transmitter for manual control. If the device has 0-20 mA output use the **rS 020** configuration, if it has 4-20 mA output use the **rS 420**.

Signal taken from + 24 Vdc



With grounded return signal

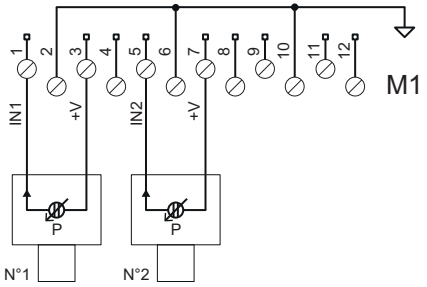


6.3 Analog input connections IN1 and IN2 in Master mode

6.3.1 Connection to two transducers with 4-20 mA output

The diagram shows the connection of two pressure transducers with 4–20 mA output. Transducers can be used to read any magnitude as long as the output is 4-20 mA and the supply +22 V dc + 10-20%. The display shows mA or bar according to the default configuration.

This connection requires the use of **rPr420** (mA measurements), **rPr015**, **rPr025**, **rPr030**, **rPr045** (bar or psi measurements) configurations.

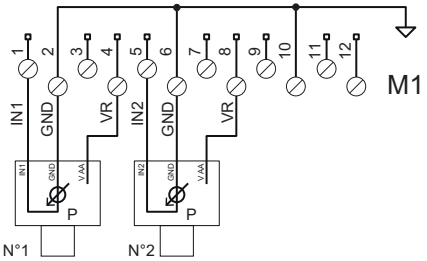


In the default configuration, the setpoint coincides with the maximum fan speed (menu **4: SETUP** > **C4** = **hi**). Two transducers are provided for (menu **4: SETUP** > **C0** = **r2**), the controller automatically selects the transducer with the strongest signal (menu **4: SETUP** > **C1** = **hi**).

6.3.2 Transducer connection with output 0–5/0–10 Vdc

The diagram below shows the connection of two pressure transducers with output 0–5/0–10 Vdc. Transducers can be used to read any magnitude as long as the output is 0–5/0–10 Vdc and the power supply is 5/10 Vdc. The display shows volt or bar according to the default configuration. The VR communication between +5.0 Vdc and +10.0 Vdc is automatic.

This connection requires the use of **rUu010**, **rUu-05** (Vdc measurements), **rPu030** (bar or psi measurements) configurations.

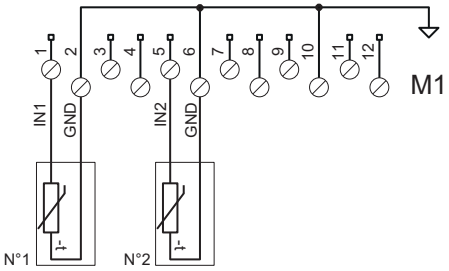


In the default configuration, the setpoint coincides with the maximum fan speed (menu **4: SETUP** > **C4** = **hi**), there are two transducers (menu **4: SETUP** > **C0** = **r2**), the controller automatically selects the transducer with the stronger signal (menu **4: SETUP** > **C1** = **hi**).

6.3.3 Connection to NTC probe with 10 kΩ @ 25 °C/77 °F, B (25/85)= 3435 K ohm value

The connection of two NTC 10 kΩ @ 25 °C/77 °F probes is illustrated in the diagram. Only this type of NTC probe can be used. The display is in °C or °F.

This connection requires the use of **rtE-01** and **rtE-02** (measurements in °C or °F) configurations.

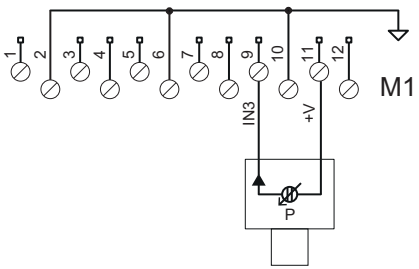


In the default configuration, the setpoint coincides with the maximum fan speed (menu **4: SETUP** > **C4** = **hi**), there are two transducers (menu **4: SETUP** > **C0** = **r2**), the controller automatically selects the transducer with the stronger signal (menu **4: SETUP** > **C1** = **hi**). If only one sensor is connected, the system automatically selects the one present.

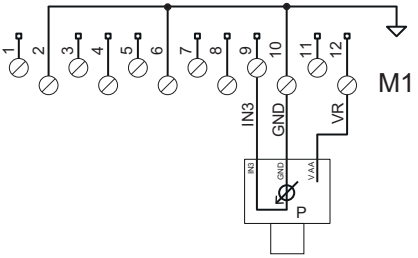
6.4 Analog input IN3 wiring

6.4.1 IN3 wiring for read-only input

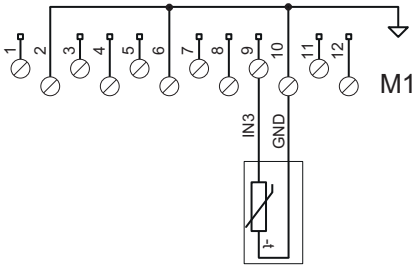
4–20 mA



0–5/0–10 Vdc

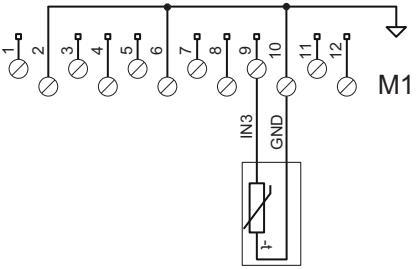


NTC 10 kΩ @ 25 °C/ 77 °F, B (25/85)= 3435 K

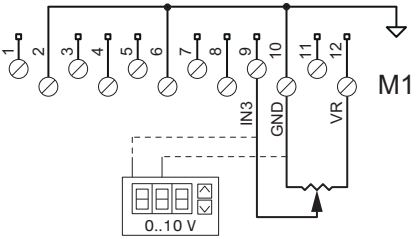


***Note**: the same type of sensor as the ones connected to inputs **IN1** and **IN2** must be connected on input **IN3**. For details on the necessary configurations and display screens, see "Analog input connections IN1 and IN2 in Master mode" on page 29.*

6.4.2 Connection IN3 for switching the setpoint (Bank Switch) or for adjustment of the setpoint (Floating SP) following the external temperature

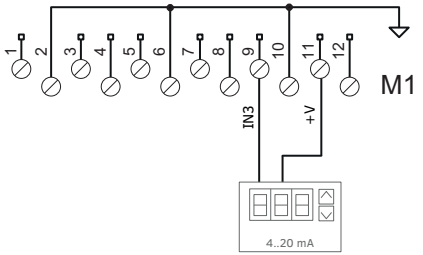


6.4.3 IN3 connection for external setpoint control with 0-10 V signal (SP from IN3)



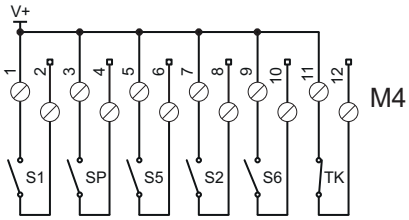
***Note**: in configurations **rUu-05** and **rPu030**, the voltage +10V must be supplied externally.*

6.4.4 Connection IN3 for operation in Slave Safety mode



6.5 On/Off inputs connection

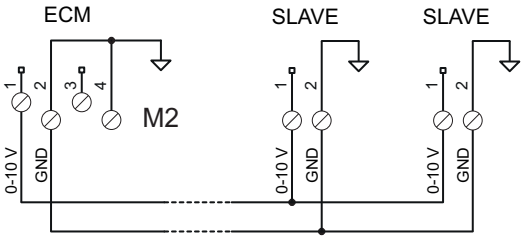
6.5.1 Diagram



6.6 Analog outputs OUT1 and OUT2

6.6.1 Slave unit connection

This connection is suitable for EC fans. By default, the output varies from 0/1–10 V to be directly proportionate to the **Co** parameter.



6.6.2 Connection to Water Spray unit

This connection is indicated to coordinate fan system and spray unit operations that increase heat exchanger heat power. You can connect three different Water Spray unit models:

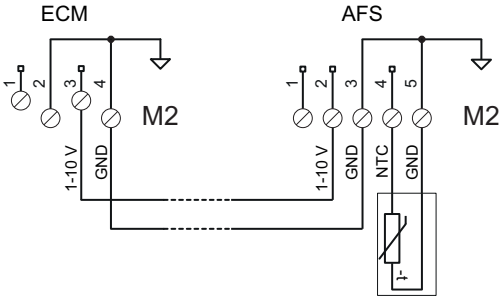
- AFS: for single-spray ramp on/off control
- AWS100: for On/Off control from 1 to 3 spray ramps of 1 or 2 modulating valves.
- WS100-180: for On/Off control from 1 to 4 spray ramps (product replaced by AWS100).

NOTICE*: to avoid unwanted activation, do not connect the spray unit or pay careful attention to the parameter settings when the regulator works in Master PID mode.*

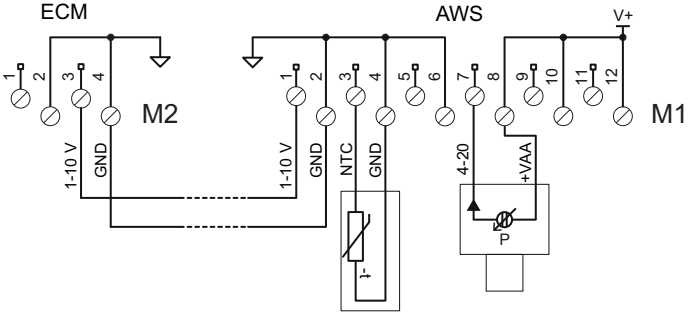
The **C8** = SPRAY 1-10 V parameter (default) enables the **OUT2** analog output to transmit the spray unit control command, making a work area defined by the **USP** setpoint and **UPb** proportional band for external units available. This work area overlaps by integrating with the fan work area.

USP is set by deviation (+/-) from the reference setpoint (**SP1** or **SP2**) for fans.

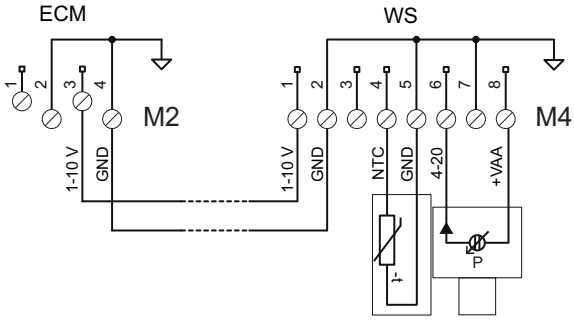
Connection diagram to AFS units



Connection diagram to AWS100 unit



Connection diagram to WS100-180 unit

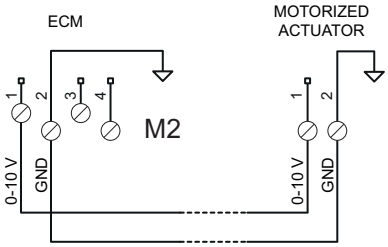


6.6.3 Motorized valve actuator connection

This connection is used to coordinate the operation of the ventilation system with a motorized actuator (valve, damper, etc.) with programmable working range.

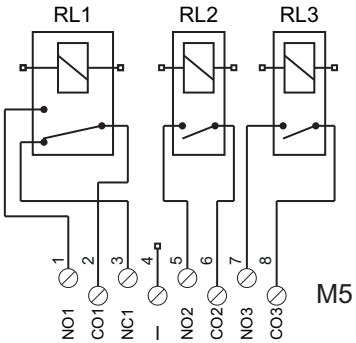
Parameters **C7**/**C8** = USP-DIR 0-10V or USP-REV 10-0 V enable the analog outputs **OUT1**/**OUT2** to control an actuator or a motorized valve. This makes a work area available, defined by the **USP**

setpoint and the **UPb** proportional band for external units, and proportional control in direct (DIR) or reverse (REV) mode. This work area interacts by overlapping and integrating in the fan work area.
USP and **UPb** are set by deviation (+/-) from the reference setpoint (**SP1** or **SP2**) for fans.



6.7 Relay output connection

6.7.1 Connection to external systems for communicating alarms, faults or operating states.



6.8 RS485 Modbus RTU COM0 and COM1 network connection

6.8.1 Correct connection steps between PC-BMS and ECM (COM0 port)

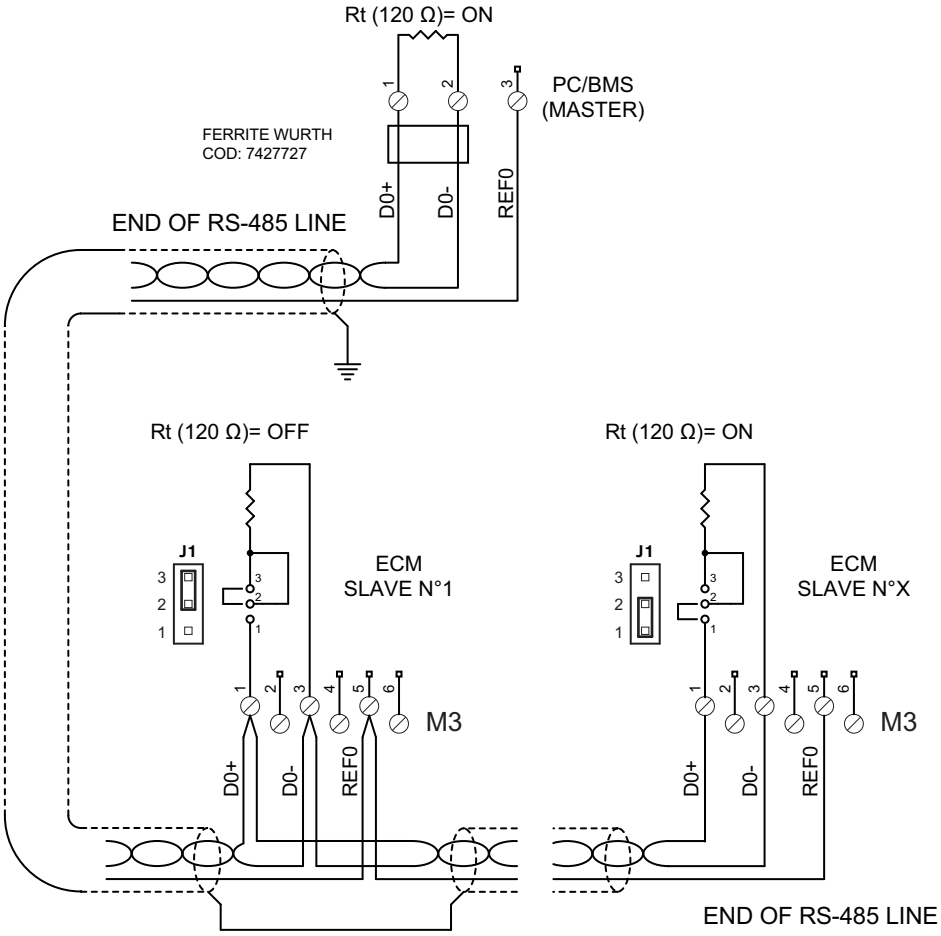
***NOTICE**: follow the indicated steps for correct Modbus connection operations.*

1. Use an outdoor cable specific for outdoor applications with **length under 1000 meters**, for example, a serial cable for LAN ITC BELDEN 15S7D networks (see specifications "BELDEN cable specifications for RS485 connection" on page 108).
2. Make sure the RS-485 line is correctly connected: all network **D0+** terminals must **all be connected to the same conductor**, the same for **D0-** and **REF0** terminals.
3. Lay the data line cable (Modbus network) **from an ECM device to the next**, starting from the Master unit and ending with the last serviced device. Other wiring methods are not permitted.
4. Ensure **sufficient distance between the Modbus network cable and other system cables**, especially from mains cables.
5. **Terminate line ends** (the Master and last serviced device) **with a 120 Ω resistance** (**Rt**). Enable the 120 Ω termination on the RS-485/PC-BMS adapter.

6. **On the last ECM device on the line**, turn the **J1** jumper to 2-1 (ON). **On all other ECM devices**, turn the **J1** jumper to 2-3 (OFF).
7. Ground the cable shield starting from the RS-485/PC-Host insulated adapter **only near the adapter**: the cable will be divided into sections, one for each segment. **Do not connect the REF0 shield** at any point.
8. **Connect the first segment shield to the second shield** and so on. The last segment on the last device side shield remains free.

6.8.2 Modbus network connection diagram between PC-BMS and ECM (COM0 port)

***NOTICE**: the network cable must be connected as indicated in the diagram. Other wiring methods are NOT permitted.*



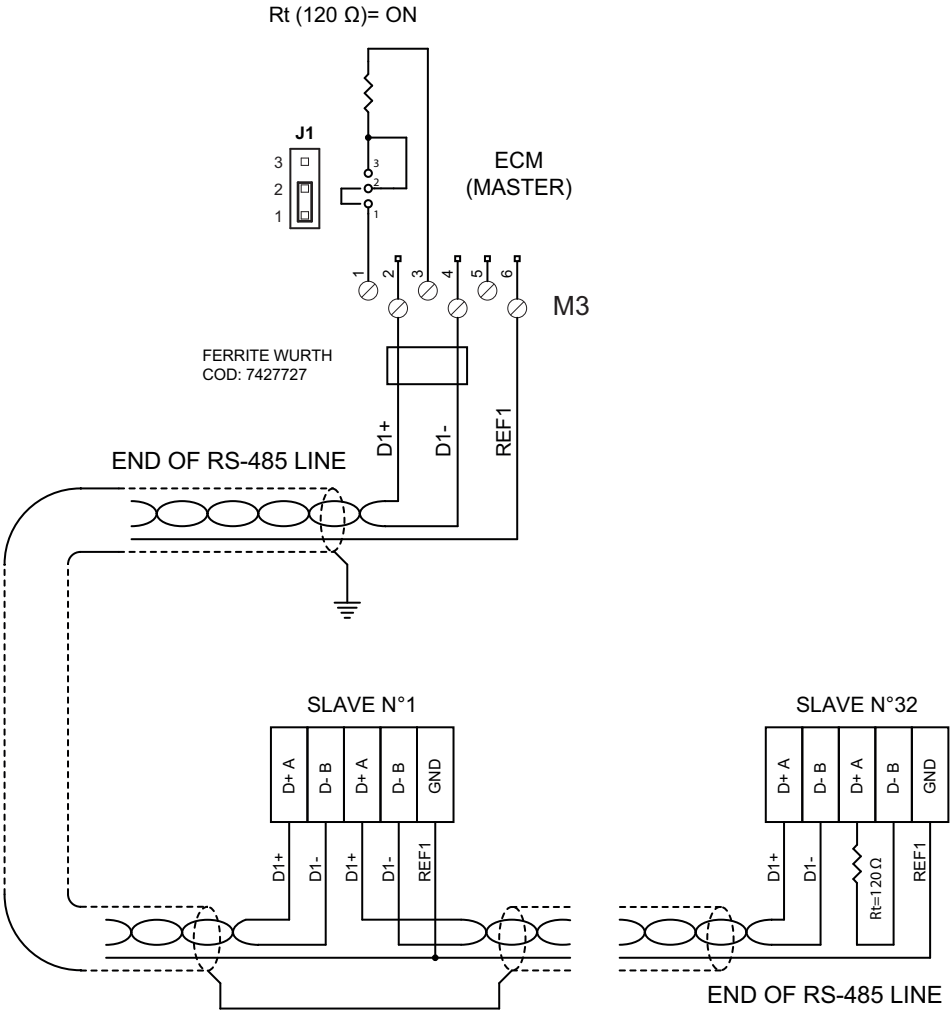
6.8.3 Correct connection steps between ECM and EC fans (COM1 port)

***NOTICE**: follow the indicated steps for correct Modbus connection operations.*

1. Use an outdoor cable specific for outdoor applications with **length under 1000 meters**, for example, a serial cable for LAN ITC BELDEN 15S7D networks (see specifications "BELDEN cable specifications for RS485 connection" on page 108).
2. Make sure the RS-485 line is correctly connected: all network **D1+** terminals must **be connected to the same conductor**; similarly for **D1-** and **REF1** terminals.
3. Lay the data line cable (Modbus network) **from a fan to the next**, starting from the Master unit and ending with the last serviced device. Other wiring methods are not permitted.
4. Ensure **sufficient distance between the Modbus network cable and other system cables**, especially from mains cables.
5. **Terminate line ends** (the Master and last serviced device) **with a 120 Ω resistance** (**Rt**). Position the **J2** jumper to 2-1 (ON). **On the last device in the line** assemble a 120 Ω resistance.
6. Ground the cable shield starting from the controller **near the controller**: the cable will be divided into sections, one for each segment. **Do not connect the shield to REF1** at any point.
7. Near the controller, run the cables **D+** and **D-** in a Wurth ferrite ring (product number: 7427727).
8. **Connect the first segment shield to the second shield** and so on. The last segment on the last device side shield remains free.

6.8.4 Modbus network connection diagram between ECM and EC fans (COM1 port)

***NOTICE**: the network cable must be connected as indicated in the diagram. Other wiring methods are NOT permitted.*



7. Operating mode

7.1 Slave proportional mode

7.1.1 Applications

Control from external controller or manually controlled potentiometer.

7.1.2 EC fan control

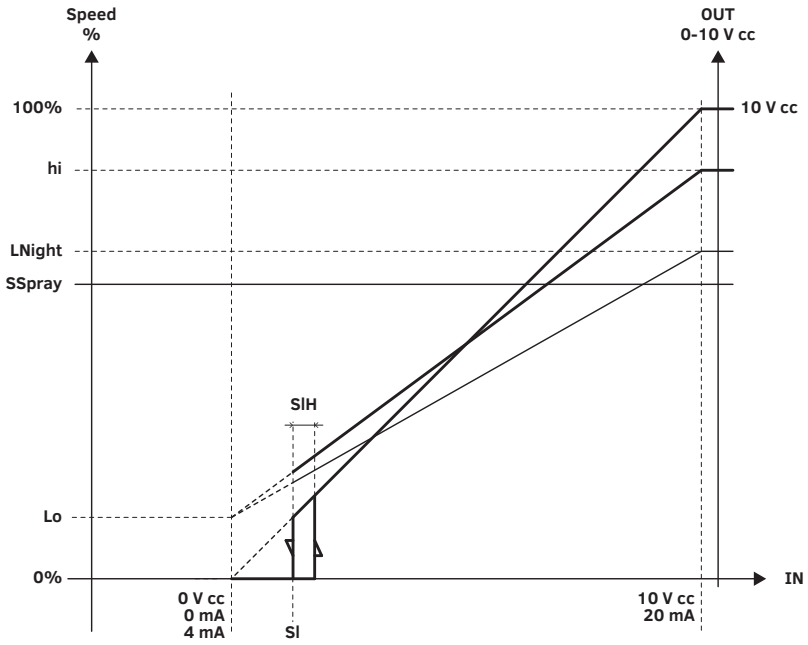
The control command value for fans **Co**, and possibly the **OUT** output voltage increases or decreases in proportion to the prevalent input **IN** based on the status of the **S1** input. The **Lo** minimum and **Hi** maximum speed limits are active, with forcing at 0% and relative hysteresis (**Sl**+**SlH**).

If the maximum night limit of % RPM **LNight** is activated (input **S5** = closed), **LNight** prevails over **Hi** only if the value is lower. If constant speed forcing is activated with the spray activated (input **S6** = closed), **Co** is equal to **SSpray**. If both functions are active, the lower value between **LNight** and **SSpray** prevails.

Control jumps (**JH1** + **JL1** and **JH2** + **JL2**) are activated to avoid particularly noisy zones, "Speed band" on page 52

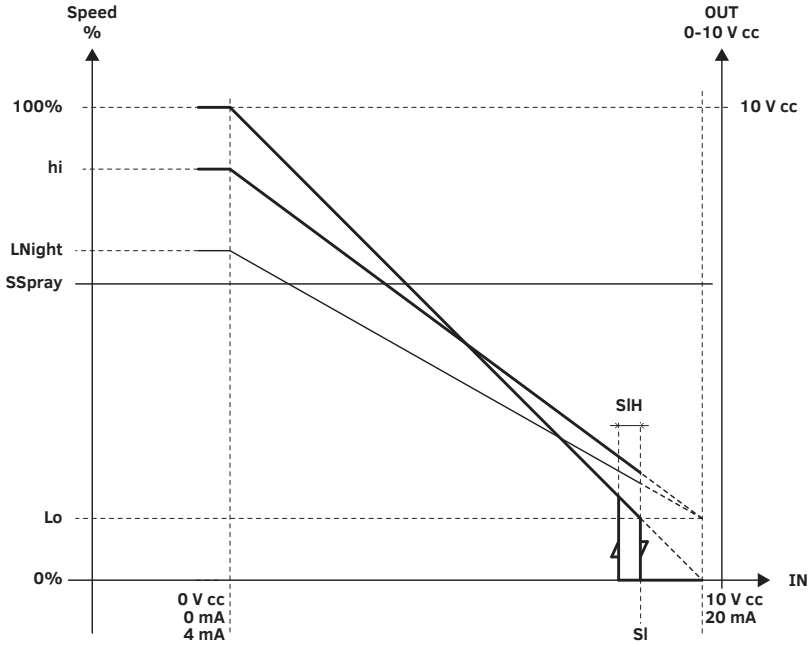
7.1.3 Direct Slave control for EC fans

S1 contact = *open*
menu ***4: SETUP*** > *parameter* ***C7/C8*** = ***SLAVE 0-10V***



7.1.4 Reverse Slave control for EC fans

S1 contact = *closed*
menu ***4: SETUP*** > *parameter* ***C7/C8*** = ***SLAVE 0-10V***



7.1.5 Spray unit control

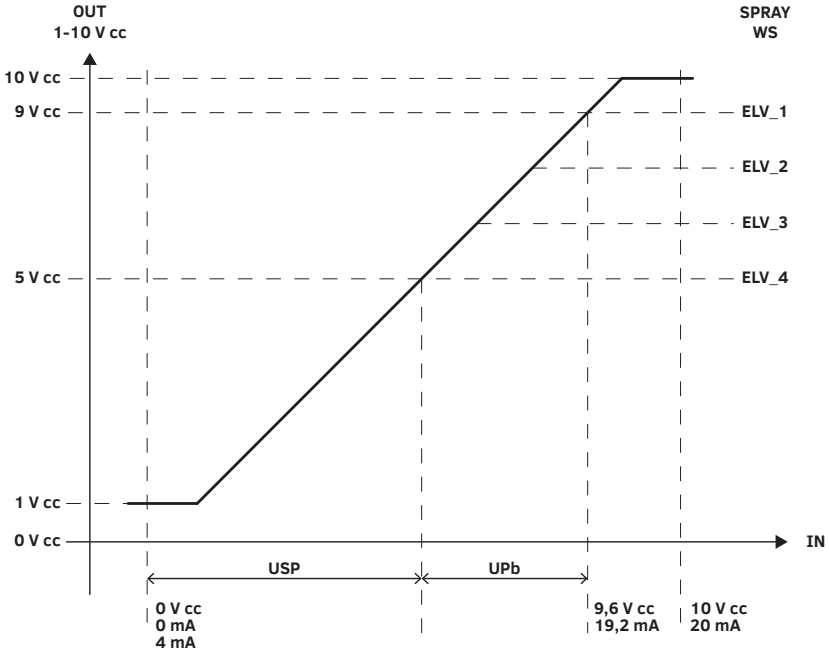
The controller enables a second work zone with independent setpoint **USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The voltage of output **OUT** varies in proportion to the prevalent input (**IN**). The signal never reaches zero but is always between 1 and 10 V.

The **RL1** relay is On when input **IN** is greater than **USP** + **UPb/2**, it is Off when input **IN** is less than **USP** - **UPb/2**.

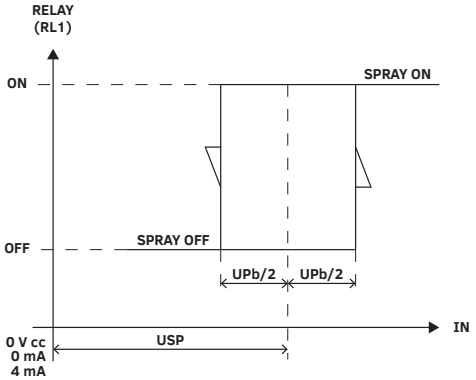
7.1.6 Slave control for spray with OUT output

*menu **4: SETUP** > **C7/C8** = **SPRAY 1-10V***



7.1.7 Slave control for spray with relay RL1

*menu **4: SETUP** > **C6** = **RL1=off -> Spray OFF***



Operating example

Following is an example of spray unit control via relay.

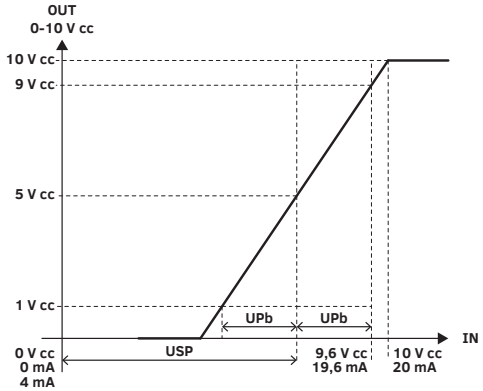
Configuration	Spray unit setpoint	Proportional band	Effect on relay
rS-020	**USP** = 15 mA	**UPb** = 4.2 mA	Relay On with **IN1** or **IN2** = 15+4.2/2 = 17.1 mA Relay Off with **IN1** or **IN2** = 15-4.2/2 = 12.9 mA
rS-420	**USP** = 15 mA	**UPb** = 4.2 mA	Relay On with **IN1** or **IN2** = 15+4.2/2 = 17.1 mA Relay Off with **IN1** or **IN2** = 15-4.2/2 = 12.9 mA
rS-010	**USP** = 7.5 V	**UPb** = 2.1 V	Relay On with **IN1** or **IN2** = 7.5+2.1/2 = 8.55 V Relay Off with **IN1** or **IN2** = 7.5-2.1/2 = 6.45 V

7.1.8 Slave regulation on OUT output to directly control a motorized valve actuator

*menu **4: SETUP** > parameter **C7/C8**= **USP-DIR 0-10V***

The controller enables a second work zone with independent setpoint **SP-USP** and proportional band **UPb**. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The voltage of output **OUT** increases and decreases in direct proportion to the signal of the input **IN**.

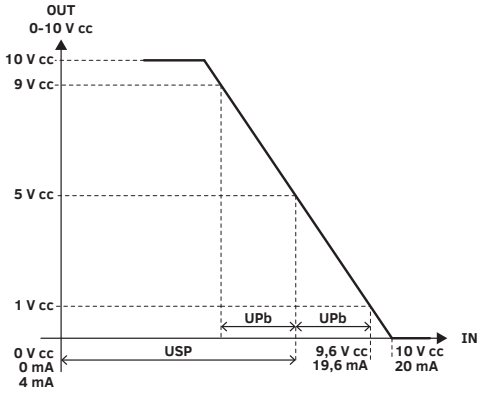


7.1.9 Slave regulation on OUT output to reversely control a motorized valve actuator

*menu **4: SETUP** > parameter **C7/C8**= **USP-REV 10-0V***

The controller enables a second work zone with independent setpoint **USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The voltage of output **OUT** increases and decreases in direct proportion to the signal of the input **IN**.



7.2 Master proportional mode

7.2.1 Applications

Signals from temperature sensors or transducers.

7.2.2 EC fan control

The control command value for the fans **Co**, and possibly the **OUT** output voltage varies to keep the magnitude measured by the transducer with prevalent signal (**IN**) inside its **Pb** proportional band. Based on the status of input **S1**, **Co** increases or decreases proportionally to the prevalent input.

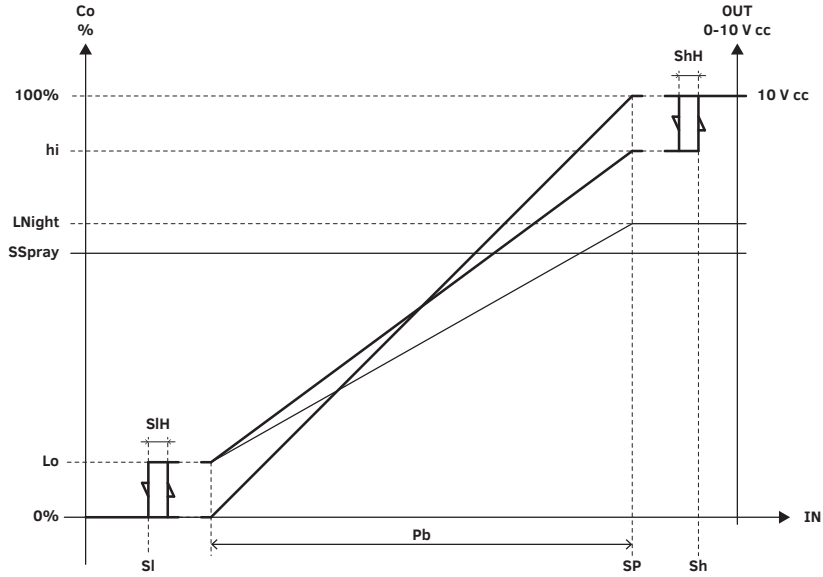
The setpoint **SP** can be at the limit of minimum (**Lo**) or maximum (**Hi**) speed for the control command value (parameter **C4** = **Lo**/**Hi**). Forcing is active at 0% and 100%, and the relative hysteresis (**SI**+**SIH** and **Sh**+**ShH**).

If the maximum night limit of % RPM **LNight** is activated (input **S5** = closed), **LNight** prevails over **Lo** only if the value is lower. If constant speed forcing is activated with the spray activated (input **S6** = closed), **Co** is equal to **SSpray**. If both functions are active, the lower value between **LNight** and **SSpray** prevails.

Control jumps (**JH1** + **JL1** and **JH2** + **JL2**) are activated to avoid particularly noisy zones, "Speed band" on page 52

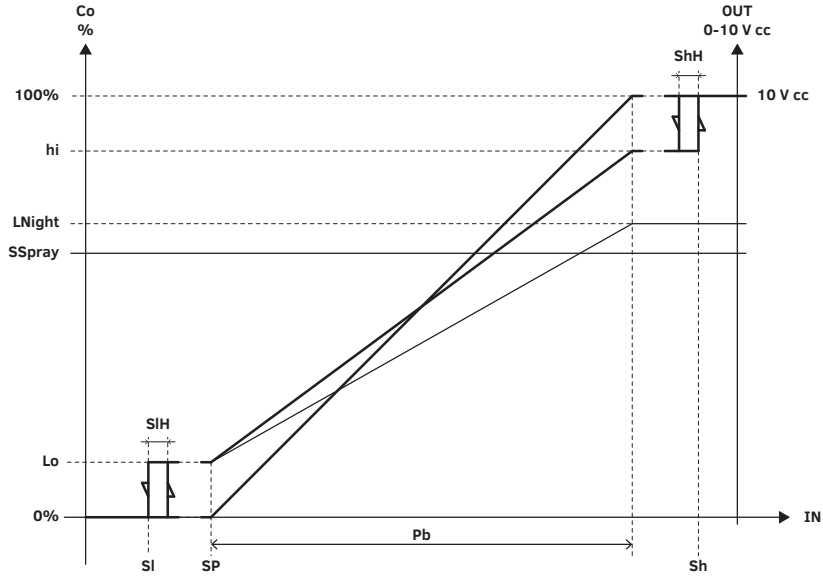
7.2.3 Direct Master control for EC fans, SP at the maximum limit (default)

S1 contact = *open*
menu ***4: SETUP*** > *parameter* ***C7/C8*** = ***SLAVE 0-10V***, ***C4*** = ***hi***



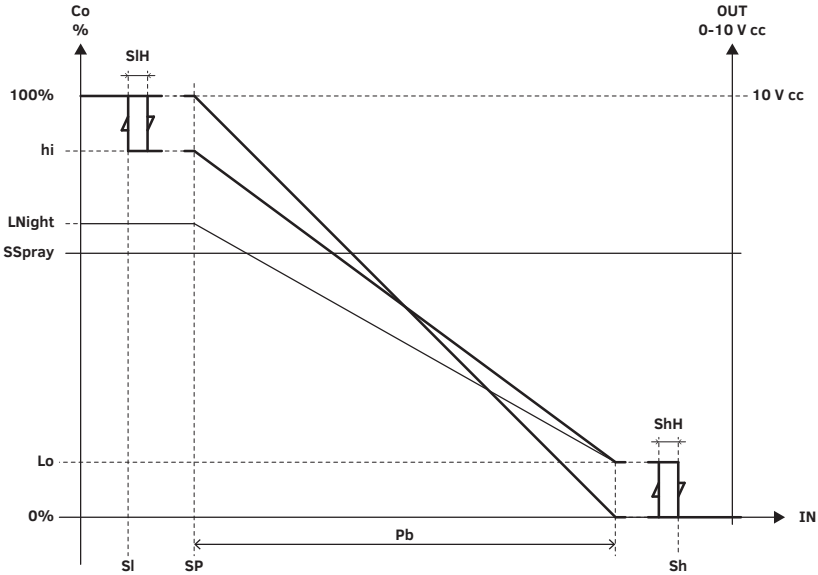
7.2.4 Direct Master control for EC fans, SP at the minimum limit

S1 contact = *open*
menu ***4: SETUP*** > *parameter* ***C7/C8*** = ***SLAVE 0-10V***, ***C4*** = ***Lo***



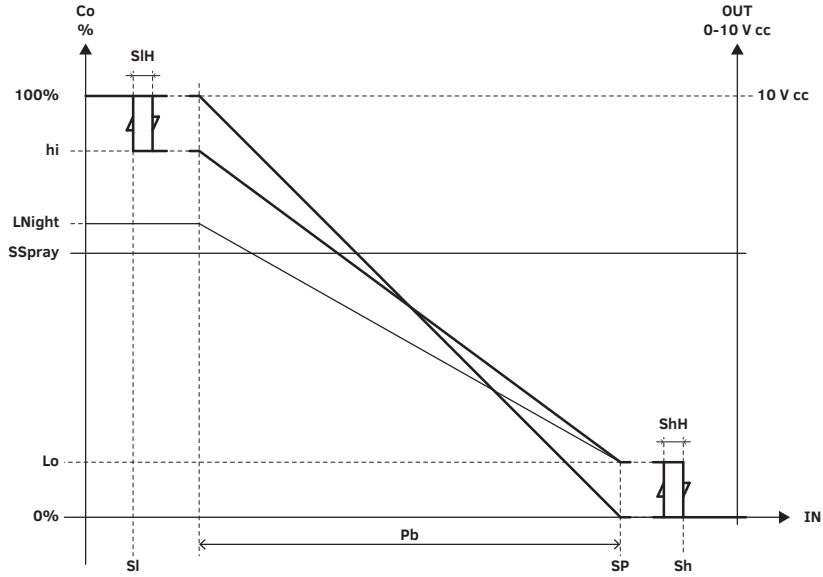
7.2.5 Reverse Master control for EC fans, SP at the maximum limit

S1 contact = *closed*
menu ***4: SETUP*** > *parameter* ***C7/C8*** = ***SLAVE 0-10V***, ***C4*** = ***hi***



7.2.6 Reverse Master control for EC fans, SP at the minimum limit

S1 contact = *closed*
menu ***4: SETUP*** > *parameter* ***C7/C8*** = ***SLAVE 0-10V***, ***C4*** = ***Lo***



7.2.7 Spray unit control

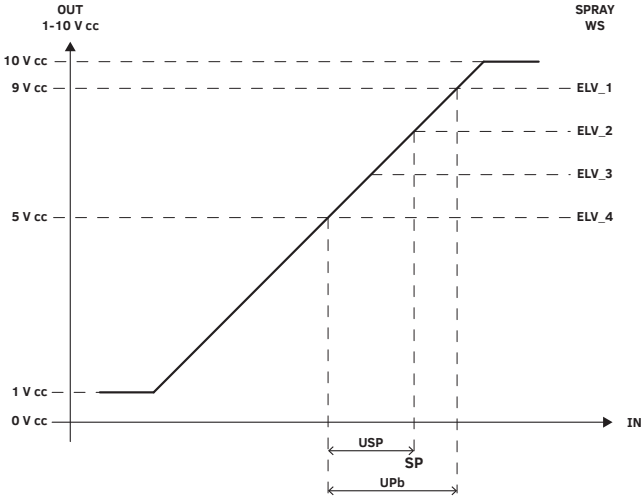
The controller enables a second work zone with independent setpoint **SP-USP** and proportional band **UPb**. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The voltage of output **OUT** varies in proportion to the prevalent input (**IN**). The signal never reaches zero but is always between 1 and 10 V.

The **RL1** relay is On when input **IN** is greater than **SP**+**USP**+**UPb/2**, it is Off when input **IN** is less than SP+**USP** - **UPb/2**.

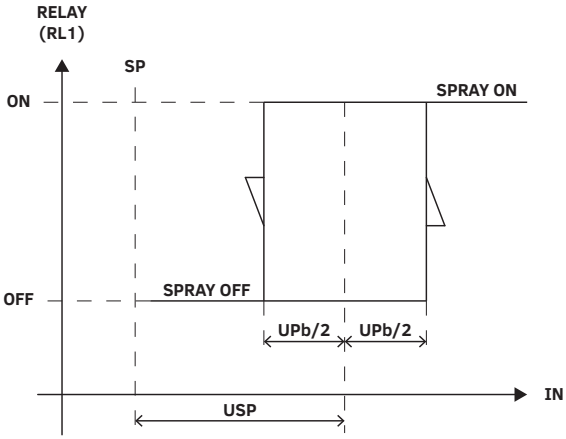
7.2.8 Master control for spray with OUT output

*menu **4: SETUP** > parameter **C7/C8** = **SPRAY 1-10V***



7.2.9 Master control for spray with relay RL1

*menu **4: SETUP** > parameter **C6** = **RL1=off -> Spray OFF***



Operating example

Following is an example of spray unit control via relay with the controller in **rtE-01** configuration.

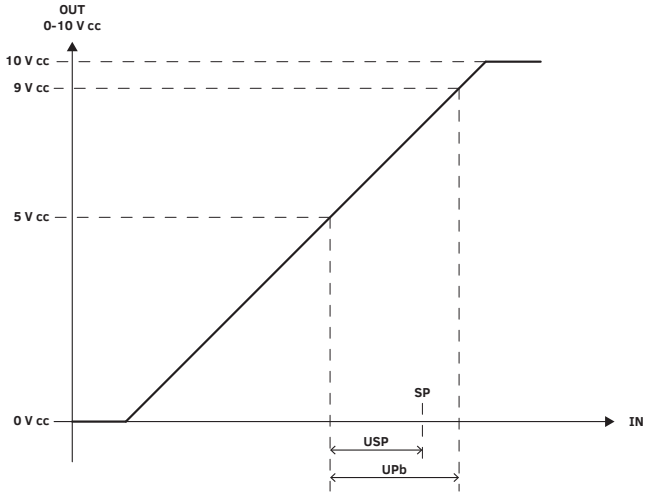
Controller setpoints	Spray unit setpoint	Proportional band	Effect on relay
SP = 45.0 °C	**USP** = - 1,0 °C	**UPb** = 4,0 °C	Relay On with **IN1** or **IN2** = 46.0 °C Relay Off with **IN1** or **IN2** = 42.0 °C
SP = 50.0 °C	**U.S.P.** = 3,0 °C	**U.P.b.** = 3,0 °C	Relay On with **IN1** or **IN2** = 54.5 °C Relay Off with **IN1** or **IN2** = 51.5 °C

7.2.10 Master regulation on OUT output to directly control a motorized valve actuator

*menu **4: SETUP** > parameter **C7/C8= USP-DIR 0-10V***

The controller enables a second work zone with independent setpoint **SP-USP** and proportional band **UPb**. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The voltage of output **OUT** increases and decreases in direct proportion to the signal of the input **IN**.

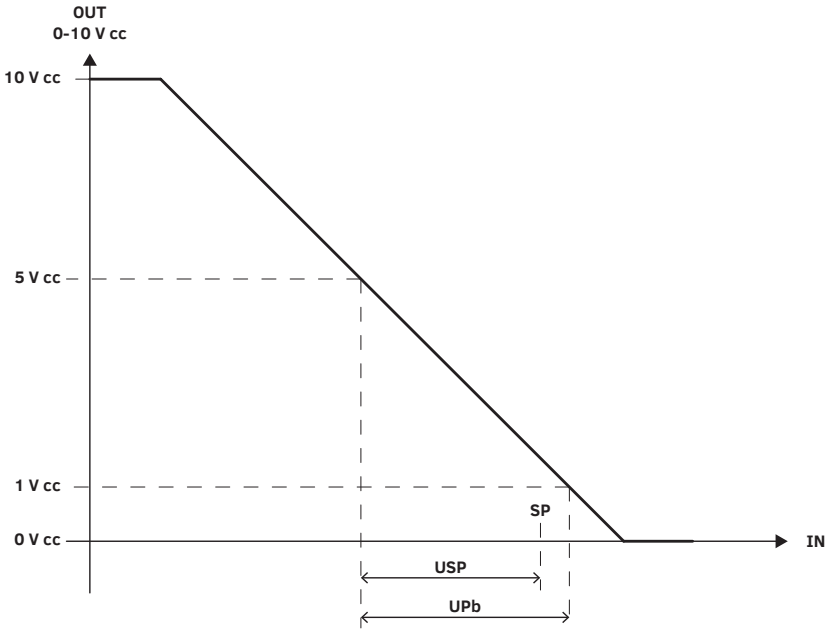


7.2.11 Master regulation on OUT output to reversely control a motorized valve actuator

*menu **4: SETUP** > parameter **C7/C8= USP-REV 10-0V***

The controller enables a second work zone with independent setpoint **SP-USP** and proportional band **UPb**. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The voltage of output **OUT** increases and decreases in direct proportion to the signal of the input **IN**.



7.3 Master PID mode

7.3.1 Applications

Signals from temperature sensors or transducers.

7.3.2 EC motor control

The control command value for the fans **Co**, and possibly the **OUT** output voltage varies to keep the magnitude measured by the transducer with prevalent signal (**IN**) at the setpoint value (**SP**).

***Note**: for correct PID control operation, accurately set the specific parameters.*

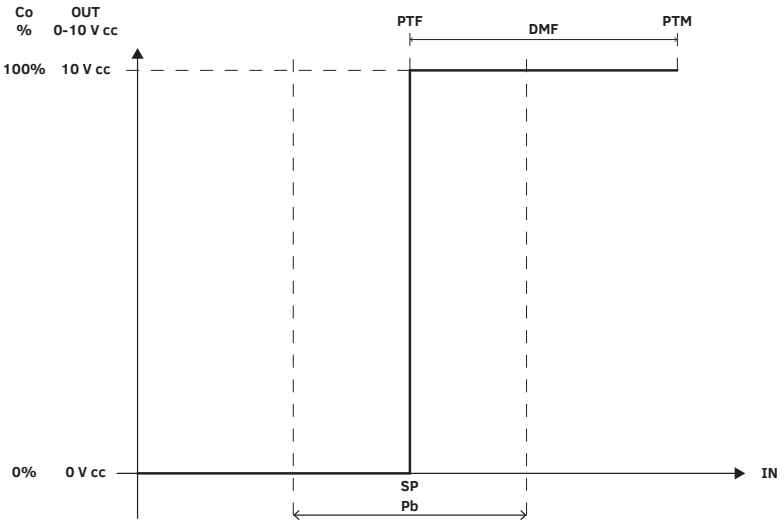
At full potential, meaning once the settlement transitions are depleted and far from the minimum and (**Lo**) and maximum (**Hi**) limits, the PID controller maintains the value of the magnitude measured by the prevalent transducer at input at **SP**. **Co** can have a free value that ranges from 0% to 100%, as a function of what is required to maintain the working setpoint.

During the transitions, if **IN**, it moves inside the **SP** but remains within the proportional band **Pb**, **Co** varies from 0% to 100% to return **IN** to **SP**.

Instead, if **IN** is outside the **Pb**, the motor control gradually moves to 0% or 100%, according to what is needed.

The minimum (**Lo**) and maximum (**hi**) speed limits are enabled, with forcing at 0% and relevant hysteresis at 100% (**SI**+**SIH** and **Sh**+**ShH**).

Control jumps (**JH1** + **JL1** and **JH2** + **JL2**) are activated to avoid particularly noisy zones, "Speed band" on page 52



***NOTICE**: to avoid unwanted activation, do not connect the spray unit or pay careful attention to the parameter settings when the regulator works in Master PID mode.*

Key

Following is the description of the graph parameters used for setting the setpoint (**SP**) and the proportional band (**Pb**):

Variable	Description
PTF	Minimum working temperature or pressure restricted by system conditions. Set the setpoint to the same value as PTF to obtain greater compressor energy savings.
PTM	Maximum working temperature or pressure restricted by system conditions.
DMF	Temperature or pressure difference (**PTM**-**PTF**). Movement of the input from **PTF** to **PTM** occurs due to an increase in ambient temperature.

7.3.3 Spray unit control

See "Spray unit control" on page 47.

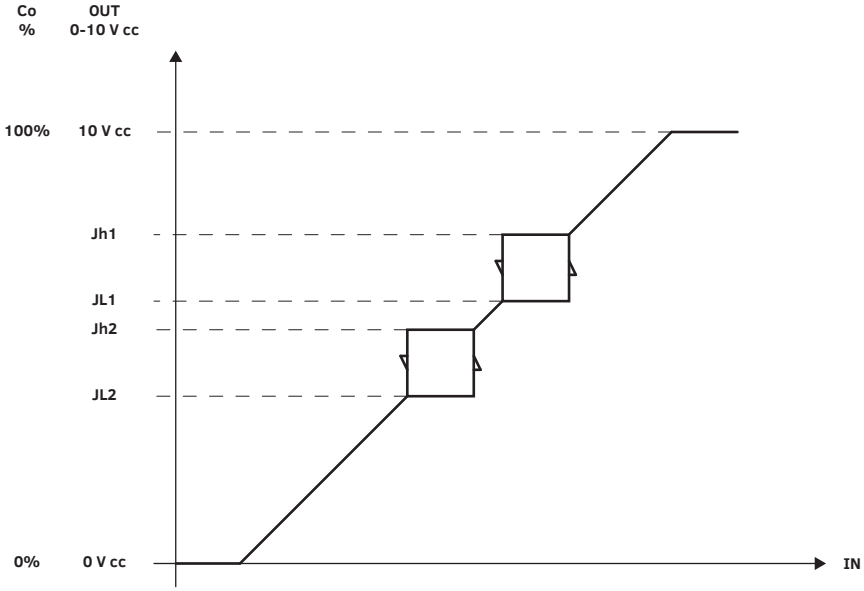
7.3.4 Command control of an actuator for a motorized valve

See "Master regulation on OUT output to directly control a motorized valve actuator" on page 49 and "Master regulation on OUT output to reversely control a motorized valve actuator" on page 49.

7.4 Speed band

7.4.1 Control jumps

Control jumps (**JH1** + **JL1** and **JH2** + **JL2**) can be defined to avoid particularly noisy zones.



8. Special functions

8.1 Timed washing of the heat exchanger

8.1.1 Applications

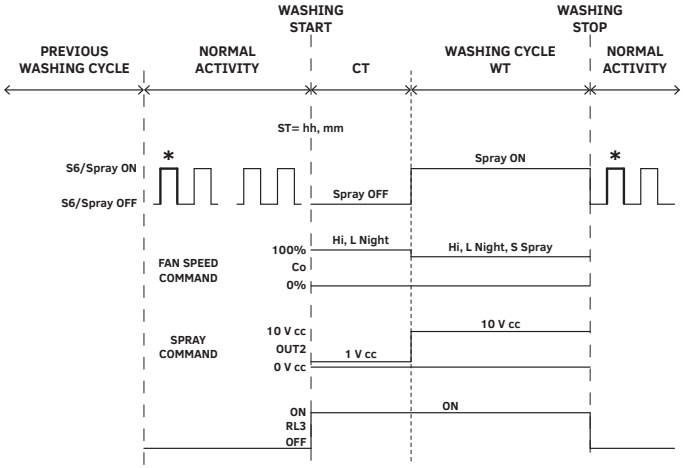
Presence of salt residues in the heat exchanger water.

***Note**: function only available AWS unit.*

8.1.2 "Washing forward" washing cycle

Washing is performed at most once a day, at the set time (**ST**). Following are the stages:

Step	Description
1	Stop the supply of the fluid to the heat exchanger by activation of relay **RL3**.
2	Cooling of the heat exchanger for **CT** minutes. The fans rotate at the maximum speed (lower value between **Hi** and **LNight**).
3	Washing the heat exchanger for **WT** minutes by activating the spray unit. The fans rotate at the maximum speed allowed of the settings (lower value between **LSpray**, **Hi** and **LNight**).



***Note**: when this washing cycle is running, the "Washing forward" message appears on the display.*

***Note**: washing is performed if, and only if, in the preceding operating period (Normal Activity) there was at least one activation of the spray (*).*

***Note**: if the controller is stopped during the washing cycle (input **S2** = closed), or if there is a power outage or water cutoff, the current cycle is considered finished.*

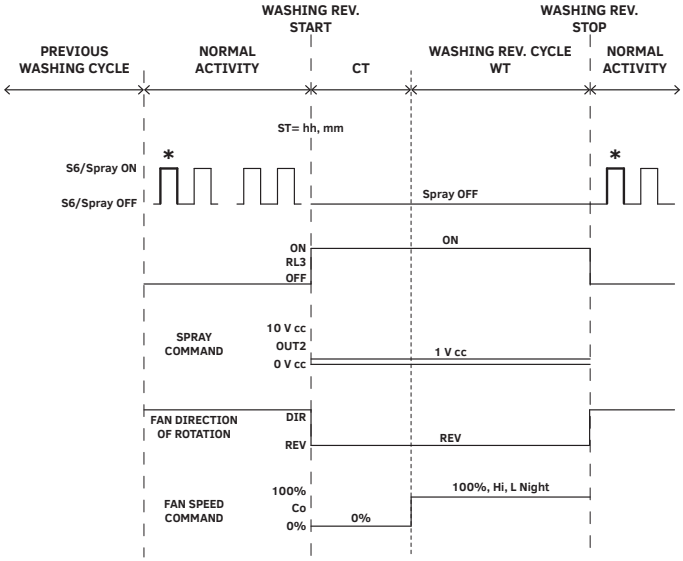
8.1.3 "Washing reverse" washing cycle

***Note**: function only available with EC fan control by Modbus control.*

***Note**: when this washing cycle is running, the "Washing Rev." message appears on the display.*

Washing is performed at most once a day, at the set time (**ST**). Following are the stages:

Step	Description
1	Disabling of the spray unit (output voltage **OUT** = 1 V)
2	Activation of washing sprays inside the heat exchanger and stop the supply of the fluid to the heat exchanger by activation of relay **RL3**.
3	Standby for **CT** minutes for gravity draining of the washing water. The fans are stopped.
4	Activation for **WT** minutes of the fans at 100% of the speed or at the maximum speed allowed of the settings (lower value between **Hi** and **LNight**). The fans rotate in the opposite direction of normal operation.



***Note**: if the controller is stopped during the washing cycle (input **S2** = closed), or if there is a power outage or water cutoff, the current cycle is considered finished.*

8.1.4 Setting Parameters

See "Timed washing of the heat exchanger" on page 97.

8.2 Heat exchanger power management

8.2.1 Applications

More precise control of the fluid exiting the heat exchanger, modulating the ability to disperse the heat in the exchanger in proportion to the effective need. Reduction in the energy consumption.

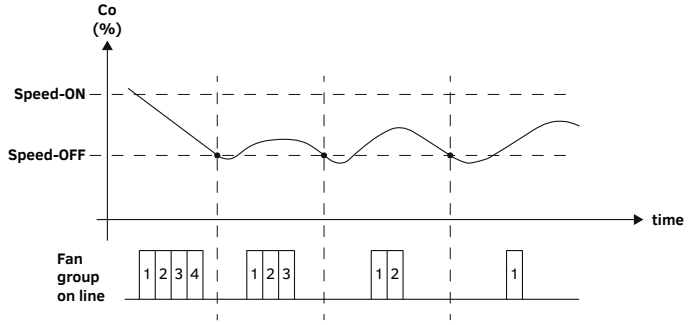
8.2.2 Reduction in the heat dissipation capacity

***Note**: function only available with EC fan control by Modbus control.*

The heat exchanger power is controlled by regulating the air flow rate to the fans. Once the fans have reached the minimum speed, the capacity of the heat exchanger to dissipate the thermal power can be further reduced by stopping a few.

If the control command value of the **Co** fans falls below the **Speed OFF** value, the controller deactivates a fan unit. Wait for **Pause** seconds for the system to stabilize. Normally **Co** returns above **Speed OFF**. If and when **Co** falls below **Speed OFF** once again, the controller deactivates the next fan unit.

This operation is repeated until the last fan unit, which remains active and follows the value **Co**. When **Co** is 0%, all the **Pause** timers still active are zeroed.



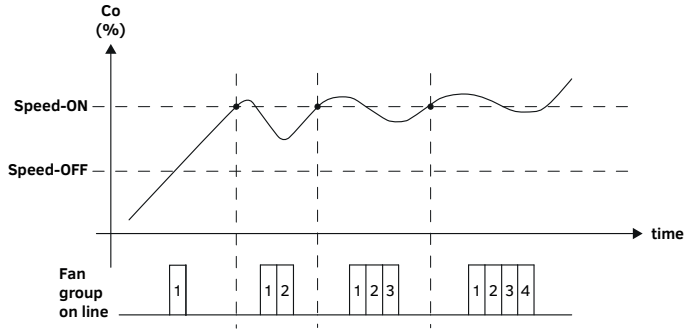
8.2.3 Increase in heat dissipation capacity

***Note**: function only available with EC fan control by Modbus control.*

The heat exchanger power is controlled by regulating the air flow rate to the fans. To reach maximum capacity of the heat exchanger to dissipate the thermal power, all of the fan units must be activated.

If the control command value of the **Co** fans exceeds the **Speed ON** value, the controller activates the next fan unit. Wait for **Pause** seconds for the system to stabilize. Normally **Co** returns below **Speed ON**. If and when **Co** rises above **Speed ON** once again, the controller activates the next fan unit.

This operation is repeated until the last fan unit. When **Co** is 100%, all the **Pause** timers still active are zeroed.



8.2.4 Setting Parameters

See "Heat exchanger power management" on page 97.

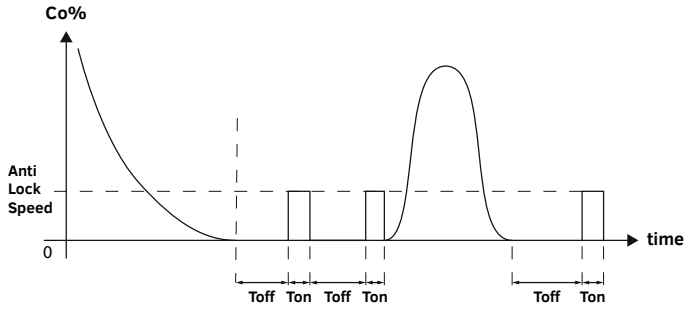
8.3 Fan anti-locking

8.3.1 Applications

Long downtimes or winters with snow and ice accumulation on the guard grid to avoid damaging the fans.

8.3.2 Operation

If the control command value **Co** is 0% for **TOff** minutes, all of the fans are activated at a constant **Anti Lock Speed** for **TOn** minutes.



8.3.3 Setting Parameters

See "Fan anti-locking" on page 98.

8.4 Night limits for speed using internal clock

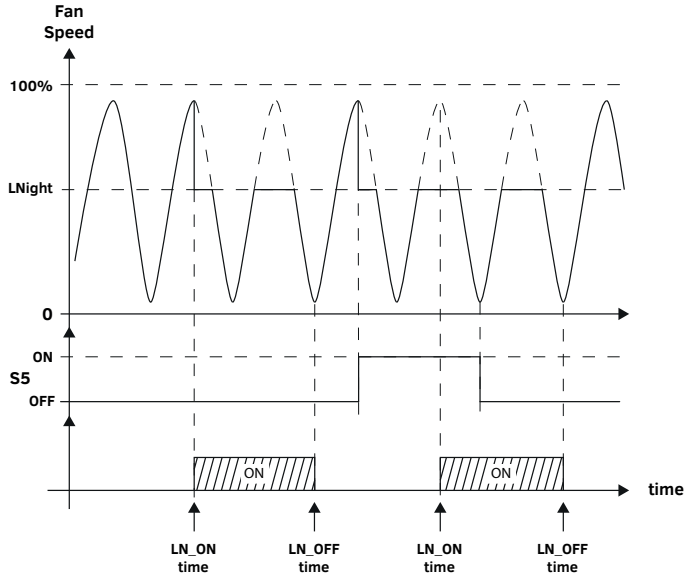
8.4.1 Applications

Activation of the night speed limit using the controller's internal clock.

8.4.2 Operation

The night maximum speed limit, **LNight**, is activated in the time interval between **LN ON Time** until **LN Off Time**.

***Note**: the function is in parallel to the command defined by input **S5**.*



8.4.3 Setting Parameters

See "Night limits for speed using internal clock" on page 99.

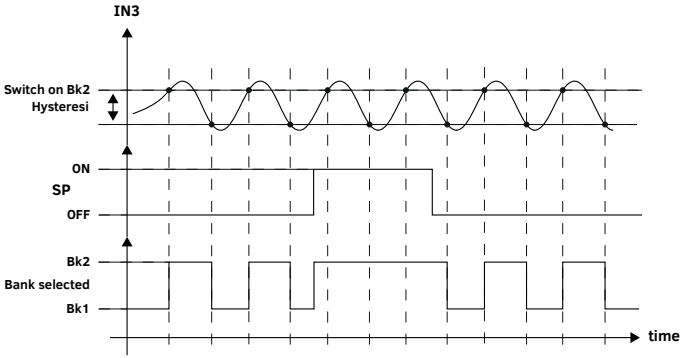
8.5 Switching of setpoint following the ambient temperature from IN3 (Bank Switch)

8.5.1 Operation

***Note**: with this function active, the other functions that use analog input **IN3** are not available.*
The active parameter set (**Bk1** or **Bk2**) is defined as the temperature value read on analog input **IN3**:

- it is **Bk2** if the temperature is greater than the **Switch on Bk2** value
- it is **Bk1** if the temperature is less than the (**Switch on Bk2** -**Hysteresis)** value

If the On/Off **SP** = On, the active parameter set is always **Bk2**, regardless of the temperature value read.



8.5.2 Setting Parameters

See "Switching of setpoint following the ambient temperature from IN3 (Bank Switch)" on page 100.

8.6 Timed cleaning of the heat exchanger

8.6.1 Applications

Paper, leaves and/or dust present on the heat exchanger.

8.6.2 Operation

Cleaning is performed at most once a day, at the set time for the set amount of time. The fans turn in the direction opposite the normal working direction and at the set speed.

***Note**: function only available with ebm-papst EC fan control by Modbus control.*

8.6.3 Setting Parameters

See "Timed cleaning of the heat exchanger" on page 100.

8.7 Adjustment of the setpoint following the external temperature IN3 (Floating SP)

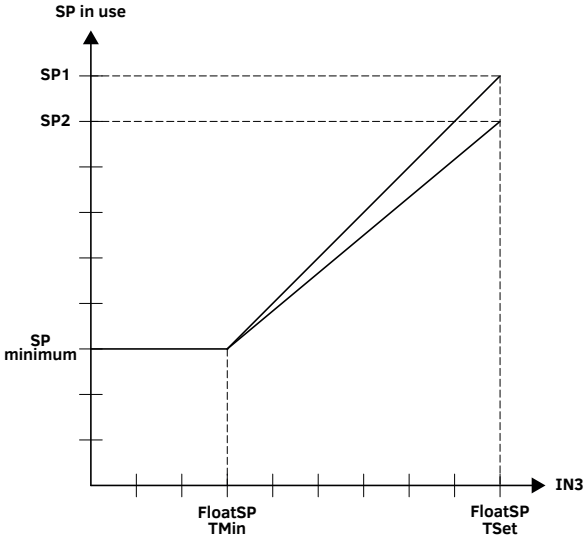
8.7.1 Operation

***Note**: function available only in Master mode.*

***Note**: with this function active, the other functions that use analog input **IN3** are not available.*

The active setpoint value, **SP**, is modified in proportion to the external temperature value of the temperature probe connected to the analogue input **IN3**.

The working zone is the range between the **FloatSP TMin** and **FloatSP TSet** temperatures. When the **FloatSP TMin** temperature is reached, the setpoint reaches the minimum set value, **SP Minimum**; when it reaches the **FloatSP TSet** temperature, the setpoint equals the setpoint entered (**SP1**/**SP2**).



8.7.2 Operating example

Following is an example of the values taken by **SP** as the temperature detected by **IN3** varies:

	IN3	rPr420	rPr015	rPr025	rPr030	rPr045	rUu-05	rPu030	rUu010	rtE-01	rtE-02
	0,0°C	10,0 mA	6,9 bar	10,8 bar	9,7 bar	14,0 bar	1,9 V	9,8 bar	4,0 V	19,6 °C	19,6 °C
FloatSP Tmin	5,0°C(*)	10,0 mA	6,9 bar	10,8 bar	9,7 bar	14,0 bar	1,9 V	9,8 bar	4,0 V	19,6 °C	19,6 °C
	10,0°C(*)	12,0 mA	8,8 bar	14,0 bar	13,4 bar	19,6 bar	2,4 V	13,5 bar	5,0 V	32,5 °C	32,5 °C
FloatSP Tset	15,0°C(*)	14,0 mA	10,6 bar	17,0 bar	17,0 bar	25,0 bar	2,9 V	17,0 bar	6,0 V	45,0°C	45,0°C
	20,0°C(*)	14,0 mA	10,6 bar	17,0 bar	17,0 bar	25,0 bar	2,9 V	17,0 bar	6,0 V	45,0°C	45,0°C

***Note (*)**: the area of variation of **SP** as a function of the **IN3** value with the default values.*

8.7.3 Setting Parameters

See "Adjustment of the setpoint following the ambient temperature from IN3 (Floating SP)" on page 101.

8.8 Adjustment of external setpoint with 0-10 V signal from IN3

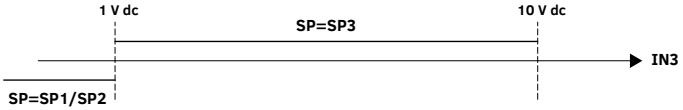
8.8.1 Operation

***Note**: function available only in Master mode.*

***Note**: with this function active, the other functions that use analog input **IN3** are not available.*

The active setpoint value **SP** depends on the 0-10 V signal connected to input **IN3**:

- it is **SP1**/**SP2** if the signal is between 0 and 1 V.
- it is the value set using input **IN3** (**SP3**) if the signal is between 1 and 10 V.



8.8.2 Operating example

Following is an example of the values taken by **SP3** as the **IN3** signal varies:

IN3	rPr420	rPr015	rPr025	rPr030	rPr045	rUu-05	rPu030	rUu010	rtE-01	rtE-02
0.0 V	SP1-2	SP1-2	SP1-2	SP1-2	SP1-2	SP1-2	SP1-2	SP1-2	SP1-2	SP1-2
1.0 V	4.1 mA	0.1 bar	0.3 bar	0.4 bar	0.6 bar	0.5 V	0.1 bar	0.0 V	-11.6 °C	-11.6 °C
2.0 V	5.9 mA	1.8 bar	3.1 bar	3.6 bar	5.4 bar	0.8 V	2.9 bar	1.1 V	0.0 °C	0.0 °C
5.0 V	11.2 mA	6.8 bar	11.3 bar	13.6 bar	20.6 bar	2.3 V	12.9 bar	4.5 V	34.7 °C	34.7 °C
10.0 V	20.5 mA	15.5 bar	25.8 bar	30.9 bar	46.5 bar	5.2 V	30.5 bar	10.3 V	94.7 °C	94.7 °C

8.8.3 Setting Parameters

See "Adjustment of external setpoint with 0-10 V signal from IN3" on page 102.

8.9 Input Slave Safety mode from IN3

8.9.1 Operation

***Note**: it is necessary to setup a Master configuration to be used if there is no 4–20 mA signal. The controller must be connected to suitable measurement transducers for the set Master configuration. The Master configurations available and the necessary transducers/sensors are those normally defined for the controller.*

***Note**: with this function active, the other functions that use analog input **IN3** are not available.*

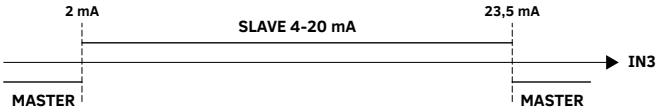
The operating mode of the controller (Slave/master) depends on the 4-20 mA signal from input **IN3**:

- Slave control with signal between 2 and 23.5 mA (normal operation)
- Master control with signal less than 2 mA and greater than 23.5 mA (emergency operation)

Emergency operation is indicated by the opening of relay RL2 (relative LED off) and the "**Slave SafeKO**" message, see "Warning messages" on page 106.

In Slave mode, the control output is proportional to the input signal, see "Slave proportional mode" on page 39.

***Note**: the analog output OUT1 follows the Slave or Master mode active at that time if the parameter **C7** = **output SLAVE 0-10V**. The OUT2 analog output cannot be used.*



8.9.2 Setting Parameters

See "Input Slave Safety mode from IN3" on page 103.

9. Use the controller

9.1 Start-up

9.1.1 Warnings

CAUTION! Check again that the equipment and wiring are correct as required in this manual. Keep people or things out of the work area.

9.1.2 Start-up procedure

Follow this procedure for correct controller start-up:

Step	Task	Reference in the manual
1	Complete all electrical power connections at mains voltage.	"Electrical installation" on page 26
2	Complete the input connections (i.e., transducers), outputs, and remote controls. ***NOTICE**: follow the indicated steps for correct Modbus connection operations.*	"Connections" on page 28
3	Set-up the type of control command for the EC fans on DIP switch SW1.	"DIP switch SW1" on page 16
4	Set the enabling/disabling of the emergency speed management for EC fans on DIP switch SW1.	"DIP switch SW1" on page 16
5	Turn on power.	-
6	Select the configuration suitable for the transducers used and the application.	"Select a configuration" on page 69
7	If necessary, enable editing of all parameters on DIP switch SW1 and other functions	"DIP switch SW1" on page 16
8	If necessary, set up the unit of measure to IP to display the temperature and pressure values (default **SI**)	"Configuration parameters" on page 80
9	Set the setpoint 1 or 2 and the night limit as well as the direction of rotation for the fans.	"Editing parameters" on page 72
10	If necessary, set proportional bandwidth and setpoints for any external units and related parameters.	
11	If needed, in PID mode, set the parameters	
12	If necessary, edit the configuration parameters	
13	If necessary, assign the addresses to the EC fans and generate the map.	"Manage ebm-papst and Ziehl-Abegg fans" on page 86
14	If necessary, set the parameters for the special functions.	"Set the common and special functions" on page 96
15	Disable reserved parameter editing on DIP switch SW1.	"DIP switch SW1" on page 16

9.1.3 Information displayed when powered on

When the controller is powered on (or after pressing the **Reset** key), before the home page (see "Home page" on page 63) appears, for a few seconds a page appears that has the following information:

- device type
- firmware version
- type of control command for the set fans

***Note**: if the control command is performed via Modbus, during the start-up step, the system checks the status of the map and the number of fans turned on. During the check, the "Map is cleared" message appears quickly and **Map** and **Run** are both zeroed (see "Home page with Modbus fan control" on page 64).*

Example

```
EC Controller R.6.2
  EC Fans & Spray
Manager & Controller
  ebm Modbus output
```

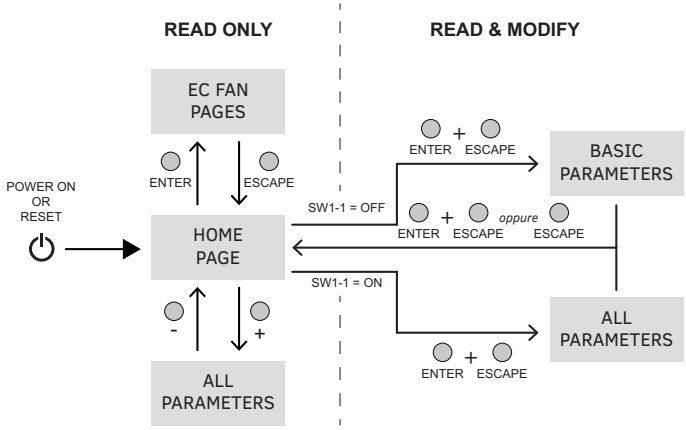
9.2 Navigation structure

9.2.1 Getting started

When turned on, the home page is displayed (see "Home page" on page 63). On the home page, press the **+** and **-** keys to display the current values of all the parameters/measurements (see "List of parameters/measurements" on page 65) or press the **ENTER** key to display the data for the EC fans (see "Display the EC fan data" on page 87).

To edit the parameters, simultaneously press the **ENTER** + **ESCAPE** keys. Based on the position of switch 1 of DIP switch SW1, all parameters are visible (see "Parameter menu" on page 68) or only the base ones are (see "Basic parameters" on page 72).

9.2.2 Navigation map

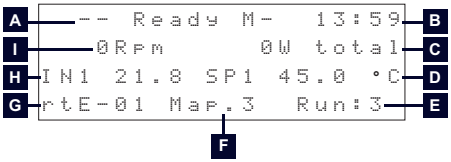


9.3 Home page

9.3.1 Getting started

The information displayed on the home page depends on the fan control mode set using DIP switches 5 and 6, see "DIP switch SW1" on page 16.

9.3.2 Home page with Modbus fan control

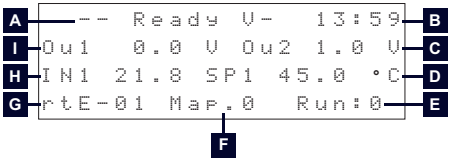


Part	Description
A	System status or alarm/warning message. **System status** ■ **Ready M**: control command value = 0 ■ **Run M CW** (*): control command value > 0. Direction of rotation of the fans: clockwise. ■ **Run M CCW** (*): control command value > 0. Direction of rotation of the fans: counter-clockwise. ■ **Stop**: control disabled (contact **S2** = closed) ■ **RTC N.Limit**: speed limit from active RTC (typically the night speed limit) ■ **Washing Fwd.**.: heat exchanger washing active, normal fan rotation direction ■ **Washing Rev.**.: heat exchanger washing active, reverse fan rotation direction ■ **Cleaning**: dry cleaning of the heat exchanger active ■ **Anti lock**: fan anti-lock rotation running ■ **Floating SP**: control command value > 0 and menu **4: SETUP** > parameter **C5** = **Floating SP** ■ **SP from IN3**: **SP value** from input **IN3** active ■ **Safe Slave**: control command value > 0 and menu **4: SETUP** > parameter **C5** = **Slave safety** (with control in Slave mode). **Alarm and warning messages** See "Troubleshooting" on page 104.
B	Internal clock time
C	Total power absorbed by fans. With **Map.0** and **Run:0** only the unit of measure is visible without the value.
D	Only for Master configurations. Value of the selected setpoint (**SP1** or **SP2**) ***Note**: it is **SP3** if the setpoint is set using **IN3** (menu **4: SETUP** > parameter **C5** = **SP from IN3**) and the input value at **IN3** is > 1 V.*
E	Number of EC fans that respond to the polling on bus RS485 Modbus
F	Number of EC fans mapped
G	Current configuration
H	Value of the prevalent input (**IN1** or **IN2**). The unit of measure depends on the set configuration. ***Note**: it is **Slave IN3** if the control mode is set as Slave by IN3 (menu **4: SETUP** > parameter **C5** = **Slave safety**) and the input value at **IN3** is between 2 and 23.5 mA.*
I	Current fan speed. With **Map.0** and **Run:0** only the unit of measure is visible without the value.

***Note (*)**: the direction of forced rotation during start-up of the system (default = **CW**). The content of the holding register of the motors is overwritten. To modify the direction of rotation, use the reserved parameter **Working Fan Direction** (see "Editing parameters" on page 72).*

***Note**: during the start-up step, the system checks the status of the map and the number of fans that respond. During this check, the "Alarm: No Fans" message appears and **Map** and **Run** are zero.*

9.3.3 Home page with fan 0–10 V output fan control and reading/writing data by Modbus



Part	Description
A	System status or alarm/warning message. **System status** ■ **Ready V**: voltage command, control command value = 0 ■ **Run V CW** (*): voltage command, control command value > 0. Direction of rotation of the fans: clockwise. ■ **Run V CCW** (*): voltage command, control command value > 0. Direction of rotation of the fans: counter-clockwise. ■ **Stop**: control disabled (contact **S2** = closed) ■ **RTC N.Limit**: speed limit from active RTC (typically the night speed limit) ■ **Washing Fwd.**.: heat exchanger washing active, normal fan rotation direction ■ **Cleaning**: dry cleaning of the heat exchanger active ■ **Anti lock**: fan anti-lock rotation running ■ **Floating SP**: control command value > 0 and menu **4: SETUP** > parameter **C5** = **Floating SP** ■ **SP from IN3**: **SP value** from input **IN3** active ■ **Safe Slave**: control command value > 0 and menu **4: SETUP** > parameter **C5** = **Slave safety** (with control in Slave mode). **Alarm and warning messages** See "Troubleshooting" on page 104.
B	Internal clock time
C	Voltage absorbed by **OUT2** analog output
D	Only for Master configurations. Value of the selected setpoint (**SP1** or **SP2**) ***Note**: it is **SP3** if the setpoint is set using **IN3** (menu **4: SETUP** > parameter **C5** = **SP from IN3**) and the input value at **IN3** is > 1 V.*
E	Number of EC fans that respond to the polling on bus RS485 Modbus
F	Number of EC fans mapped
G	Current configuration
H	Value of the prevalent input (**IN1** or **IN2**). The unit of measure depends on the set configuration. ***Note**: it is **Slave IN3** if the control mode is set as Slave by IN3 (menu **4: SETUP** > parameter **C5** = **Slave safety**) and the input value at **IN3** is between 2 and 23.5 mA.*
I	Voltage of the **OUT1** analog output

***Note (*)**: to get the indication of the direction of rotation (**CW** or **CCW**), the fans must be correctly mapped and functioning. With **Map.0** and **Run:0**, the **CW** and **CCW** characters do not appear.*

***Note**: when the 0-10 V regulation mode is active, the fans only need to be mapped to access the information on the fans available by Modbus.*

9.4 Parameters

9.4.1 List of parameters/measurements

Following are all of the parameters for the controller in order of their display.

***Note**: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

Parameter/ page	Description	Unit of measure
Home page	See "Home page" on page 63	-
IN 1	Input value 1	mA/ V dc/ bar/ °C
IN 2	Input value 2	mA/ V dc/ bar/ °C
IN 3	Input value 3	mA/ V dc/ bar/ °C
SP1 (*)	Setpoint 1	°C/ mA/ bar/ V dc
SP2 (*)	Setpoint 2	°C/ mA/ bar/ V dc
LNight	Maximum night limit speed (% RPM)	%
SSpray	Speed (% RPM) with SPRAY on	%
JH 1	Upper speed limit for jump 1 (% RPM)	%
JL 1	Lower speed limit for jump 1 (% RPM)	%
JH 2	Upper speed limit for jump 2 (% RPM)	%
JL 2	Lower speed limit for jump 2 (% RPM)	%
Working Fan Direction	Working (normal) direction of rotation of the fans	-
P (*)	Proportional band	°C/ mA/ bar/ V dc
I (*)	Integral component weight	-
D (*)	Derivative component weight	-
ti (*)	Integration time	s
td (*)	Derivation time	s
SP1 (*)	Setpoint 1	°C/ mA/ bar/ V dc
Pb 1 (*)	Fan proportional band	°C/ mA/ bar/ V dc
Hi 1	Maximum speed limit (% RPM)	%
Lo 1	Minimum speed limit (% RPM)	%
dE 1	Soft-Start acceleration/deceleration time for starter	s
Sh 1	Input value that forces the fan control command to the maximum. (Bypass maximum speed limit)	°C/ mA/ bar/ V dc
ShH 1	Hysteresis on value of **Sh 1** and **Sh 2**	°C/ mA/ bar/ V dc
Sl 1	Input value that forces the fan control command to zero. (Bypass minimum speed limit)	°C/ mA/ bar/ V dc
SlH 1	Hysteresis of value of **Sl 1** and **Sl 2**	°C/ mA/ bar/ V dc
USP 1	Setpoint (RH %) for voltage output to external unit (spray unit) **OUT**	°C/ mA/ bar/ V dc
UPb 1	Proportional band (RH %) for voltage output to external unit (spray unit) **OUT**	°C/ mA/ bar/ V dc
SP2 (*)	Setpoint 2	°C/ mA/ bar/ V dc
Pb 2 (*)	Fan proportional band	°C/ mA/ bar/ V dc
Hi 2	Maximum speed limit (% RPM)	%
Lo 2	Minimum speed limit (% RPM)	%
dE 2	Soft-Start acceleration/deceleration time for starter	s
Sh 2	Input value that forces the fan control command to the maximum. (Bypass maximum speed limit)	°C/ mA/ bar/ V dc
ShH 2	Hysteresis on value of **Sh 1** and **Sh 2**	°C/ mA/ bar/ V dc
Sl 2	Input value that forces the fan control command to zero. (Bypass minimum speed limit)	°C/ mA/ bar/ V dc
SlH 2	Hysteresis of value of **Sl 1** and **Sl 2**	°C/ mA/ bar/ V dc
USP 2	Setpoint (RH %) for voltage output to external unit (spray unit) **OUT**	°C/ mA/ bar/ V dc
UPb 2	Proportional band (RH %) for voltage output to external unit (spray unit) **OUT**	°C/ mA/ bar/ V dc

Parameter/ page	Description	Unit of measure
C0	Operating modes and number of inputs used	-
C1	Input to use. The other input is still visible from the display or from Modbus port (input selection)	-
C2	**IN1** and **IN2** type input	-
		-
C3	Display value conversion	-
C4	Setpoint position	-
C5	Input **IN3** functions	-
C6	Relay **RL1** management	-
C7	**OUT_1** analog output settings	-
C8	**OUT_2** analog output settings	-
Configuration page in use	Working mode set, type of input and display value conversion	-
Modbus page	Modbus communication parameters with PC-BMS	-
Internal clock page (RTC)	Date and time	-
Heat exchanger washing page (Washing) (*)	Parameters for timed washing of the heat exchanger	-
Heat exchanger power management page (LowCapacity) (*)	Heat exchanger power management parameters	-
Fan anti-locking page (Anti Lock Fan) (*)	Fan anti-locking parameters	-
Night limit page (RTC Night Limit) (*)	Parameters for night control	-
Heat exchanger cleaning page (Cleaning) (*)	Heat exchanger cleaning parameters	-
Fans Power (**)	Total power absorbed by EC fans	W
Fans Current (**)	Total current in the intermediate circuit (DC-Link) absorbed by the EC fans	A
Fans Speed (**)	EC fan rotation speed (RPM %)	%
TLogic (**)	Electronic board real time temperature	°C
Out 1 (**)	**OUT1** analog output value	V dc
Out 2 (**)	**OUT2** analog output value	V dc
Co (**)	Control command value for the fans	%

***Note** (*): parameters only visible if the controller configuration calls for it or when the function is active.*

***Note** (**): parameters visible only if the fans are controlled by Modbus.*

9.4.2 Display the values of all the parameters/measurements

***Note**: visible parameters depend on the set configuration.*

1. Press **+** or **-** to scroll through all the parameters/measurements: they are shown in the sequence indicated in "List of parameters/measurements" on page 65.
2. Press the **ESCAPE** key to return to the home page.

9.4.3 Parameter menu

The parameters are listed in the menu and displayed in the following order:

Description	Menu
Basic parameters	**1: BASIC**
Setpoint 1 parameters	**2: EXPERT Bank 1**
Setpoint 2 parameters	**3: EXPERT Bank 2**
Controller configuration parameters	**4: SETUP**
PID control parameters.	**5: PID**
Modbus communication parameters with PC-BMS, over COM-0.	**6: MODBUS**
Internal clock control parameters.	**7: Real Time Clock**
Heat exchanger washing parameters	**8: Washing**
Heat exchanger power management parameters	**9: LowCapacity**
Fan anti-locking parameters	**10: Anti Lock Fan**
Night control with internal clock parameters	**11: RTC Night Limit**
Parameters for set switching of parameters 1 and 2 by temperature probe	**12: Bank Switch ***
EC fan management by Modbus functions	**13: EC FAN Functions**
Heat exchanger cleaning parameters	**14: Cleaning**
Parameters for adjusting the setpoints as a function of the external temperature	**15: Floating SetPoint**

***Note**: menu item only visible if **C5** = **Nothing**.*

9.4.4 Editing parameters

To...	Then...
edit any parameter	see "Edit any parameter" on page 84
edit a basic parameter	see "Edit a basic parameter" on page 74

10. Set the operating mode

10.1 Select a configuration

10.1.1 Configuration description

***Note**: in the default Master configuration, the setpoint coincides with the maximum fan speed (menu **4: SETUP** > parameter **C4** = **hi**), and the controller automatically selects the sensor with the stronger signal (menu **4: SETUP** > parameter **C1** = **hi**).*

Configuration	Signal/Transducer	Type of control	Description
rS-010, rS-020, rS-420	signal 0–10 Vdc/0–20 mA/4–20 mA	**Slave**	They receive a voltage or current signal in input and replicate it proportionally to the analog **OUT** output and Modbus **COM1**. Control, alarms, and value display are always in volt (rS-010) or milliamp (rS-020, rS-420).
rtE-01, rtE-02	probe NTC 10 kΩ @ 25 °C/77 °F	**Master**	They read NTC sensor values and convert them to temperature values. Regulation, alarms, and value display will always be in temperature (° C). ***NOTICE**: use the rtE-02 configuration if the MEI-4 input expansion module is installed.*
rPr420	transducers with 4-20 mA output and mA reading	**Master**	It reads transducer values with current output. Regulation, alarms, and value display will always be in milliampere.
rPr015, rPr025, rPr030, rPr045,	transducers with 4-20 mA output and bar reading	**Master**	They read transducer values with current output with different scales and convert them into pressure values. Control and value display will always be in pressure (bar). While the minimum and maximum limit alarm on the inputs are in mA, regardless. ***Note**: if the signal is less than 4 mA, 0 bar will always appear on the display.*
rPu030	transducers with V dc output and bar reading	**Master**	It reads transducer values with voltage output and converts them into pressure values. Regulation and value display will always be in pressure (bar).
rUu-05, rUu-010	transducers with V dc output and V dc reading	**Master**	They read transducer values with voltage output. Regulation, alarms, and value display will always be in volt.

10.1.2 Technical specifications of the configurations

Following are the specifications of each configuration:

***Note**: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

Configuration	Mode	IN1/IN2 input	Signal/ Transducer/	Display	Setpoint	Proportional band
rS020	Slave	0–20 mA Ri= 100 Ω	0–20 mA	0–23.5 mA	-	-
rS-010	Slave	0–10 V dc Ri= 10 kΩ	0–10 V dc	0–10 V dc	-	-
rS-420	Slave	4–20 mA Ri= 100 Ω	4–20 mA	0–23.5 mA	-	-
rtE-01 (default)	Master	NTC 10 kΩ @ 25 °C/77 °F	NTC 10 kΩ @ 25 °C/77 °F	from -30 to + 99 °C	45 °C	7.5 °C
rtE-02	Master	NTC 10 kΩ @ 25 °C/77 °F	NTC 10 kΩ @ 25 °C/77 °F	from 9.6 to 99 °C	45 °C	7.5 °C

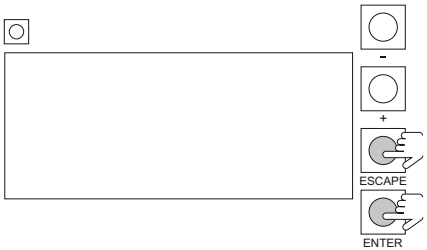
Configuration	Mode	IN1/IN2 input	Signal/ Transducer/	Display	Setpoint	Proportional band
rPr420	Master	4–20 mA Ri= 100 Ω	4–20 mA	4–20 mA	14 mA	2.6 mA
rPr015	Master	4–20 mA Ri= 100 Ω	0–15 bar > 4–20 mA	0–15 bar	10.6 bar	2.4 bar
rPr025	Master	4–20 mA Ri= 100 Ω	0–25 bar > 4–20 mA	0–25 bar	17.0 bar	3.5 bar
rPr030	Master	4–20 mA Ri= 100 Ω	0–30 bar > 4–20 mA	0–30 bar	17.0 bar	3.5 bar
rPr045	Master	4–20 mA Ri= 100 Ω	0–45 bar > 4–20 mA	0–45 bar	25.0 bar	5.2 bar
rUu05	Master	0–5 V dc Ri= 10 kΩ	0.5–4.5 V dc	0–5 V dc	2.9 V dc	0.8 V dc
rPu030	Master	0–5 V dc Ri= 10 kΩ	0–30 bar > 0–5 V dc	0–35 bar	17.0 bar	3.5 bar
rUu010	Master	0–10 V dc Ri= 10 kΩ	0–10 V dc	0–10 V dc	6 V dc	1.6 V dc

10.1.3 Select a configuration

***NOTICE**: this deletes any previous change and restores all selected configuration default values.*

***Note**: follow this procedure also if there is a fault in displaying the parameters on the display: all selected configuration default values will be restored.*

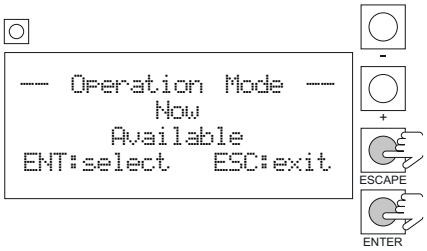
To change/restore a configuration:



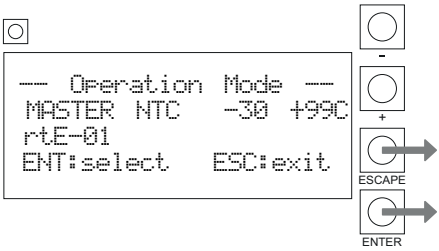
1. Simultaneously press and hold down the **ESCAPE** and **ENTER** keys.



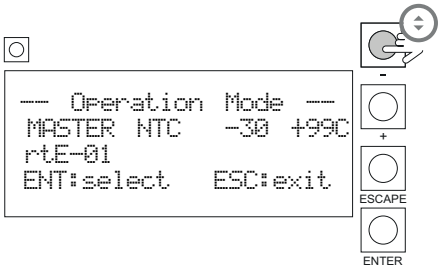
2. Press and hold down both keys, briefly press the **RESET** button (or turn the controller off and on).



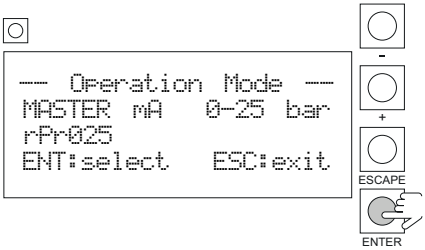
3. Holding down the two keys, wait for the "Operation mode now available" message.



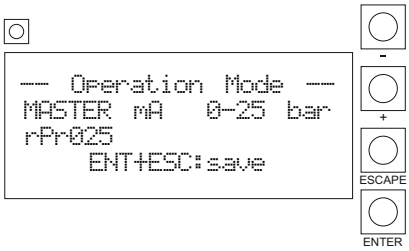
4. Simultaneously release the **ESCAPE** and **ENTER** keys: the last set configuration appears.



5. Press **-**(or **+**) to scroll through the settings.



6. Press the **ENTER** key for the selected configuration.



7. Continue as follows:
   - To confirm, press the **ENTER** and **ESCAPE** keys: the "Saving new values. Please wait" message appears that confirms that it is being saved. Then, the controller restarts and displays the home page.
   - To cancel and modify the selected configuration press the **ESCAPE** key once.
   - To return to the home page, press the **ESCAPE** key twice.

10.2 Editing parameters

10.2.1 Basic parameters

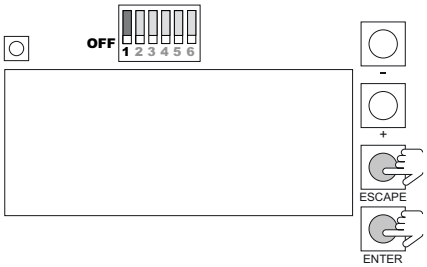
SW1-1 = *Off* > ***ESCAPE*** + ***ENTER***
or
SW1-1 = *On* > ***ENTER*** + ***ESCAPE*** > ***1: BASIC***

Note*: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

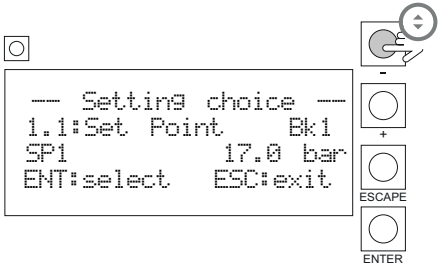
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration	Settings system
SP1/SP2	Setpoint 1/ Setpoint 2	°C	-15.0	+90.0	45.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	+20.0	+90.0	45.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	4.0	20.0	14.0	4–20 mA	rPr420	
		bar	0	15.0	10.6	0–15 bar > 4–20 mA	rPr015	
		bar	0	25.0	17.0	0–25 bar > 4–20 mA	rPr025	
		bar	0	30.0	17.0	0–30 bar > 4–20 mA	rPr030	
		bar	0	45.0	25.0	0–45 bar > 4–20 mA	rPr045	
		V dc	0	5.0	2.9	0.5–4.5 V dc	rUu-05	
		bar	0	30.0	17.0	0–30 bar > 0–5 V dc	rPu030	
		V dc	0	10.0	6.0	0–10 V dc	rUu010	
LNight	Maximum night limit speed (% RPM)	%	0%	100%	100%	All	All	
SSpray	Speed (% RPM) with SPRAY on	%	0%	100%	100%	All	All	
JH 1	Upper speed limit for jump 1 (% RPM)	%	0%	100%	100%	All	All	
JL 1	Lower speed limit for jump 1 (% RPM)	%	0%	100%	100%	All	All	
JH 2	Upper speed limit for jump 2 (% RPM)	%	0%	100%	100%	All	All	
JL 2	Lower speed limit for jump 2 (% RPM)	%	0%	100%	100%	All	All	
Working Fan Direction (*)	Working (normal) direction of rotation of the fans	-	CW	CCW	CW	All	All	

***Note** (*): expert parameters, can only be displayed and edited with switch 1 = On (DIP switch SW1). Note: to know the working direction of rotation of the fans, please refer to the product documentation.*

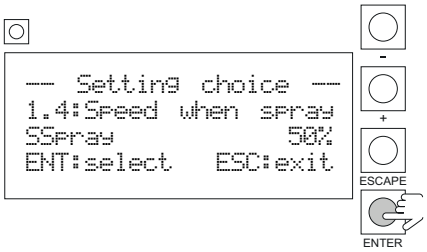
10.2.2 Edit a basic parameter



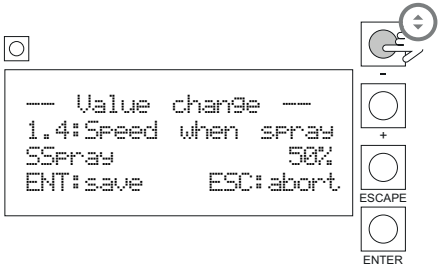
1. Leave switch 1 of DIP switch **SW1 OFF** and simultaneously press the **ENTER** and **ESCAPE** keys.



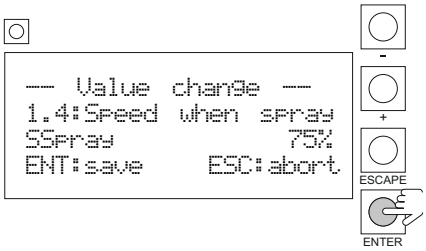
2. Press **+** (or **-**) to scroll through the parameters.

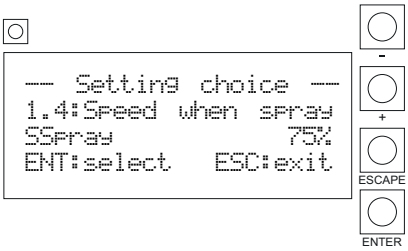


3. Press the **ENTER** key at the parameter of interest.



4. Press **+** (or **-**) to edit the selected parameter value.





5. Continue as follows:
   - To save the value, press the **ENTER** key: the value is saved in the volatile memory and the message "Remember: to save changed values press ENT * ESC" appears to remember how to perform the final saving step.
   - To cancel the change, press the **ESCAPE** key: it returns to step 3.

6. Continue as follows:
   - To edit the other parameters in the same submenu, repeat the procedure in step 4.
   - To save the changes made, press the **ENTER** and **ESCAPE** keys: the "Saving new values Pleas wait" message appears that confirms the saving is in progress. Then, the home page is displayed.
   - To cancel the changes, press the **ESCAPE** key: the "Restoring old values Change values discarded" message is displayed, informing the operator that the previous values have been restored and then the home page is displayed.

10.2.3 Expert level parameters for set 1 and 2

SW1-1** = On > **ENTER** + **ESCAPE** > **2: EXPERT Bank 1/3: EXPERT Bank 2

***Note**: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

***Note**: parameters **SP1**, **SP2**, **Pb1**, and **Pb2** are only visible with the controller in Master mode.*

***Note**: in Master configurations, the dedicated setpoint for the external unit is the algebraic sum of the setpoint in use (**SP1** or **SP2**) and the setpoint for the external unit in use (**USP1** or **USP2**).*

***Note**: in Slave configurations, the dedicated setpoint for the external units is simply the setpoint for the external unit in use (**USP** or **USP2**).*

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration	Settings system
SP1/SP2	Setpoint 1/ Setpoint 2	°C	-15.0	+90.0	45.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	+20.0	+90.0	45.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	4.0	20.0	14.0	4–20 mA	rPr420	
		bar	0	25.0	17.0	0–25 bar > 4–20 mA	rPr025	
		bar	0	30.0	17.0	0–30 bar > 4–20 mA	rPr030	
		bar	0	45.0	25.0	0–45 bar > 4–20 mA	rPr045	
		V dc	0	5.0	2.9	0.5–4.5 V dc	rUu-05	
		bar	0	30.0	17.0	0–30 bar > 0–5 V dc	rPu030	
		V dc	0	10.0	6.0	0–10 V dc	rUu010	
Pb 1/ Pb 2	Fan proportional band	°C	2.0	55.0	7.5	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	2.0	55.0	7.5	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	0.2	16.0	2.6	4–20 mA	rPr420	
		bar	0.5	15.0	2.4	0–15 bar > 4–20 mA	rPr015	
		bar	1.0	25.0	3.5	0–25 bar > 4–20 mA	rPr025	
		bar	1.0	30.0	3.5	0–30 bar > 4–20 mA	rPr030	
		bar	1.0	45.0	5.2	0–45 bar > 4–20 mA	rPr045	
		V dc	0.1	5.0	0.8	0.5–4.5 V dc	rUu-05	
		bar	1.0	30.0	3.5	0–30 bar > 0–5 V dc	rPu030	
		V dc	0.2	10.0	1.6	0–10 V dc	rUu010	
Hi 1/ Hi 2	Maximum speed limit (% RPM)	%	0	100	100	All	All	
Lo 1/ Lo 2	Minimum speed limit (% RPM)	%	0	100	0	All	All	
dE 1/ dE 2	Execution time for changing from the minimum speed to the maximum speed, and vice versa	s	1.5	60.0	2.0	All	All	

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration	Settings system
Sh 1/ Sh 2	Input value that forces the fan control command to the maximum. (Bypass maximum speed limit)	°C	-9.7	+99.8	99.8	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	+29.6	+99.8	99.8	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	4.0	20.0	20.0	4–20 mA	rPr420	
		bar	0	15.0	15.0	0–15 bar > 4–20 mA	rPr015	
		bar	0	25.0	25.0	0–25 bar > 4–20 mA	rPr025	
		bar	0	30.0	30.0	0–30 bar > 4–20 mA	rPr030	
		bar	0	45.0	45.0	0–45 bar > 4–20 mA	rPr045	
		V dc	0	5.0	5.0	0.5–4.5 V dc	rUu-05	
		bar	0	30.0	30.0	0–30 bar > 0–5 V dc	rPu030	
		V dc	0	10.1	10.0	0–10 V dc	rUu010	
ShH 1/ ShH 2	Hysteresis on value of **Sh 1** and **Sh 2**	°C	1.0	30.0	1.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	1.0	30.0	1.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	0.1	5.0	0.1	4–20 mA	rPr420	
		bar	0.1	5.0	0.1	0–15 bar > 4–20 mA	rPr015	
		bar	0.1	8.0	0.1	0–25 bar > 4–20 mA	rPr025	
		bar	0.1	8.0	0.1	0–30 bar > 4–20 mA	rPr030	
		bar	0.1	15.0	0.1	0–45 bar > 4–20 mA	rPr045	
		V dc	0.1	2.5	0.1	0.5–4.5 V dc	rUu-05	
		bar	0.1	15.0	0.1	0–30 bar > 0–5 V dc	rPu030	
		V dc	0.1	5.0	0.1	0–10 V dc	rUu010	

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration	Settings system
SI 1/ SI 2	Input value that forces the fan control command to zero. (Bypass minimum speed limit)	-	0	20.0	0	-	rS-020	
		-	4	20.0	4	-	rS-420	
		-	0	10.0	0	-	rS-010	
		°C	-25.1	+79.5	-25.1	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	+9.6	+79.5	+9.6	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	4.0	20.0	4.0	4–20 mA	rPr420	
		bar	0	15.0	0	0–15 bar > 4–20 mA	rPr015	
		bar	0	25.0	0	0–25 bar > 4–20 mA	rPr025	
		bar	0	30.0	0	0–30 bar > 4–20 mA	rPr030	
		bar	0	45.0	0	0–45 bar > 4–20 mA	rPr045	
		V dc	0	5.0	0	0.5–4.5 V dc	rUu-05	
		bar	0	30.0	0	0–30 bar > 0–5 V dc	rPu030	
		V dc	0	10.0	0	0–10 V dc	rUu010	
SIH 1/ SIH 2	Hysteresis of value of **SI 1** and **SI 2**	mA	0.1	10.0	0.2	-	rS-020	
		mA	0.1	5.0	0.2	-	rS-420	
		V	0.1	5.0	0.1	-	rS-010	
		°C	1.0	30.0	1.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	1.0	30.0	1.0	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	0.1	5.0	0.1	4–20 mA	rPr420	
		bar	0.1	5.0	0.1	0–15 bar > 4–20 mA	rPr015	
		bar	0.1	8.0	0.1	0–25 bar > 4–20 mA	rPr025	
		bar	0.1	8.0	0.1	0–30 bar > 4–20 mA	rPr030	
		bar	0.1	15.0	0.1	0–45 bar > 4–20 mA	rPr045	
		V dc	0.1	2.5	0.1	0.5–4.5 V dc	rUu-05	
		bar	0.1	15.0	0.1	0–30 bar > 0–5 V dc	rPu030	
		V dc	0.1	5.0	0.1	0–10 V dc	rUu010	

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration	Settings system
USP 1/ USP 2	Setpoint for voltage output to external unit (spray unit) **OUT**	mA	0	20.0	15.0	-	rS-020	
		mA	0	20.0	11.0	-	rS-420	
		V	0	10.0	7.5	-	rS-010	
		°C	-54.9	+55.0	-1.6	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	-54.9	+55.0	-1.6	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	-8	+8	-0.6	4–20 mA	rPr420	
		bar	-7.5	+7.5	-0.4	0–15 bar > 4–20 mA	rPr015	
		bar	-12.5	+12.5	-0.8	0–25 bar > 4–20 mA	rPr025	
		bar	-15	+15	-0.8	0–30 bar > 4–20 mA	rPr030	
		bar	-22.5	+22.5	-1.0	0–45 bar > 4–20 mA	rPr045	
		V dc	-2.5	+2.4	-0.2	0.5–4.5 V dc	rUu-05	
		bar	-15	+15	-1.0	0–30 bar > 0–5 V dc	rPu030	
		V dc	-5.1	+4.9	-0.5	0–10 V dc	rUu010	
UPb 1/ UPb 2	Proportional band for voltage output to external unit (spray unit) **OUT**	mA	0.5	20	4.2	-	rS-020	
		mA	0.5	20	4.2	-	rS-420	
		V	0.2	10	2.1	-	rS-010	
		°C	2.0	55.0	2.4	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	2.0	55.0	2.4	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	0.5	15.0	1.0	4–20 mA	rPr420	
		bar	0.5	15.0	0.8	0–15 bar > 4–20 mA	rPr015	
		bar	1.0	25.0	1.2	0–25 bar > 4–20 mA	rPr025	
		bar	1.0	30.0	1.2	0–30 bar > 4–20 mA	rPr030	
		bar	1.0	45.0	1.8	0–45 bar > 4–20 mA	rPr045	
		V dc	0.1	5.0	0.4	0.5–4.5 V dc	rUu-05	
		bar	1.0	30.0	1.5	0–30 bar > 0–5 V dc	rPu030	
		V dc	0.2	10.0	0.8	0–10 V dc	rUu010	

10.2.4 Configuration parameters

SW1-1** = On > **ENTER** + **ESCAPE** > **4:SETUP

***Note**: the values of these parameters are defined automatically by the set predefined configuration (see "Select a configuration" on page 69). They can be singularly edited according to need.*

Parameter/ page	Description	Values	Default	Configuration	Settings system
C0	Operating modes and number of inputs used	**GP1**: Slave controller that uses one input **GP2**: Slave controller that uses two inputs	GP2	rS-010, rS-020, rS-420	
		r1: Master proportional controller that uses one input **r2**: Master proportional controller that uses two inputs **rP1**: PID controller that uses one input **rP2**: PID controller that uses two inputs	r2	rtE-01, rtE-02, rPr420, rPr015, rPr025 rPr030, rPr045, rUu-05, rPu030, rUu010	
C1	Input to use. The other input is still visible from the display or from Modbus port (input selection)	Con **C0** = **GP1, r1, rP1, rAP1** ▪ **oFF**: always uses input **IN1** With **C0** = **GP2, r2, rP2, rAP2** ▪ **hi**: always uses the input with the higher value ▪ **Lo**: always uses the input with the lower value	hi	All	
C4	Setpoint position	**oFF**: Slave controller	oFF	rS 010 , rS 020, rS-420	
		hi: Master controller, setpoint at **Pb** high end. **Lo**: Master controller, setpoint at low end of **Pb**. **Mid**: PID controller, setpoint at **Pb** center	hi	rtE-01, rtE-02, rPr420, rPr015, rPr025 rPr030, rPr045, rUu-05, rPu030, rUu010	

Parameter/ page	Description	Values	Default	Configuration	Settings system
C5	Input **IN3** functions	**Nothing**: not connected / reading value / switching parameter set **SP from IN3**: set setpoint by external signal 0–10 V. **Floating SP**: adjust setpoint as a function of the external temperature. **Slave Safety**: control in Slave mode (Slave safety)	Nothing	rtE-01, rtE-02, rPr420, rPr015, rPr025 rPr030, rPr045, rUu-05, rPu030, rUu010	
C6	Relay **RL1** management	**RL1=off-> error**: RL1=off: relay Off when the controller is in fail status. **RL1=off-> error + S2**: RL1=off: relay Off when the controller is in fail status and contract S2 is closed. **RL1=off-> error + S2 + OFF**: RL1=off: relay Off when the controller is in fail status, contract S2 is closed, and the speed command is zero. **RL1=off -> Spray OFF**: command to spray unit On/Off	RL1=off-> error	All	

Parameter/ page	Description	Values	Default	Configuration	Settings system
C7	**OUT_1** analog output settings	**output SLAVE 0-10V**: command to Slave unit (fans), with proportional input 0–10 Vdc at the **Co** value. **output SPRAY 1-10 V**: command to Water-Spray unit 0.75-10 VDC with specific setpoint and proportional band. **output USP-DIR 0-10V**: command to Master motorized actuator with 0–10 Vdc input with specific setpoint and proportional band.	SLAVE 0-10 V	All	
C8	**OUT_2** analog output settings	**output SUP-REV 10-0V**: reverse command to Master motorized actuator with input 10–0 Vdc with specific setpoint and proportional band **output SLAVE 10-0V**: reverse command to Slave unit with proportional input 10–0 Vdc at the **Co** value. **output SLAVE 0.75-10V**: command to Slave unit with proportional input 0.75–10 Vdc at the **Co** value.	SPRAY 1-10V	All	

***Note**: parameters **C2** and **C3** are set automatically as a function of the predefined configuration chosen and cannot be modified.*

10.2.5 C0, C1 and C4 parameter combinations for each configuration

Configuration	C0	C1	C4
rS-010, rS-020	**GP2 (default)**	**Hi**	**oFF**
		Lo	**oFF**
	GP1	**oFF**	**oFF**
rtE-01, rtE-02, rPr420, rPr015, rPr025 rPr030, rPr045, rUu-05, rPu030, rUu010	**r2 (default)**	**Hi**	**Hi**
			Lo
		Lo	**Hi**
			Lo
	r1	**oFF**	**Hi**
			Lo

10.2.6 PID control parameters

SW1-1** = On > **ESCAPE** + **ENTER** > **5:PID

***Note**: parameters visible only with **4: SETUP** > parameter **C0** = **rP1** or **rP2**.*

***Note**: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/signal	Configuration	Settings system
P	Proportional band	°C	2.0	55.0	7.5	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-01	
		°C	2.0	55.0	7.5	NTC 10 kΩ @ 25 °C/ 77 °F	rtE-02	
		mA	0.2	16.0	2.6	4–20 mA	rPr420	
		bar	0.5	15.0	2.4	0–15 bar > 4–20 mA	rPr015	
		bar	1.0	25.0	3.5	0–25 bar > 4–20 mA	rPr025	
		bar	1.0	30.0	3.5	0–30 bar > 4–20 mA	rPr030	
		bar	1.0	45.0	5.2	0–45 bar > 4–20 mA	rPr045	
		V dc	0.1	5.0	0.8	0.5–4.5 V dc	rUu-05	
		bar	1.0	30.0	3.5	0–30 bar > 0–5 V dc	rPu030	
		V dc	0.2	10.0	1.6	0–10 V dc	rUu010	
I	Integral component weight	-	0.0	1000	2	All	All	
D	Derivative component weight	-	0.0	1000	1	All	All	
ti	Integration time	s	0.0	100.0	1.0	All	All	
td	Derivation time	s	0.0	100.0	10.0	All	All	

10.2.7 Parameters for Modbus communication with PC-BMS

SW1-1** = On > **ESCAPE** + **ENTER** > **6: MODBUS

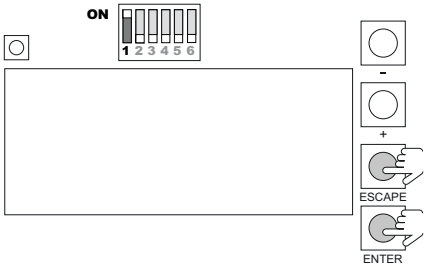
***Note**: the parameters for Modbus communication with the EC fans cannot be modified.*

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
MBaddr	Controller Modbus address	-	1	247	247	
MBrate	Communication speed ▪ **4800** ▪ **9600** ▪ **19200** (default) ▪ **38400**	baud	4800	38400	19200	

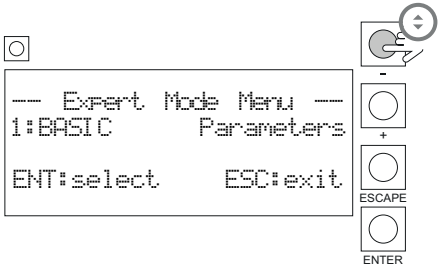
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
MBtype	Communication mode ■ **8b+1s NO p.**: 8 bit, no parity, 1 stop bit ■ **8E1+1s EVEN p.**: 8-bit, even parity, 1 stop bit (default) ■ **8b+1s ODD p.**: 8 bit, odd parity, 1 stop bit	-	-	-	8b+1s EVEN p.	

***Note**: when editing the Modbus parameters for the PC/BMS and ECM connection, communication between the ECM and the EC fans is interrupted. If the emergency speed is activated for the EC fans, they start rotating at that speed.*

10.2.8 Edit any parameter



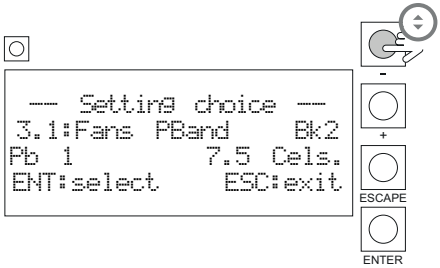
1. Leave switch 1 of DIP switch **SW1 ON** and simultaneously press the **ENTER** and **ESCAPE** keys.



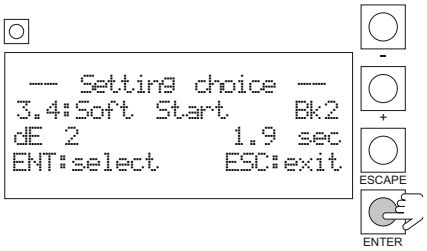
2. Press **-** (or **+**) to scroll through the menu.



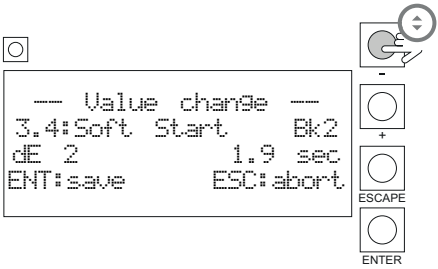
3. Press the **ENTER** key at the parameter of interest.



4. Press **-** (or **+**) to scroll through the parameters.



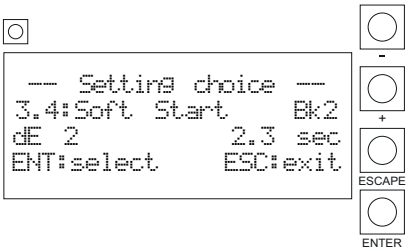
5. Press the **ENTER** key at the parameter of interest.



6. Press **-** (or **+**) to edit the parameter value.



7. Continue as follows:
   - To save the value, press the **ENTER** key: the value is saved in the volatile memory and the message "Remember: to save changed values press ENT * ESC" appears to remember how to perform the final saving step.
   - To cancel the change, press the **ESCAPE** key: it returns to step 5.



8. Continue as follows:
   - To edit the other parameters in the same submenu, repeat the procedure in step 4.
   - To save the changes made, press the **ENTER** and **ESCAPE** keys: the "Saving new values Pleas wait" message appears that confirms the saving is in progress. Then, the home page is displayed.
   - To cancel the changes, press the **ESCAPE** key: the "Restoring old values Change values discarded" message is displayed, informing the operator that the previous values have been restored and then the home page is displayed.

11. Manage ebm-papst and Ziehl-Abegg fans

11.1 What you need to know

11.1.1 Getting started

If the EC fans are connected and controlled by Modbus, it is possible to read and modify some of the data for the fans.

The controller manages EC fans made by: ebm-papst and Ziehl -Abegg.

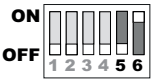
11.1.2 Set the control by Modbus

To enable management of the EC fans using Modbus, use DIP switch SW1 as indicated below:

ebm-papst fans



Ziehl-Abegg fans



11.1.3 Modbus communication mode

The communication parameters are predefined as requested by the manufacturers of EC fans and cannot be modified:

- 19200 baud rate
- 8-bit
- 1 stop bit
- even parity

Transmission of the control is instantaneous. If no changes are required, a control refresh is executed every 5 s.

11.1.4 Available functions

Function	ebm-papst	Ziehl-Abegg	See
Display main data	x	x	"Display the EC fan data" on page 87
Set the emergency speed	x	x	"Set the emergency speed for the fans" on page 88
Set the maximum speed limit	x	x	"Set the maximum speed limit for the fans" on page 89
Update the fan map on the controller	x	x	"Update the fan map" on page 90
Assign the address to all fans	x	x	"Assign the address to all ebm-papst fans" on page 91 "Assign the address to all Ziehl Abegg fans" on page 92
Command the speed of a single fan	x	x	"Command the speed of a single fan" on page 90
Assign an address to a single fan	x	x	"Assign an address to a single fan" on page 92
Assign addresses to multiple fans automatically	-	x	"Assign new addresses to one or more Ziehl -Abegg fans." on page 94
Change the direction of rotation and the speed	x	x	"Change the direction of rotation and the speed of the fans" on page 94
Free from ice	x	-	"Free frozen ebm-papst fans" on page 95

11.1.5 Change from Modbus control to analog output control

If, after setting up and controlling EC fans with Modbus control, analog output control must be reset, follow the steps below:

***Note**: function available only if the Modbus connection with the EC fans is active and operative.*

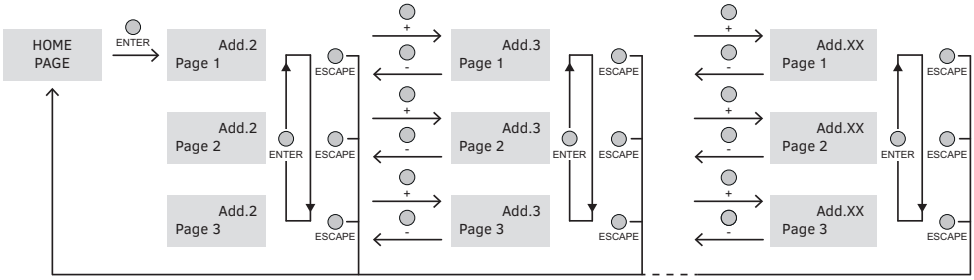
To set the EC fans...	Then...
with the controller	1. Make certain that the EC fans are correctly connected with the RS485 cable and are mapped. 2. Set switch 5 = On (DIP switch SW1). 3. Read and execute the instructions that appear on the display. **Result**: the controller send the fans a Modbus command to enable reception of the control command using the analog output. ***Note**: if the controller locks (for ex.: display locked, control locked, or faulty operation), press the reset button or turn the controller off and on.*
without controller	execute the EC fan manufacturer's instructions (Ziehl-Abegg or ebm-papst) using the suitable programming devices indicated.

11.2 Display the EC fan data

11.2.1 Getting started

From the home page, press the **ENTER** key to scroll through the pages for the individual EC fans.
For each fan connected by Modbus, mapped and on, three pages of data are available.
Fans are ordered starting from the one with the lowest Modbus address.

11.2.2 Navigation mode



***Note**: form any page, press the **ESCAPE** key to return to the home page.*

11.2.3 Data displayed

Element	Description	Page	
		ebm-papst	Ziehl-Abegg
Status	Fan status: ■ **OK** = operating correctly ■ or a first error, in order of priority or before the present malfunction	**All**	**All**
Add.	Modbus address	**All**	**All**
RPM	Current speed	**1**	**1**
W	Absorbed power	**1**	**1**

Element	Description	Page	
		ebm-papst	Ziehl-Abegg
ID	Identification of the type of electronics and protocol version for the ebm-papst fan	**1**	**Unavailable**
RpmMax	Maximum speed	**1**	**1**
h.wo	Total work hours	**1**	**Unavailable**
FW	Firmware identification	**Unavailable**	**1**
Emergency	Fan emergency speed and relative operation delay	**1**	**1**
Tp	Power module temperature	**2**	**2**
Tm	Motor temperature	**2**	**2**
Te	Electronic board temperature	**2**	**2**
DC-Link	Intermediate circuit voltage and current	**2**	**2**
ebm SN	Serial number..	**3**	**Unavailable**
UDS	Unique Device Signature (on two lines).	**Unavailable**	**3**

***Note**: for more information on the meaning of the information provided, please refer to the documentation provided in "Related documents" on page 6.*

Example (ebm-papst fan)

Page 1

```
 Status OK .Add.    4
   0Rpm      0W ID   8
1200RpmMax    151h.Wo
No Emergency Operat.
```

Page 2

```
 Status OK .Add.    4
Tp   8C Tm   7C Te 17C
DC-link       0mA 558V
```

Page 3

```
 Status OK .Add.    4
ebm SN: 1105 00 0NNO
```

Example (Ziehl-Abegg fan)

Page 1

```
 Status OK .Add.    4
 298 Rpm       420 W
 950 RpmMax   FW13.31
No Emergency Operat.
```

Page 2

```
 Status OK .Add.    4
Tp   9C Tm   0C Te 13C
DC-link    200mA 562V
```

Page 3

```
 Status OK .Add.    4
UDS   FF39 05D6 3459
      3639 6659 4318
```

11.3 Set the emergency speed for the fans

11.3.1 When the emergency speed is activated

The fans run at emergency speed (only if it has been setup previously) and only under the following conditions:

- for 0.75-10 control fans and with "cable break" function active: the control signal falls below the value of 0.75 V for a period longer than the set safety period

  ***Note**: the "Cable Break" function can be activated only if there is a Modbus connection with the EC fans.*

- for fans with Modbus control: communication with the Modbus network is cut-off for a period longer than the set safety interval (parameter **Time**)
- on direct command of the controller when it is in under an alarm condition.

***Note**: if the emergency speed has not been set and communications on the Modbus network are cut-off, the fans maintain the speed of the last speed command received.*

11.3.2 Procedure

***Note**: the change is transmitted at the same time to all the fans in the network.*

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Emergency Values Set & Modify

1. For EC Fans with 0.75–10 V control, to avoid untimely intervention of the emergency speed, check that the output setting is **output SLAVE 0.75-10V** (for **OUT_1** parameter **C7**, for **OUT_2** parameter **C8**).
2. Press **ENTER** to enter the function: the **enabled**, **speed**, and **time** parameters appear, with the current values.
3. Press the **ENTER** key and then the **+** or **-** key to edit the parameter value.

   ***Note**: the parameter of the change is highlighted with "edit".*
4. Press the **ENTER** key to confirm the value and to proceed to the next parameter.
5. After modifying the last parameter, press **ENTER**: "edit" disappears.
6. Press the **+** key: the "start process" command appears.
7. To start the operation, press the **ENTER** key: the "work in progress" message appears.

   ***Note**: it is possible to exit the function at any time by pressing the **ESCAPE** key, except once the operation has been started.*

   ***Note**: after editing, wait 5 seconds before re-reading the updated value.*

11.3.3 Parameters

Parameter	Description	Notes on values
enabled	Enabling emergency speed	▪ **ON** enables. ▪ **OFF** disables.
speed (RPM)	Emergency speed value	0-**X** (where x is the maximum value set in "Set the maximum speed limit for the fans" on page 89).
time (s)	Operation delay	5–25

11.4 Set the maximum speed limit for the fans

11.4.1 Introduction

***Note**: the maximum allowed value is defined by the type of EC fan. For more information on the meaning of the information provided, please refer to the technical documents supplied for the EC fans.*

The changes are transmitted at the same time to all of the fans in the network.

11.4.2 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Max Speed Set & Modify

1. Press the **ENTER** key and enter the function: the name of the register "D119", the **speed** parameter with the current value, and the list of possible actions appear.
2. Press the **+** or **-** key to modify the **speed** value: after a few seconds, the fans rotate at the set speed.

   Suggestion: increase/decrease the value of one or two units at a time in order to perceive the effect of the change.
3. To further change the value, press the **+** or **-** key: as a consequence, the fans change speed.
4. To exit the function without saving the value, press the **ESCAPE** key. To save the set value, press the **ENTER** key: the "work in progress" message appears.

   ***Note**: after editing, wait 10 seconds before re-reading the updated value.*

11.4.3 Parameters

Parameter	Description	Notes on values
speed (RPM)	Maximum speed set	**0–x** where x is the maximum value set.

11.5 Command the speed of a single fan

11.5.1 Introduction

***NOTICE**: this function zeros the speed of all the other EC fans.*

It is possible to control only one EC fan at a time and only if a map of the fans is defined in "Update the fan map" on page 90 and if the parameter **bus drive** = ON.

The maximum speed that can be set is defined in "Set the maximum speed limit for the fans" on page 89.

11.5.2 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Single Fan Manual Driving

1. Press **ENTER** to enter the function: the **fan ADD**, **speed rpm**, and **bus drive** parameters appear, with the current values.
2. Press the **ENTER** key and then the **+** or **-** key to edit the parameter value.
3. Press the **ENTER** key to confirm the value and to proceed to the next parameter: the selected fan moves at the set speed.

   ***Note**: the parameter of the change is highlighted with "edit".*
4. To control another fan, press **ENTER** after the last parameter: the parameter **fan ADD** can be modified again. The previously controlled fan stops.
5. To exit, press the **ESCAPE** key: normal operation is restored.

11.5.3 Parameters

Parameter	Description	Notes on values
fan ADD	Address of the selected fan, among those present on the map	-
speed rpm	Desired speed	0-**x** (where x is the maximum value set in "Set the maximum speed limit for the fans" on page 89).
bus drive	Read-only parameter. Command source of the fan control	▪ **ON**: control command by Modbus. ▪ **OFF**: control command by 0-10 V analog input.

11.6 Update the fan map

11.6.1 Applications

To install the controller with a pre-existing network of EC fans.

11.6.2 Prerequisites

The fans must already be assigned a specific and unique address (other than the factory default address).

11.6.3 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Existing fans map acquisition

1. Press **ENTER** to select the function.
2. With the **+** or **-** key, set the **Fans to find** parameter.
3. To start the scan, press the **ENTER** key: the address of the interrogation is shown at the top and below the addresses of the fans found.
4. To interrupt the scan, press **ESCAPE**. The partial scan can be saved.
5. Wait for all of the expected fans to be found. The operation may take a few minutes.
6. Press the **ENTER** key to save the new map or **ESCAPE** to keep the previous map.

11.6.4 Parameters

Parameter	Description	Notes on values
Fans to find	Number of EC fans present in the network	**0** = the map is reset and the situation prior to the scan is restored ***Note**: if a greater number is set than what is effectively present, all addresses are scanned.*

11.7 Assign the address to all ebm-papst fans

11.7.1 Applications

During machine commissioning.

11.7.2 Assumptions

It is assumed that all EC fans have an address of 1. Fans with addresses other than 1 can be set to 1 in a preliminary step of the procedure.

11.7.3 Prerequisites

The fans must be powered and stable for at least 10 s.

11.7.4 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Total Addressing Procedure

1. Press **ENTER** to select the function.
2. To start automatic assignment of address 1 to all of the fans, press the **ENTER** key. If all fans already have an address of 1, press the **ESCAPE** key.
3. Turn off all of the fans. Wait for **at least 10 s** and press the **+** key: the first address that the first fan will be assigned appears.
4. Power on the first fan, wait **at least 10 s** and press the **ENTER** key: the controller generates the fan address. A temporary message indicates the result of the assignment operation:

If the operation...	And...	Then...
fails	the "EC Fan at ADD 1 not found!" message appears and the previous address is proposed again	1. check the power supply to the fan and wait the indicated amount of time 2. retry to assign
when successful	the "Fan X programmed" message appears	continue to step 5.

5. Repeat step 4 one at a time for all fans.
6. After configuring the last fan, end operations by pressing the **ESCAPE** key.
7. Press the **+** key to start automatic generation of the map. Press the **-** key or wait 5 minutes before leaving and then execute generation of the map manually (see "Update the fan map" on page 90).

11.8 Assign the address to all Ziehl Abegg fans

11.8.1 Applications

During machine commissioning.

11.8.2 Assumptions

It is assumed that all EC fans have an address of 247. Fans with addresses other than 247 can be set to 247 in a preliminary step of the procedure.

11.8.3 Prerequisites

The fans must be powered and stable for at least 10 s.

11.8.4 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Total Addressing Procedure

1. Press **ENTER** to select the function.
2. To start automatic assignment of address 247 to all of the fans, press the **ENTER** key. If all fans already have an address of 247, press the **ESCAPE** key.
3. Turn off all of the fans. Wait for **at least 10 s** and press the **+** key: the first address that the first fan will be assigned appears.
4. Power on the first fan, wait **at least 10 s** and press the **ENTER** key: the controller generates the fan address. A temporary message indicates the result of the assignment operation:

If the operation...	And...	Then...
fails	the "EC Fan at ADD 247 not found!" message appears and the previous address is proposed again	1. check the power supply to the fan and wait the indicated amount of time 2. retry to assign
when successful	the "Fan X programmed" message appears	continue to step 5.

5. Turn off the fan that was configured and press the **+** key.
6. Repeat steps 4 and 5, one at a time, for all of the fans.
7. After assigning the last fan address, end operations by pressing the **ESCAPE** key.
8. Turn on all fans and wait **at least 10 s**.
9. Press the **+** key to start automatic generation of the map. Press the **-** key or wait and execute generation of the map manually (see "Update the fan map" on page 90).

   ***Note**: if acquisition is not started and 5 minutes pass from the last time the keys were touched, the function automatically closes without generating the new map.*

11.9 Assign an address to a single fan

11.9.1 Applications

Replace a fan or add a fan to the network.

11.9.2 Introduction

***NOTICE**: two EC fans cannot have the same address.*
A new fan can be assigned the settings or another fan present in the network

11.9.3 Prerequisites

The new fan must be in one of the following conditions:

- be assigned the factory default address
- be assigned a known address
- be assigned an unknown address but can be the only fan connected to the COM1 serial line of the controller

11.9.4 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Single Address Change

1. Press **ENTER** to enter the function: the **final ADD**, **origin ADD** and **master ADD** parameters appear, with the current values.
2. Press the **ENTER** key and then the **+** or **-** key to edit the parameter value.

   ***Note**: the parameter of the change is highlighted with "edit".*
3. Press the **ENTER** key to confirm the value and to proceed to the next parameter.
4. After modifying the last parameter, press **ENTER**: "edit" disappears.
5. Press the **+** key: the "start process" message appears.
6. To start the operation, press the **ENTER** key: the "work in progress writing fan slave" message appears.

   ***Note**: it is possible to exit the function at any time by pressing the **ESCAPE** key, except once the operation has been started.*
7. Only for Ziehl-Abegg fans. Restart the fan (that is: turn it off, wait 10 s and turn it back on) to complete assignment of the address.
8. If a fan has been added, regenerate the fan map (see "Update the fan map" on page 90).

11.9.5 Parameters

Parameter	Description	Notes on values
final ADD (automatic fill-in by the system)	First address on the map with no associated fan	▪ **0** = no missing fan, complete map. ▪ **≠ 0**= addressed proposed by the system to be assigned to the new fan.
final ADD (manual setup)	Address to be assigned to the new fan.	Set a value other than 0. ***NOTICE**: do not use the default factory address (**1** for ebm-papst and **247** for Ziehl-Abegg).*
origin ADD	Current address of the new fan	▪ **0** = for fan with unknown address ***NOTICE**: the fan must be the only one connected to the network.* ▪ **1** = for ebm-papst fan with default factory address ▪ **247** = for Ziehl-Abegg fan with default factory address ▪ **x** = (with known address x of the fan)
master ADD	Fan address from which settings are to be copied	▪ **0** = copy of settings not enabled ▪ **≠ 0**= fan address form which settings are to be copied

11.10 Assign new addresses to one or more Ziehl -Abegg fans.

11.10.1 Assignment mode

Assignment is performed automatically starting from the set value. This value is attributed to the first fan in the chain (with the ID input connected to ground). The next one is assigned this same value incremented by one, and so on through to the last fan in the chain.

11.10.2 Prerequisites

The fans must be Ziehl-Abegg fans and must be wired as described in the "Ziehl-Abegg AM-MODBUS/AM_MODBUS-W, Communication Module for ECblue fans" manual, para. 5.3 "Communication".

11.10.3 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Auto Addressing Procedure

1. Press **ENTER** to select the function.
2. With the **+** or **-** key, set the **start ADD** parameter.
3. To start the operation, press the **ENTER** key: the system provides information on the advancement of the operation. When the operation is concluded, the home page is displayed.

   ***Note**: it is possible to exit the function at any time by pressing the **ESCAPE** key, except once the operation has been started.*

11.10.4 Parameters

Parameter	Description	Notes on values
start ADD	Address to be assigned to the first fan in the chain.	1–240 (multiples of 10)

11.11 Change the direction of rotation and the speed of the fans

11.11.1 Applications

Cleaning the heat exchanger or other needs of the system

11.11.2 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Rotation Direction Temporary Change

1. Press **ENTER** to enter the function: the **rotation** and **speed** parameters appear, with the current values.
2. Press the **ENTER** key and then the **+** or **-** key to edit the parameter value.

   ***Note**: the parameter of the change is highlighted with "edit".*
3. Press the **ENTER** key to confirm the value and to proceed to the next parameter: the fans move in the direction and at the speed set.
4. To exit, press the **ESCAPE** key: normal operation is restored.

11.11.3 Parameters

Parameter	Description	Notes on values
rotation	Direction of rotation of the fans	▪ **CW** clockwise ▪ **CCW** counter-clockwise ***Note**: to know the default direction of rotation of the fans, please refer to the product documentation.*
speed (RPM)	Fan speed	0-**x** (where x is the maximum value set in "Set the maximum speed limit for the fans" on page 89).

11.12 Free frozen ebm-papst fans

11.12.1 Applications

Presence of ice on the fan impellers.

11.12.2 Release mode

This function is automatically activated if the fan impellers are blocked and calls for movements in both directions of rotation with increasing intensity.

***Note**: for more information on the meaning of the data provided, please refer to the MODBUS parameters specification for "ebm-papst series 84/112/150/200" V.5.00 para. 2.39 "Shedding Function".*

11.12.3 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **13: EC FAN functions** > **Shedding Function Set & Modify

1. Press **ENTER** to enter the function: the **enabled** and **attempts** parameters appear, with the current values.
2. Press the **ENTER** key and then the **+** or **-** key to edit the parameter value.

   ***Note**: the parameter of the change is highlighted with "edit".*
3. Press the **ENTER** key to confirm the value and to proceed to the next parameter.
4. After modifying the last parameter, press **ENTER**: "edit" disappears.
5. Press the **+** key: the "start process" command appears.
6. To start the operation, press the **ENTER** key: the "work in progress" message appears.

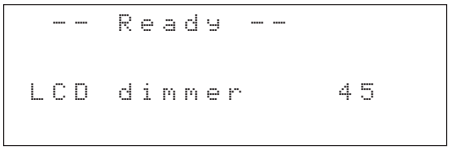
   ***Note**: it is possible to exit the function at any time by pressing the **ESCAPE** key, except once the operation has been started.*

11.12.4 Parameters

Parameter	Description	Notes on values
enabled	Enable function	▪ **ON** enables. ▪ **OFF** disables.
attempts	Attempts to restart the impellers	1–200

12. Set the common and special functions

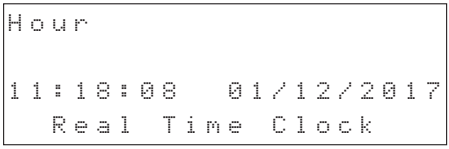
12.1 Display contrast adjustment



12.1.1 Procedure

To increase the contrast, simultaneously press and hold down the **ENTER** and **+** keys.
To decrease the contrast, simultaneously press and hold down the **ENTER** and **-** keys.

12.2 Real-time control parameters (RTC)



12.2.1 Procedure

SW1-1** = On > **ESCAPE** + **ENTER** > **7: Real Time Clock

1. Press **ENTER** to enter the sub-menu: the parameter **Hour** is displayed.
2. Press **+** (or **-**) to set the value.
3. Press the **ENTER** key to confirm the value and to proceed to the next parameter.
4. After the last parameter has been confirmed:

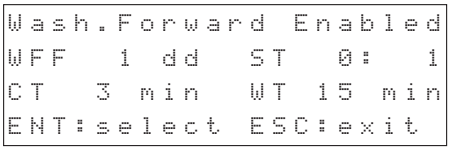
If you want to...	Then...
save the settings	simultaneously press the **ENTER** and **ESCAPE** keys: a message appears that confirms it has been saved and then the home page of the sub-menu is displayed.
edit a parameter again	press **ENTER**: the parameter Hour is displayed.
cancel setup	press the **ESCAPE** key: a message informs that the previous settings have been restored and the first page of the submenu is displayed.

12.2.2 Parameters

Parameter/ page	Description	Unit of measure	Minimum	Maximum
Hour	Hours	h	00	23
Minute	Minutes	min	00	59
Seconds	Seconds	s	00	59
Day	Day	d	1	31
Month	Month	-	01	12
Year	Year	a	2011	2099

12.3 Timed washing of the heat exchanger

SW1-1**=On > **ESCAPE**+**ENTER** > **8: Washing



12.3.1 Enabling/disabling options

Options	Description
WASHING Disabled	No washing enabled.
Wash. Forward Enabled	Washing Forward washing cycle enabled
Wash. Reverse Enabled	Washing Reverse washing cycle enabled ***Note**: when this option is active, the absorbed fan power is not shown.*

12.3.2 Parameters

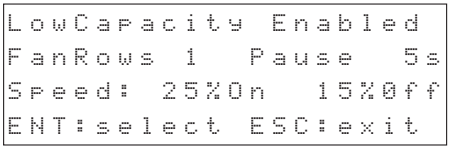
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
WFF	"Washing forward" cycle start frequency	d	1	10	1	
WFR	"Washing reverse" cycle start frequency	d	1	10	1	
ST	Time of the day washing starts	h:min	00:00	23:59	00:01	
CT	Duration of the heat exchanger cooling step	min	1	60	3	
WT	Duration of the washing step	min	1	60	15	

12.3.3 To learn more

Important to know	See
Operation	"Timed washing of the heat exchanger" on page 53.
Procedure	"Procedure for setting the special functions" on page 103.

12.4 Heat exchanger power management

SW1-1**=On > **ESCAPE**+**ENTER** > **9: LowCapacity



12.4.1 Enabling/disabling options

***Note**: function only available with EC fan control by Modbus control.*

Options	Description
Low capacity Disabled	Function disabled.
Low capacity Enabled	Function enabled.

12.4.2 Parameters

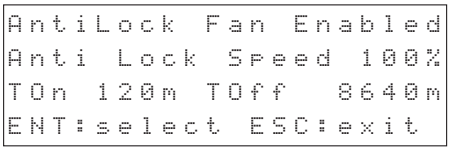
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
Fan Rows	File of fans present on the heat exchanger	-	1	2	1	
Pause	Minimum standby time before next activation/deactivation	s	3.0	99.0	5.0	
Speed On	Start-up speed of the maximum speed (% RPM)	%	8	50	25	
Speed Off	Break-away speed of the maximum speed (% RPM)	%	8	50	15	

12.4.3 To learn more

Important to know	See
Operation	"Heat exchanger power management" on page 54.
Procedure	"Procedure for setting the special functions" on page 103.

12.5 Fan anti-locking

SW1-1**=On > **ESCAPE**+**ENTER** > **10: Anti Lock Fan



12.5.1 Enabling/disabling options

Options	Description
Anti Lock Fan Disabled	Function disabled.
Anti Lock Fan Enabled	Function enabled.

12.5.2 Parameters

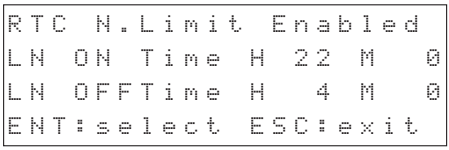
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
Anti Lock Speed	Fan speed during the period of activity (% RPM)	%	10	100	100	
TOn	Active period duration	min	1	999	120	
TOff	Rest period duration	min	1	60000	8640	

12.5.3 To learn more

Important to know	See
Operation	"Fan anti-locking" on page 56.
Procedure	"Procedure for setting the special functions" on page 103.

12.6 Night limits for speed using internal clock

SW1-1**=On* > ***ESCAPE**+**ENTER > ***11: RTC Night Limit***



12.6.1 Enabling/disabling options

Options	Description
RTC Night Limit Disabled	Function disabled.
RTC Night Limit Enabled	Function enabled.

12.6.2 Parameters

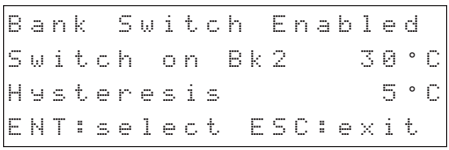
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
LN ON Time	Time for activation of the night limit	h:min	00:01	23:59	22:00	
LN OFF Time	Time for deactivation of the night limit	h:min	00:01	23:59	04:00	

12.6.3 To learn more

Important to know	See
Operation	"Night limits for speed using internal clock" on page 56.
Procedure	"Procedure for setting the special functions" on page 103.

12.7 Switching of setpoint following the ambient temperature from IN3 (Bank Switch)

SW1-1=*On* > ***ESCAPE***+***ENTER***
> ***4: SETUP*** > ***C5*** = ***Nothing enabled*** *(default)*
> ***12: Bank Switch***



12.7.1 Enabling/disabling options

Options	Description
Bank Switch Disabled	Function disabled.
Bank Switch Enabled	Function enabled.

12.7.2 Parameters

Note*: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

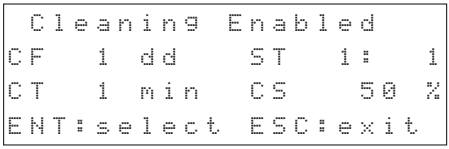
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
Switch on Bk2	Switching temperature from Set 1 to Set 2	°C	-10	80	30	
Hysteresis	Hysteresis on **Switch on Bk2** value	°C	3	20	5	

12.7.3 To learn more

Important to know	See
Operation	"Switching of setpoint following the ambient temperature from IN3 (Bank Switch)" on page 57.
Procedure	"Procedure for setting the special functions" on page 103.

12.8 Timed cleaning of the heat exchanger

SW1-1=*On* > ***ESCAPE***+***ENTER*** > ***14: Cleaning***



12.8.1 Enabling/disabling options

***Note**: if the timed washing of the heat exchanger (see "Timed washing of the heat exchanger" on page 53) is enabled, too, the timed cleaning of the heat exchanger is disabled (**Cleaning Disabled**).*

Options	Description
Cleaning Disabled	Function disabled.
Cleaning Enabled	Function enabled.

12.8.2 Limits with function enabled

With the timed cleaning of the heat exchanger:

- on the home page, the total power absorbed by fans value remains zero (see "Home page" on page 63).
- it is not possible to display the data for the individual fans (see "Display the EC fan data" on page 87).

12.8.3 Parameters

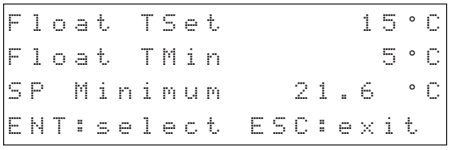
Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Settings system
CF	Start frequency (every how many days)	d	1	30	0 (= disabled)	
ST	Time of the day cleaning starts	h:min	00:01	23:59	00:01	
CT	Cleaning duration	min	1	60	3	
CS	Fan cleaning speed (% RPM)	%	1	100	50	

12.8.4 To learn more

Important to know	See
Operation	"Timed cleaning of the heat exchanger" on page 58.
Procedure	"Procedure for setting the special functions" on page 103.

12.9 Adjustment of the setpoint following the ambient temperature from IN3 (Floating SP)

SW1-1**=On > **ESCAPE**+**ENTER
*> **4: SETUP** > **C5** = **Floating SP***
*> **15: Floating SetPoint***



12.9.1 Procedure

***NOTICE**: function enabled only with parameter **4: SETUP** > **C5** = **Floating SP**.*

1. Scroll through the menu using the **+** or **-** buttons to submenu **15: Floating Setpoint**.
2. Press **ENTER** to enter the submenu: the parameters **FloatSP Tset**, **FloatSP Tmin**, and **SPMinimum** are displayed
3. Press the **ENTER** key and then the **+** or **-** key to edit the parameter value as needed.
4. Simultaneously press the **ENTER** + **ESCAPE** keys to confirm the value and to proceed to the next parameter.
5. After the last parameter has been confirmed, it returns to the first page of the submenu.

12.9.2 Parameters

***Note**: from version 8.0 of the ECM firmware, the temperature and pressure values can be viewed with Imperial units of measure (°F e psi). Therefore, where the text indicates the unit of measure available in °C, it is also available in °F, and where bar is indicated, psi is also available. For the conversion values, use the following formulas: °F = 32+ (°C x 9/5), psi = bar x 14.5.*

Parameter/ page	Description	Unit of measure	Minimum	Maximum	Default	Configuration	Settings system
FloatSP TSet	Upper temperature limit to activate the function	°C	-15.0	+40.0	15 °C	All	
FloatSP TMin	Lower temperature limit to activate the function	°C	-15.0	+40.0	5 °C	All	
SPMinimum	Minimum value that the setpoint can have	mA	3.9	19.9	10.0	rPr420	
		bar	0.0	14.9	6.9	rPr015	
		bar	0.0	24.9	10.8	rPr025	
		bar	0.0	29.8	9.7	rPr030	
		bar	0.0	44.8	14.0	rPr045	
		V	0.5	5.0	1.9	rUu-05	
		bar	0.0	33.6	9.7	rPu030	
		V	1.0	10.0	4.0	rUu010	
		°C	-17.5	+94.5	21.6	rtE-01	
		°C	-17.5	+94.5	21.6	rtE-02	

12.9.3 To learn more

Important to know	See
Operation	"Switching of setpoint following the ambient temperature from IN3 (Bank Switch)" on page 57.

12.10 Adjustment of external setpoint with 0-10 V signal from IN3

SW1-1**=On > **ESCAPE**+**ENTER** > **4: SETUP** > **C5** = **SP from IN3

***Note**: with this C5 setting, the menu item **Bank Switch** is not visible.*

12.10.1 To learn more

Important to know	See
Operation	"Switching of setpoint following the ambient temperature from IN3 (Bank Switch)" on page 57.
Procedure	"Edit any parameter" on page 84.

12.11 Input Slave Safety mode from IN3

SW1-1=*On* > ***ESCAPE***+***ENTER***
> ***4: SETUP*** > ***C5*** = ***Slave Safety***

Note*: with this C5 setting, the menu item* ***Bank Switch*** *is not visible.*

12.11.1 To learn more

Important to know	See
Operation	"Input Slave Safety mode from IN3" on page 60.
Procedure	"Edit any parameter" on page 84.

12.12 Procedure for setting the special functions

12.12.1 Procedure

SW1-1=*On* > ***ESCAPE***+***ENTER***

1. Scroll through the menu using the **+** or **-** buttons to submenu of the desired function.
2. Press **ENTER** to select enter the submenu.
3. Press **+** (or **-**) to scroll through the enabling/disabling options.
4. Press the **ENTER** key and then the **+** or **-** key to set the first parameter.

   Note*: the parameter to be edited is described in the first row.*

5. Press the **ENTER** key to confirm the value and to proceed to the next parameter.
6. After the last parameter has been confirmed:

If you want to...	Then...
save the settings	press the **ENTER** key and then at the same time **ESCAPE** and **ENTER**: a message appears that confirms it has been saved and then the home page of the submenu is displayed.
edit a parameter again	press the **ENTER** key: the first parameter can be edited again or the function can be enabled/disabled.
cancel setup	press the **ESCAPE** key: a message informs that the previous settings have been restored and the first page of the submenu is displayed.

13. Diagnostics

13.1 Troubleshooting

13.1.1 Reset alarm

The alarms are not saved. To deactivate an alarm, the cause that generated it must be removed.

CAUTION! The controller automatically restarts as soon as the alarm condition is cleared.

13.1.2 Common problems

Following are the most common problems that are not due to faults.

Problem	Cause	Solution
The configuration cannot be changed	The **ENTER** and **ESCAPE** keys were released before the "-- Operation Mode -- Now Available" message appeared Or the **ENTER** and **ESCAPE** keys have not been pressed or released simultaneously.	Correctly perform the procedure. See "Select a configuration" on page 70.
The keys do not respond when pressed	The microprocessor is executing complex algorithms.	Wait a few seconds and retry.
	Communication with one or more EC fans is absent	Standby. The response times may experience delays.
The number of fans mapped (Map**) is different from the number of fans on (**Run**)**	The map is not updated for the current situation	Start the **Existing fans map acquisition** function, see "Update the fan map" on page 90.
	Fan previously mapped off or cables not connected to it	Check the status and connections of the fan.
The "Function not allowed" message appears	An unavailable menu/function has been accessed (i.e., menu 5: PID Parameters with non-PID control mode)	Press the **ESCAPE** key.

13.1.3 Alarm and warning messages

The controller manages two levels of messages:

- alarm messages: these indicate an error or a malfunction on the controller and generate a change in the speed command of the fans directly from the controller.
- caution messages: present only if the regulator communicates with the EC fans by Modbus. Indicates an error or a malfunction of the EC fans. No changes in the speed control are performed by the controller. This management is delegated directly to the EC fan involved.

13.1.4 Alarm signal

The presence of an error or a malfunction of the controller is communicated in the following manner:

- The display flashes and the relative message appears in the first line.

  ***Note**: the message appears only if the controller is in working mode. If during this programming step, it only appears at the output of this step.*

- The controller sends the emergency speed command to the EC fans, if set; otherwise, the fans continue to operate at the last speed command received.
- Relay **RL1** is de-energized and the **FAIL** LED turns on.

13.1.5 Alarm messages

***Note**: the priority with which the messages are displayed is equal to the order they are shown in the table. A priority alarm is displayed before less important alarms.*

Possible alarm messages are shown below:

Message	Cause	Solution
Controller failure	Configuration parameter error.	Reload the default configuration
Alarm: No Fans The map is cleared	No EC fan assigned. The map is cleared.	Generate the map of the fans present with the function **13: EC Fan functions** > **Existing Fans Map Acquisition**. Assign the address to the fans and load the map with the function **13: EC Fan functions** > **Total Addressing Procedure**.
All Fans in Error	All EC fans present are in error. No fan mapped on the RS485 bus responds.	Enter the EC fan page and check which error occurred. For information on the alarm messages, please refer to the EC fan documentation. Check the connections to serial RS485.
No Answer from Fans	Modbus communication with EC fans not possible due to: ■ no power supply to the EC fans. ■ fault on one or more EC fans. ■ connection error or cut-off of the RS485 connection cable.	Check the cause of the Modbus communication interruption.
T.K. Alarm open	External overheat protection contact open **TK** (with SW1-3 = Off)	Make sure the connected circuit breakers are closed and correctly connected in series. Make sure the wires are correctly connected to the **TK** contact and that the screws are tight.
Board Overheat	Regulation stopped due to board exceeding the maximum working temperature (85 °C)	Check that the controller is installed in a ventilated room away from direct sunlight. Make sure room temperature is under 50°C. Make sure the controller is correctly installed, see "Wall mount" on page 25.
Under Range or Open	Input signal under minimum value. See "Minimum and maximum limits for inputs IN1 and IN2" on page 105	Make sure the set configuration is suited to the control signal used. Make sure the transducer/sensor/probe is correctly connected.
Over Range or Short	Input higher than maximum value. See "Minimum and maximum limits for inputs IN1 and IN2" on page 105	Make sure the input used is foreseen by the configuration in use (parameter **C0**). Make sure the transducer/sensor/prove is in good conditions and working,

13.1.6 Minimum and maximum limits for inputs IN1 and IN2

Following are the minimum and maximum limits with a precision of ±5%.

Configuration	Minimum limit	Maximum limit	Unit of measure
rS-020	-	> 23.5	mA
rS-010	-	> 11	V dc
rS-420	< 2	> 23.5	mA
rtE-01	< -24	> 100	°C
rtE-02	< 11	> 100	°C
rPr420	< 2	> 23.5	mA
rPr015 (*)	< 2	> 23.5	mA
rPr025 (*)	< 2	> 23.5	mA

Configuration	Minimum limit	Maximum limit	Unit of measure
rPr030 (*)	< 2	> 23.5	mA
rPr045 (*)	< 2	> 23.5	mA
rPr050 (*)	< 2	> 23.5	mA
rUu-05	-	> 5.5	V dc
rPu030 (*)	-	> 5.5	V dc
rUu010	-	> 11	V dc

***(*)**: the value appears in pressure (bar) on the display.*

13.1.7 Alarm signal

The presence of an error or a malfunction of the EC fans is communicated on the controller in the following manner:

- The message appears on the first line of the display.

  ***Note**: the message appears only if the controller is in working mode. If during this programming step, it only appears at the output of this step.*

- Relay **RL2** is de-energized.

  Note: for the messages "**---Fan error---**", "**Fan warning**", and "**SlaveSafe KO**", the relay opens with a delay time of about 60 seconds.

13.1.8 Warning messages

***Note**: the priority with which the messages are displayed is equal to the order they are shown in the table. A priority alarm is displayed before less important alarms.*

Possible warning messages are shown below:

Message	Cause	Solution
TK Warning	External overheat protection contact open TK (with SW1-3 = ON).	Check the cause of opening contact TK.
--- Fan Error ---	One or more EC in alarm conditions.	Enter the EC fan page and check which error occurred. For information on the alarm messages, please refer to the EC fan documentation.
Fan Warning	Warning signal for one or more EC fans.	Enter the EC fan page and check which error occurred. For information on the warning messages, please refer to the EC fan documentation.
SlaveSafe KO	4-20 mA signal at input IN3 < 2 mA or >23 mA, see "Switching of setpoint following the ambient temperature from IN3 (Bank Switch)" on page 57.	Check the connections to IN3 Check for and check the value of the 4-20 mA signal at input IN3

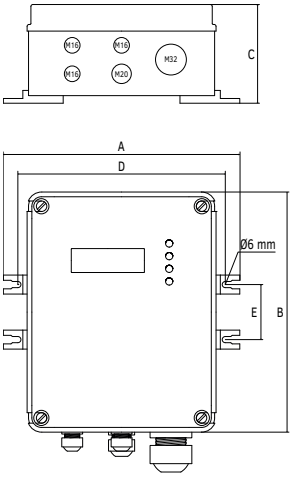
14. Technical specifications

14.1 Physical properties

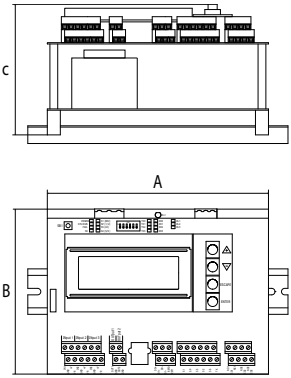
14.1.1 Dimensions and weight

Model	A	B	C	D	E	Weight (kg)
ECM 230–400 V IP55	249	254	107	218.5	58	1.5
ECM 230–400 V IP00	170	127	105	-	-	0.8
ECM 20–24 V IP00	170	127	85	-	-	0.8

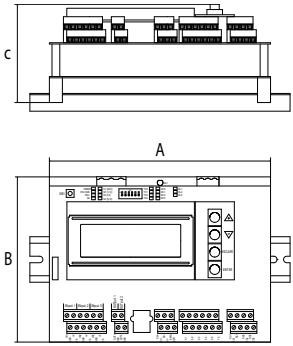
ECM 230–400 V IP55



ECM 230–400 V IP00



ECM 20–24 V IP00



14.1.2 Case and cable clamps

Materials	GW-PLAST 75 maximum temperature 60 °C (ball heat sealing 85 °C) and aluminum.
Screw plugs	TPN series with max 1.8 Nm torque (CEI 23-58)
Protection rating	IP55
Pollution	High Pollution
Fire resistance	Category D
M16, M20, M32 cable clamps	IP67 protection, class V2, polyamide PA6

14.1.3 Storage and installation environmental conditions

Working temperature	from -20 to +50 °C. For temperatures below -10 °C use input **S2**.
Storage temperature	from -25 to + 60 °C
Humidity	RH < 85% non condensing
Vibrations	Under 1 G (9.8 m/s2)

14.2 Electrical specifications

14.2.1 Applications

EC motors with 0–10 V control signal or Modbus.

14.2.2 Specifications

Rated voltage	Single phase 230-460 V ac ± 10% Single phase 20-24 V ac ± 10%
Frequency	50/60 Hz automatically recognized
Over voltage protection	For 230–460 V model only. Surge category II (4 KV), EN 61000-4-5
Auto restart	The controller automatically restarts as soon as the alarm condition is cleared.
Maximum absorption on signal 0-10 V	20 mA (minimum load resistance 500 Ω) ***NOTICE**: always check total absorption on signal 0–10 V.*
Transducer power supply	22 Vdc -10/+20 % 60 mA, not stabilized. Protected against short circuiting.
Potentiometer and sensor power supply	10 Vdc/5 Vdc (automatic switching), stabilized with protection.
RL1 relay	**NO**: 5 A at 250 Vac and cosfi 0.8 **NC**: 3 A at 250 Vac and cosfi 0.8
Rely RL2/RL3	**NO**: 5 A at 250 Vac and 30 Vdc

14.2.3 Rated current and power

Model	Command circuits	Dissipated in room
ECM 24 V, 230–460 V	10 VA	10 W

14.2.4 Electric insulation

Command circuits	Only model 230-460 V. 4000 V ac between control input and mains voltage parts

14.2.5 Nominal cable sections

Cable	Value (min–max)
Signal	0.25–1.5 mm^2 30–15 AWG Cu
Power supply	0.5–2.5 mm^2 25–10 AWG Cu

14.2.6 BELDEN cable specifications for RS485 connection

Specifications	Value
Conductor 1	CuSn 7x0.25 mm
Conductor 1 (resistance)	50 Ω/km
Conductor 2	CuSn 7x0.25 mm
Conductor 2 (resistance)	50 Ω/km
insulation	PEE 2.35 mm
Color code	White/Orange Blue
Plate 1	AL/pet 100%
Sheath 1	CuSn 65%
Internal sheath	Oil-resistant gray flame-retardant PVC
Internal sheath (diameter)	7.6 ± 0.1 mm
External sheath	Black UV ray resistant PE

Specifications	Value
External sheath (diameter)	9.0 ± 0.1 mm
Characteristic impedance	125 ± 15 Ω
Mutual or coaxial cable capacitance	MUTUAL 36 pF/m
Propagation speed	78%
Shielding efficiency (100–900 MHz)	>85 dB
Drain wire	CuSn 7x0.20 mm
Rated voltage	300 V
Working temperature	from -20 to + 80 °C (*) from -25 °C only with power supply ON)
Sheath insulation	C-4 (U0=400V)
Test voltage	4.5 kV ac
Minimum bending radius (internal/external)	40/90 mm
Weight	8.4 Kg/100 m
Notes	Suitable for installation outdoors, under ground and damp environments

(*) The ECM constantly monitors operation and in case of power OFF, stores the shutdown in the TOOL: EVENT LOGGER of the CLIMA Sinergy.

14.3 Maintenance

14.3.1 Clean Up

For the model with case, clean with a dry cloth.

14.3.2 Responsibility for disposal



As indicated in European Directive 2012/19/EU, do not dispose of the product with other unsorted urban waste.

The owner is responsible for the disposal of these products and of the other electric and electronic equipment using the specific collection organizations indicated by the government or local public agencies.

Correct disposal and recycling help to prevent potentially negative consequences to the environment and health of people.

For more detailed information about disposal, contact the responsible public authorities, the waste disposal service, or the representative from which the product was purchased.

14.4 Conformity

14.4.1 Declaration of conformity

The full text is available on the website www.selpro.it.

14.4.2 EC - Declaration of conformity

Directive	EC standard code	Version
EMC 2014/30/EU	EN IEC 61800-3	2018
	EN IEC 61000-6-2	2019
	EN 61000-6-3	2007 +A1:2011
	EN IEC 55014-1	2021
	EN IEC 55014-2	2021
Safety 2014/35/EU	EN 61800-5-1	2007 +A1:2017 +A11:2021
	EN 60335-1	2012 +A13:2017 +A2:2019
	EN 60730-1	2017
RoHS 2012/19/EU	EN 50581	2012

14.4.3 UK - Declaration of conformity

Subject	Name	Version
EMC	BS EN IEC 61800-3	2018
	BS EN IEC 61000-6-2	2019
	BS EN 61000-6-3	2007 +A1:2011
	BS EN IEC 55014-1	2021
	BS EN IEC 55014-2	2021
Safety	BS EN 61800-5-1	2007 +A1:2017 +A11:2021
	BS EN 60335-1	2012 +A13:2017 +A2:2019
	BS EN 60730-1	2017
RoHS	BS EN 50581	2012

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