

RGM

EVOLVED REGULATORS, MASTER OR SLAVE (MODBUS OPTION) FOR FANS WITH ADJUSTABLE VOLTAGE, THREE-PHASE MOTORS

Instruction manual | v. 10.05

PPRGMEN-R10.05-0

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
JAN 2022	PPRGMEN-R10.05-0	9.5 dated 11/30/2021	Updated chapter "Conformity" on page 69 Added image in "Product identification" on page 10
APR 2021	PPRGMEN-R10.04-0	9.5	Added correlated document. Added paragraph "Interrogation frequency from supervisor" on page 21 Added technical specifications.
JUN 2019	PPRGMEN-R10.03-0	9.3	Corrected product dimensions. Corrected ambient temperature declassification values. Added nominal current declassification table for installation height.
NOV 2017	PPRGMEN-R10.01-0	9.2	The value of the IN input not used for regulation can be displayed. First publication

Models described by the manual

This manual applies to the following models:

RGM312
RGM320
RGM328
RGM340
RGM360

Related documents

Document	Code	Date	Format
Instruction manual (this manual)	PPRGMEN-R10.05-0	JAN 2022	hard copy
Modbus connection plug	-	JAN 2012	PDF online
Modbus-RTU SELPRO v3_8 registers for RGM3xx (from SW v.9_2)	-	JUN 2018	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.

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 7.
- 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 and consequently decrease the maximum load current.

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.

If several controllers are grouped in the same electrical panel, provide forced air circulation with a fan or cooling unit with adequate capacity.

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.

1.3 PROTECTIONS

1.3.1 Power supply protection

The controller includes protection against transitory over voltage on the power mains and a three-phase anti-disturbance filter to meet electromagnetic compatibility standard limits.

1.3.2 Checks with overload protections - optional

If the protection is included, the controller checks distributed current and blocks regulations in the event of excessive current absorption. To ensure controller operating continuity, check that the

maximum heat current value continuously absorbed by the load is less than, or equal to, the rated controller value.

1.3.3 Checks without overload protections - optional

If the protection is not included, to avoid controller damages, assess the maximum current absorbed by the load in the most severe conditions and its duration. Check that the values are less than, or equal to, the rated controller values.

To know the current thresholds and trigger times, see "Electrical specifications" on page 66.

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 66.

2.2 Product identification

2.2.1 Package contents

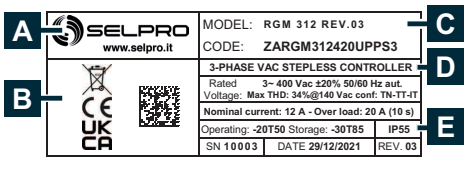
Below are the items provided in the sales package:

- one RGM
- this manual
- cable clamps or plugs (as per order)
- RGM internal sticker with illustrated instructions

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 RGM controllers

Multifunction and multi-input RGM controllers regulate the speed of voltage adjustable high-speed, three-phase, asynchronous motors applied to axial or centrifugal fans. Connected to transducers, sensors or a Modbus network, they can receive signals (pressures, temperatures, etc.) that, together with the set parameters, regulate motor speeds.

3.1.2 Applications

RGM controllers are suitable for HVAC/R environment applications with voltage adjustable high-speed asynchronous motors, for example, ventilated heat exchangers used in air conditioning and refrigeration systems.

3.1.3 How they work

RGM controllers are three-phase voltage transformers that use the principle of phase partialization or phase cut-off. Partialization is totally controlled on the three phases, regulating the effective voltage applied to the load. During installation, the motor cosϕ can be taken into account and manually compensated. You can exclude up to two speed zones with higher acoustic disturbances. Neutral conductor connection is not required.

There are two regulation outputs, one for power for the three-phase motors and the other for the Slave unit signal.

3.1.4 Controls

The control can be:

- **Slave proportional**: changes the three-phase output proportionally to the prevalent input value.
- **Master proportional**: changes the three-phase output to maintain the value of the prevalent input within the proportional band.
- **Master PID**: changes the three-phase output to keep the prevalent input value near the setpoint.

Voltage regulation at the signal output can be:

- for 0-10 V dc Slave units, proportional variable to the value of the power output
- for 0–10/10–0 V dc outdoor units or 1–10 V dc spray units with independent setpoint and proportional band

3.1.5 Setpoints and associated parameters

Two different regulation setpoints and two set of associated parameters are available. 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.

3.1.6 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.

3.1.7 Functions that can be activated with On/Off inputs

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

- start reverse mode: the output voltage decreases as the input increases
- motor heating activation
- start according to setpoint and relative set of parameters
- enabling night limit
- stop power and signal output regulation signal
- motor thermal protection status reading (only with Modbus board, optional)

3.1.8 Default configurations

To facilitate installation, the RGM 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 or voltage) and configurations for Slave proportional control (in current or in voltage).

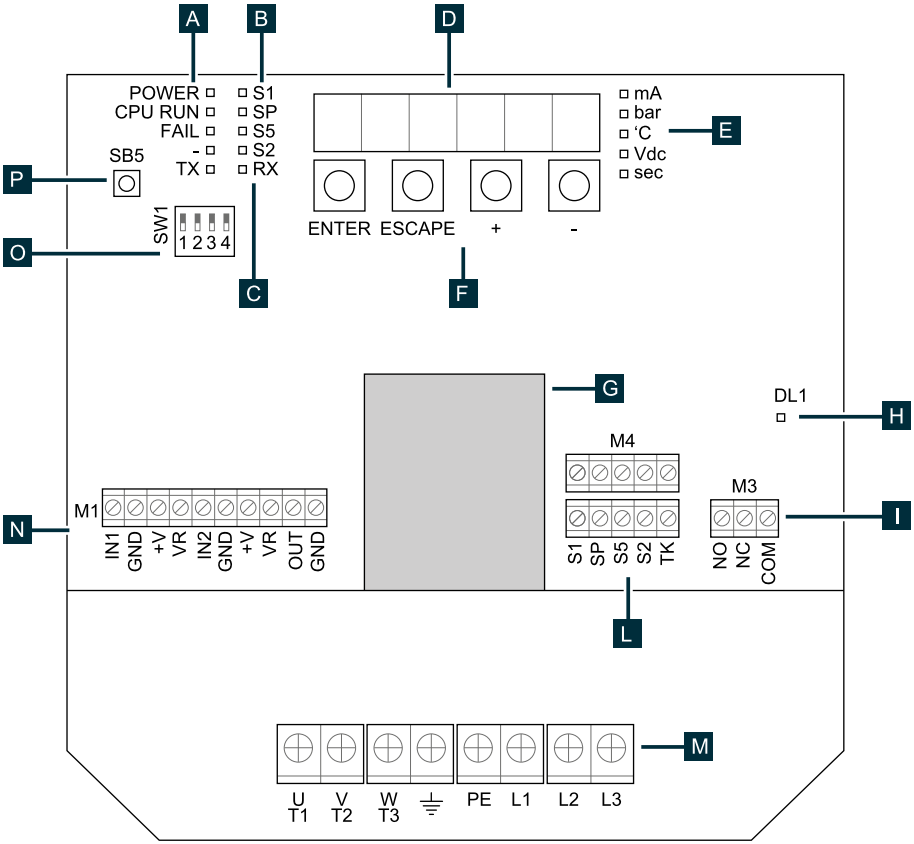
3.1.9 Optional functions

The following are available upon request:

- overload protection function
- an optional card to communicate with a supervision system via Modbus RTU RS-485 protocol

3.2 Presentation

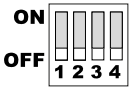
3.2.1 Main components



Part	Description	Reference in the manual
A	Device status LED.	"Status LED" on page 15
B	On/Off input LEDs active.	"On/Off inputs LED" on page 15
C	Modbus communication status LED (with optional Modbus card included)	"Modbus communication LED" on page 15
D	Display.	-
E	Unit of measure LED for the displayed value.	"Unit of measure LED" on page 16
F	Keyboard to scroll parameters and set them.	"Programming display keyboard" on page 16
G	Optional board for connection to supervisor via serial RS485-Modbus (RTU).	"Modbus card (PB1073C) - optional" on page 21
H	LED **DL1** relay status.	"Relay status LED" on page 16

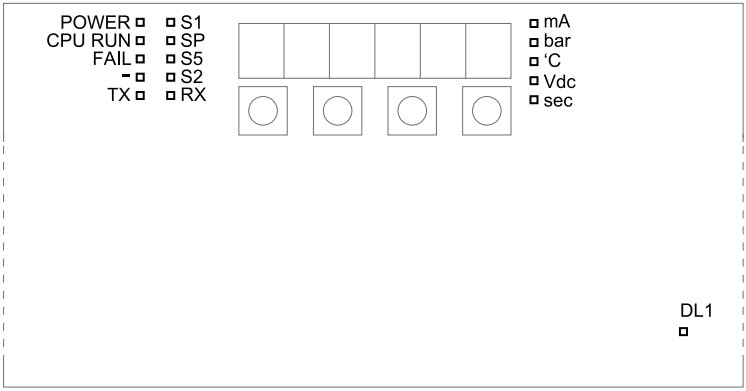
Part	Description	Reference in the manual
I	Terminal board M3 with relay output.	"Relay output" on page 20
L	Terminal board M4 for remote On/Off inputs or from motor overload protections.	"On/Off inputs" on page 19
M	Terminal board input and three-phase voltage output (M1 or M3 or M5 according to the model).	"Three-phase power supply and power output for motor(s)" on page 17
N	Terminal board M1 with analog inputs and analog regulation output.	"Analog inputs and outputs" on page 18
O	DIP switch SW1 to turn functions on/off.	"DIP switch SW1" on page 14
P	Reset button.	-

3.2.2 DIP switch SW1



Switch	Function
1	Enables/disables reserved parameter editing ■ On: enables reserved parameter editing by expert users. **PArA**, **conF**, **conn** and **Pid** menus are available with all parameters editable. ■ Off: disables reserved parameter editing. Only basic parameters can be edited (visible after the "ProGra" message).
2	With regulation in PID mode, enters an area +/-2.5% on the PID proportional band around the setpoint (dead band) to avoid excessive regulation adjustments. ■ On: dead band on ■ Off: dead band off
3	Sets external overload protection alarm management for input **TK**. ■ On: with overload protection input **TK** = Off (contact open) the fan regulation will not stop, but **TK** input status can be read by the supervisor via RS485-Modbus (if applicable). Typical for installations with several fans. ■ Off: with overload protection **TK** = Off (contact open) puts regulation in stand-by and generates an alarm.
4	With Modbus card only. Defines the duration of non standard Modbus forcing received by the supervisor (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

3.2.3 LED overview



3.2.4 Status LED

Name	Description
POWER	Power on
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
-	Non standard Modbus force control with effects on the controller

3.2.5 On/Off inputs LED

Name	Description
S1	Motor heating on/reverse mode on
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	Power regulation consent status: ■ on: regulation consent on ■ off: regulation consent off

3.2.6 Modbus communication LED

Name	Description
TX	Blinking: transmitting data.
RX	Blinking: receiving data.

3.2.7 Relay status LED

Name	Description
DL1	Alarm relay status/external unit control. ■ on: relay energized (closed between **COM**-**NO**) ■ off: relay at rest (closed between **COM**-**NC**)

3.2.8 Unit of measure LED

Name	Description
mA	The value displayed is expressed in milliamps.
bar	Value displayed expressed in bar.
'C	Value displayed expressed in degrees Celsius.
Vdc	Value displayed expressed in Vdc.
sec	Value displayed expressed in seconds.

3.2.9 Programming display keyboard

Key	Function
ENTER	Confirms the selection or saves new settings with the **ESCAPE** key.
ESCAPE	Cancels the selection. Saves the new settings with the **ENTER** key.
+	Increases the value read or scrolls the parameter list up.
-	Decreases the value read or scrolls the parameter list down.

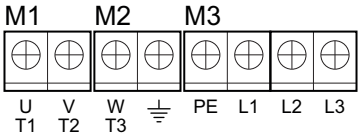
4. Inputs and outputs

4.1 Three-phase power supply and power output for motor(s)

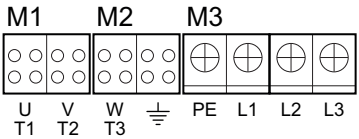
4.1.1 Power supply terminal board

Three-phase power supply and output to fan groups with total absorption within the adopted RGM model limits.

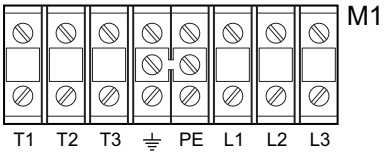
Terminal board RGM312 single output



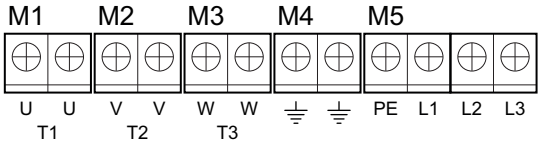
Terminal board RGM312 output x 4



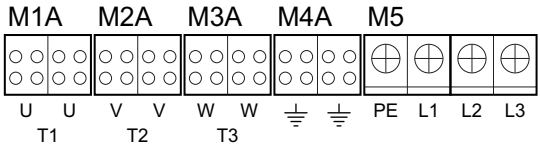
Terminal board RGM340, RGM360 single output



Terminal board RGM320, RGM328 double output



Terminal board RGM320, RGM328 output x 8



4.1.2 Terminal description

Terminal	Description
U/T1	Phase output 1 **(*)**
V/T2	Phase output 2 **(*)**
W/T3	Phase output 3 **(*)**
⏚	Auxiliary grounding to be used for the load, internally connected to PE.
PE	Protection circuit breaker connection terminal **(**)**.
L1	Phase input 1
L2	Phase input 2
L3	Phase input 3

***Note**(*): double three-phase output on models RGM320 and RGM328.*

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

4.1.3 Power supply wiring diagram

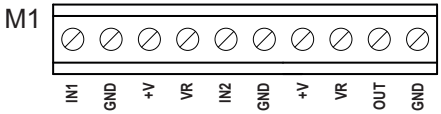
See "Power supply wiring" on page 25.

4.2 Analog inputs and outputs

4.2.1 Terminal board M1

Analog inputs for reading NTC current/voltage/resistance signals from sensors and transducers. Voltage outputs to power potentiometers, sensors and transducers. Analog output to regulate external unit operations (i.e.: spray).

***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	**OUT**	Analog output used to control external units.**(*)**	0-10 V Max 20 mA
10	**GND**	Grounding.	-

***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** and **GND**.*

***Note**(*): default setting for spray unit regulation, with dedicated and adjustable setpoint and proportional band. For applications where only the spray unit on and off control is required, use the relay output (terminal board M3) as an alternative.*

4.2.2 Analog inputs IN1 and IN2

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, it can be set from menu **conF** > parameters **C0** and **C1

4.2.3 Wiring diagrams

See "Connecting analog inputs in Slave mode" on page 25"Analog input connections in Master mode" on page 26 and "OUT analog output connections" on page 28.

4.2.4 OUT analog output control limits

The configurable **OUT** analog output can be used to control:

- up to ten Slave units through a 0-10 V dc control signal
- up to ten spray units through a 1–10 V dc control signal with dedicated and adjustable setpoint and proportional band
- up to ten external units through a 0–10/10–0 V dc control signal with dedicated and adjustable setpoint and proportional band

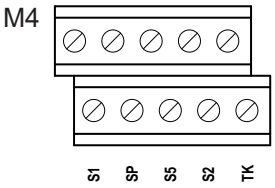
***Note**: it can be set from menu **conF** > parameter **C7**.*

4.3 On/Off inputs

4.3.1 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 special customer needs. Refer to the project documentation.*



Contact	Terminal	Function
S1	**1, 2**	The function of this input depends on the value of the base parameter **icE** If **icE** = 0, it selects the direct/reverse mode: ■ closed: reverse regulation mode ■ open: direct regulation mode If **icE** > 0, it manages the motor heating function (antifreeze): ■ closed: antifreeze function on ■ open: antifreeze function off
SP	**3, 4**	Selects the set setpoint (base parameters **S1** or **S2**) ■ closed: setpoint 2 on ■ open: setpoint 1 on
S5	**5, 6**	Activates/deactivates the % RPM night limit (**Lh** base parameter) ■ closed: limit active ■ open: limit not active

Contact	Terminal	Function
S2	**7, 8**	Enables/disables the controller operation. ■ closed: turns off regulation, power output to zero and OUT analog output to zero (only with **C7**= 2, 3) ■ open: turns on regulation: the unit runs according to settings and inputs. ***NOTICE**: always use this input if the room temperature is below -10 °C. DO NOT use this input to replace the switch for individual fans or to replace the main power switch.*
TK	**9, 10**	Normally closed contact to connect motor overload protections. ■ closed: no alarm, consent to regulation ■ open: alarm, no consent to regulation ***NOTICE**: the overload protection of one or more motors 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.*

4.3.2 Forcing in the presence of Modbus connection

In the presence of a Modbus card, some of these inputs can be forced by supervisor. See "Modbus card (PB1073C) - optional" on page 21

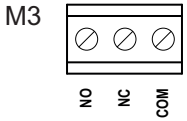
4.3.3 On/Off input wiring diagram

See "On/Off inputs connection" on page 28.

4.4 Relay output

4.4.1 Terminal board M3

The two-logic relay terminal board can be used to control alarm devices (i.e. sirens) or to control external drives as an alternative to the **OUT** analog output.



Terminal		Description
1	**NO**	Normally open output (**NO**+**COM**).
2	**NC**	Normally closed output (**NC**+**COM**).
3	**COM**	Shared.

Note**: it can be set from menu **conF** > parameter **C6

4.4.2 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 the relay remains energized.*

4.4.3 Configuration for communicating operative statuses and malfunctions

It is possible to manage the operative (for example, if the regulator is in alarm) and fault (for example, insufficient power) states in different ways by setting DIP switch SW1 switches 5 and 6, see "Presentation" on page 13.

4.4.4 Relay wiring diagram

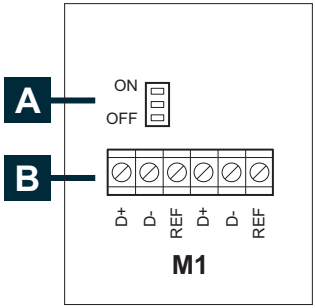
See "Relay output connection" on page 31.

4.5 Modbus card (PB1073C) - optional

4.5.1 Modbus RTU Architecture

The optional card with isolated transceiver for RS485 allows you to use the Modbus protocol to create a line of controllers connected to Clima-Sinergy or a third party supervisor.

4.5.2 Modbus card description



Part	Description
A	Serial Line termination jumper ■ **ON** (1-2): 120 Ω line termination on ■ **OFF** (2-3): 120 Ω line termination off
B	Modbus connections **(*)** ■ **D+**: non inverting RS485 ■ **D-**: inverting RS485 ■ **REF**: isolated transceiver reference grounding

***Note** (*): terminals with the same code are electrically connected.*

4.5.3 Forcing from a supervisor

The following can be forced from a supervisor:

- fan speed, via **UVW** power output.
- the **OUT** analog output.
- the commands on the On/Off inputs **S1**, **SP**, **S5**, and **S2**.

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.*

4.5.4 Interrogation frequency from supervisor

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

5. Installation

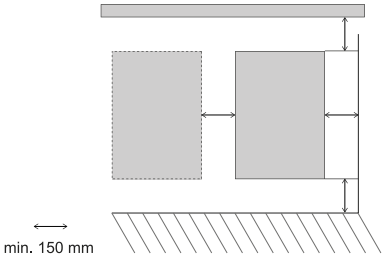
5.1 Wall mount

5.1.1 Important considerations for installation

RGM is a device that allows for different types of installation. Before proceeding, check:

- if the fans are equipped with asynchronous motors that are voltage adjustable, meaning high speed
- if the maximum rated load current is less than or equal to the rated current of the selected RGM model

5.1.2 Guarantee cooling



***NOTICE**: the air must circulate freely in the dissipater without obstacles (below and above the dissipater). Leave a free area between the device and the walls or between several devices in series.*

***NOTICE**: over temperature. In the case of vertical installation of multiple controllers, always measure the air temperature to which the highest controller is subjected.*

5.1.3 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.*

5.1.4 Installation in farms

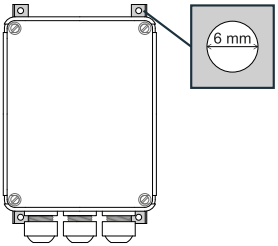
***NOTICE**: ammonia vapors. Avoid installing the controller in the stable. Install it in a separate room.*

5.1.5 Warnings

CAUTION! Heavy object. Handle with care.

***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.*

5.1.6 Secure the device to the wall



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

5.2 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.

5.2.1 Warnings

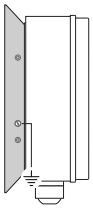
WARNING! Live parts. Electric shock. If you have to work on the powered controller, always do it in the presence of a second person. Block remote controls and any power switches.

5.2.2 Ground

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

***NOTICE**: if a circuit breaker is installed on the power supply, use a device with a threshold over 60 mA and with a short delay to prevent inopportune power outages*

5.2.3 Connect secondary grounding



To increase the electromagnetic compatibility of the controller, connect a grounding cable to the dissipater screw.

5.2.4 Protection for short-circuits on load

To protect the controller power modules from severe short-circuits or overloads, it is imperative to use semiconductor protection fuses with a suitable I2t value fitted upstream of the controller.

For additional protection, a circuit breaker with a C-curve can be used, mounted upstream of the partializer.

The installer must install these protections.

Model	Circuit breaker (A)	Fuses			
		A	V ac	Format	I2t semiconductor max (A 2s)
RGM312	20	16	690 V	10 x 38	145
RGM320	32	25			470
RGM320	32	25		14 x 51	300
RGM328	40	32			550
RGM340	60	50		NH Size 000	764
RGM360	80	80			3050

5.2.5 Power cables separate from signal cables

Install the power cables (power and load) separately from the signal cables (analog inputs and digital On/Off inputs/outputs) and keep the maximum distance possible between the cables.

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

5.2.6 Connecting loads and by-passes

The controller allows you to connect three-phase loads without having to connect the neutral. This simplifies installation and allows for a load triangle configuration. Prepare a by-pass switch in order to operate the load even in the event of partializer failure (emergency by-pass).

5.2.7 Warnings for connection and by-pass use

Match phases to avoid destructive short circuits and keep the motor running.

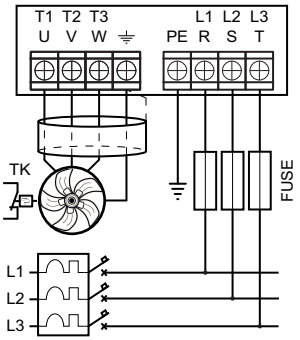
Before powering the load to the maximum voltage, disconnect the power supply to the controller, therefore:

- use a three-position manual shunt as a switching device
- if you use the automatic switch using contactors, ensure a delay of at least two seconds between turning off the controller and turning on the load.

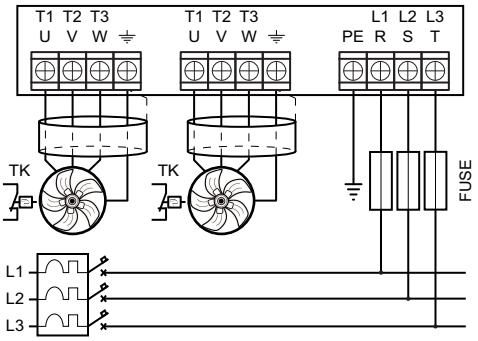
6. Connections

6.1 Power supply wiring

6.1.1 Power wiring diagram and single output load (RGM312, RGM340, RGM360)



6.1.2 Power wiring diagram and double output load (RGM320, RGM328)

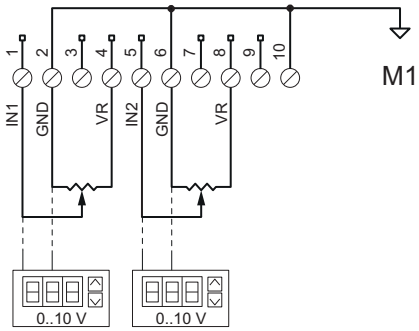


6.2 Connecting analog inputs in Slave mode

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

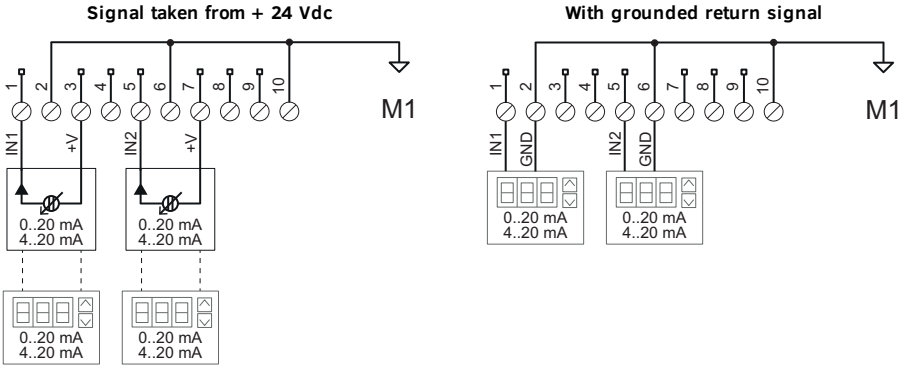
The connection of a potentiometer for manual control or, alternatively, a remote controller with 0–10 Vdc output is illustrated in the diagram. . If you use a shielded cable, ground the shield directly.

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**.

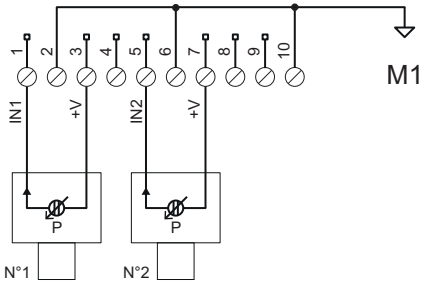


6.3 Analog input connections in Master mode

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 measurements) configurations.

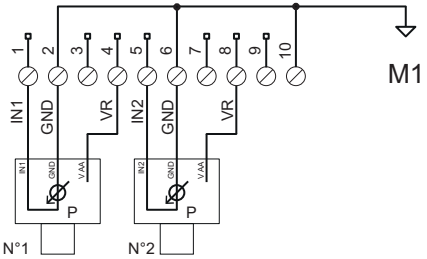


In the default configuration, the setpoint coincides with the maximum fan speed (menu **conF** > **C4** = **hi**). There are two transducers (menu **conF** > **C0** = **r2**), the controller automatically selects the transducer with the higher signal (menu **conF** > **C1** = **hi**). If only one transducer is connected, always use input **IN1** and configuration **G1**/**rP1**.

6.3.2 Transducer connection with output 0-5/0-10 V dc

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 measurements) configurations.

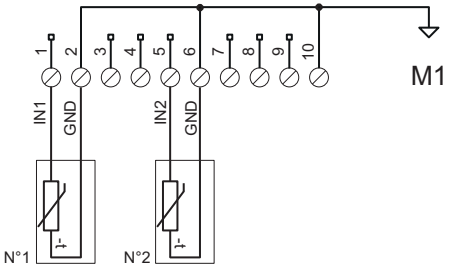


In the default configuration, the setpoint coincides with the maximum fan speed (menu **conF** > **C4** = **hi**), there are two transducers (menu **conF** > **C0** = **r2**), the controller automatically selects the transducer with the higher signal (menu **conF** > **C1** = **hi**).

6.3.3 Connection to NTC probe with 10 kΩ @ 25 °C ohm value

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

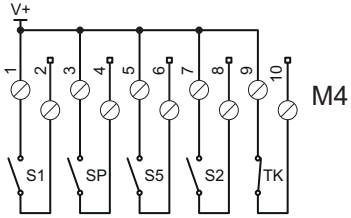
This connection requires the use of **rtE-01** and **rtE-02** (measurements in °C) configurations.



In the default configuration, the setpoint coincides with the maximum fan speed (menu **conF** > **C4** = **hi**), there are two probes (menu **conF** > **C0** = **r2**), the controller automatically selects the probe with the higher signal (menu **conF** > **C1** = **hi**). If only one sensor is connected, the system automatically selects the one present.

6.4 On/Off inputs connection

6.4.1 Diagram

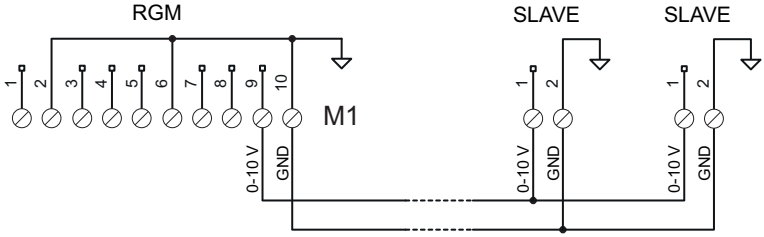


6.5 OUT analog output connections

6.5.1 Power Slave unit connection

This connection is indicated for a Master unit or one or more Slave power units.

Parameter **C7**=0 enables **OUT** analog output and transmits the direct regulation command (parameter **Co**) to the connected Slave units, setting the same operating speed for all connected fan units.



6.5.2 Connection to Water Spray unit

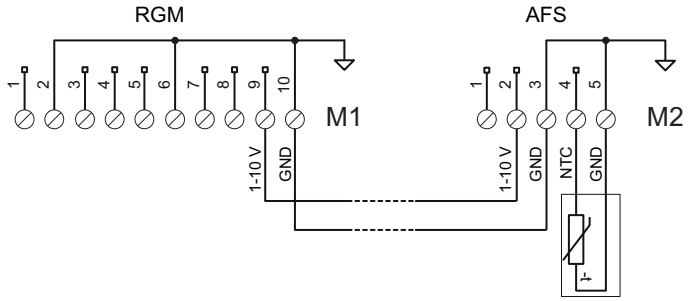
This connection is indicated to coordinate fan system and spray unit operations that increase heat exchanger heat power. You can connect three different Water Spray unit models:

- 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).

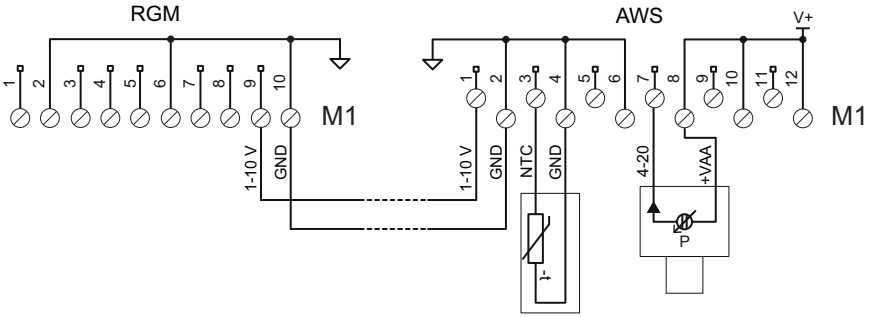
The **C7**= 1 parameter (default) enables the OUT analog output to transmit the spray unit regulation control, making a work area defined by the **USP** setpoint and **UPb** proportional band for external units available. This work area overlaps by integrating with the fan work area.

USP is set by deviation (+/-) from the reference setpoint (**S1** or **S2**) for fans.

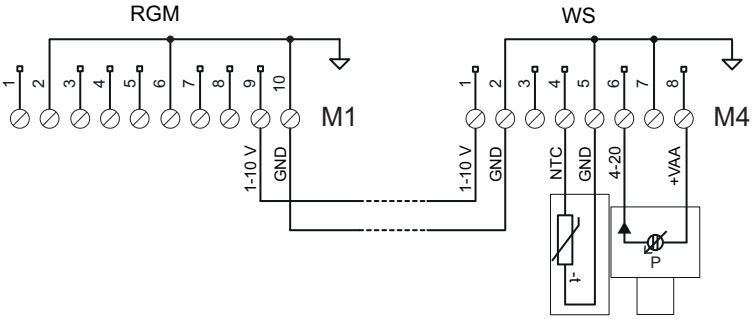
Connection diagram to AFS units



Connection diagram to AWS100 unit



Connection diagram to WS100-180 unit



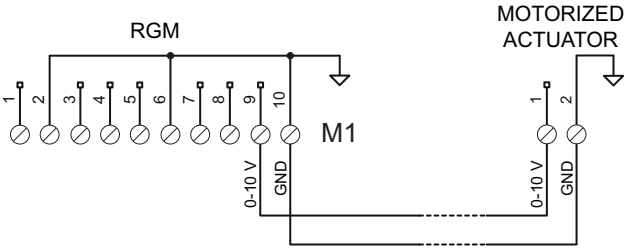
6.5.3 Motorized valve actuator connection

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

The **C7**= 2 or 3 parameter enables the OUT analog output to control an actuator, or motorized valve, and makes a work area defined by the **USP** setpoint and the **UPb**proportional band available for external units and proportional regulation in direct or reverse mode. This work area interacts by overlapping and integrating in the fan work area.

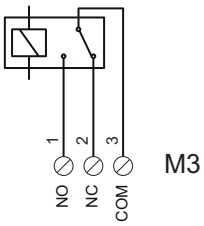
USP and **UPb** are set by deviation (+/-) from the reference setpoint (**S1** or **S2**) for fans.

***Note**: set parameter **C7** = 3 for reverse regulation.*



6.6 Relay output connection

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



6.7 RS485 Modbus RTU network connection (optional)

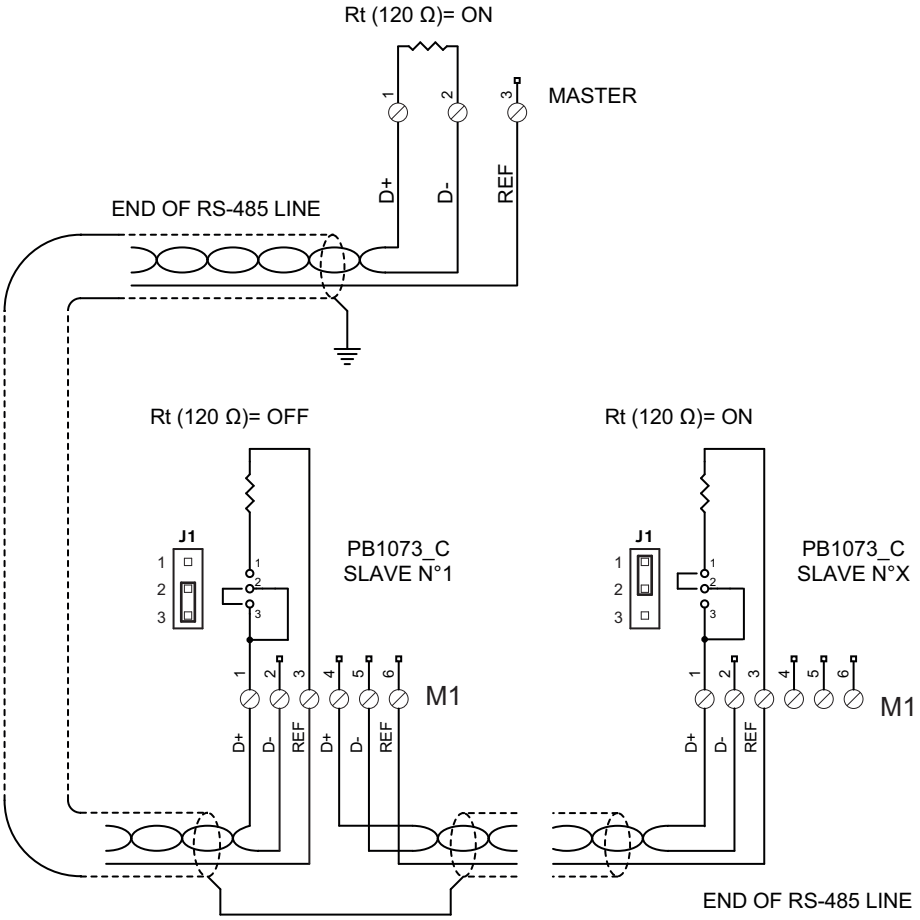
6.7.1 Correct connection steps

***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 68).
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 RGM 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-Host adapter.
6. **On the last line device** turn the **J1** jumper to 2-1 (ON). **On all other 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.

6.7.2 RS485 Modbus RTU network wiring diagram

***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 Operation

Three-phase output voltage varies in proportion to the prevalent input. The minimum speed limits, **Lo/L.o.** are active. and maximum, **hi/h.i.**, with forcing at 0% and relative hysteresis (**So/S.o.** + **io/i.o.**). Regulation jumps (**Jh1** + **JL1** and **Jh2** + **JL2**) are enabled, used to avoid particularly noisy zones.

7.1.3 Slave regulation on OUT output for power Slave

*menu **conF** > parameter **C7**=0*

The **OUT** analog output is set to control one or more external power slave units. It increases or decreases in direct proportion to the **Co** parameter (regulation control value).

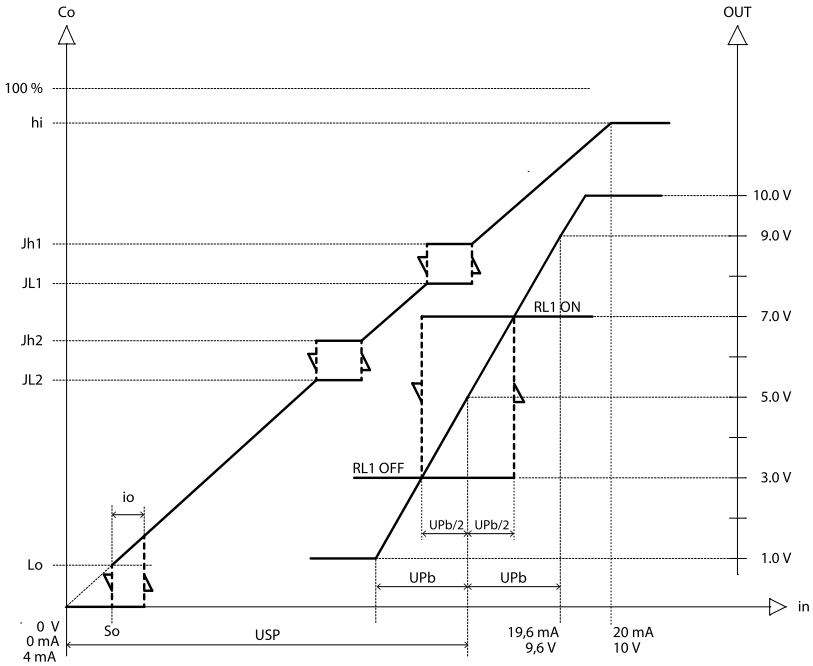
7.1.4 Slave regulation on OUT output for spray and relay control

*menu **conF** > parameter **C6**=3, parameter **C7**= 1 (default)*

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 **OUT** analog output is set to control water spray units (**C7**=1). It increases or decreases in direct proportion to the **Co** parameter (regulation control value).

The RL1 relay is configured for the On/Off control of a water spray unit (**C6**=3): it is On when input **IN** is greater than **USP** + **UPb**/2, it is Off when input IN is lower than **USP** - **UPb**/2.



Operating example

Following is an example of spray unit control via relay.

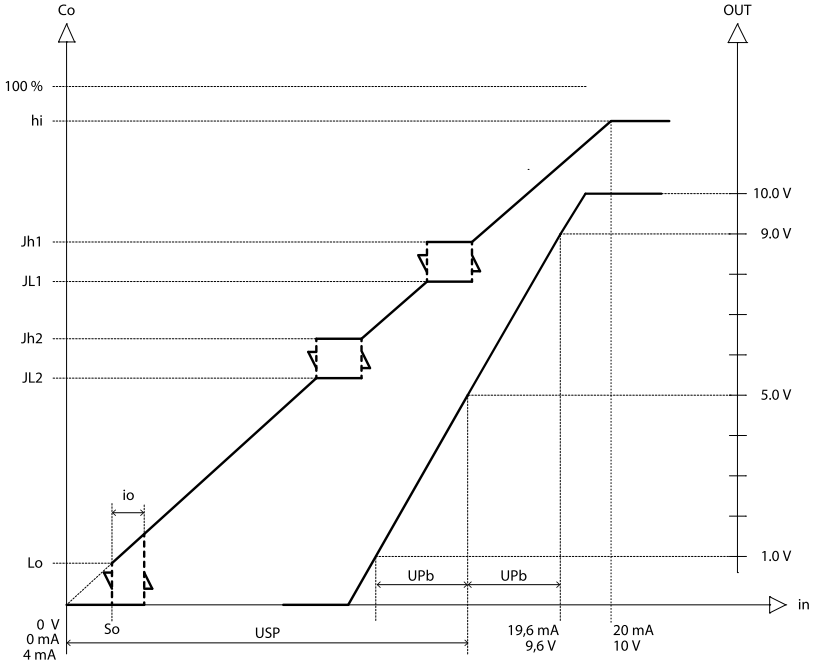
Configuration	Setpoint	Proportional band	Effect on relay
rS-020	**USP** = 15 mA	**UPb** = 4.2 mA	Relay On with **IN1** or **IN2** = 15+4.2/2 = 17.1 mA Relay Off with **IN1** or **IN2** = 15-4.2/2 = 12.9 mA
rS-420	**USP** = 15 mA	**UPb** = 4.2 mA	Relay On with **IN1** or **IN2** = 15+4.2/2 = 17.1 mA Relay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

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

*menu **conF** > parameter **C7**=2*

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 **OUT** analog output is set to control an auxiliary motorized system (**C7**=2). It increases or decreases in direct proportion to the **Co** parameter (regulation control value).

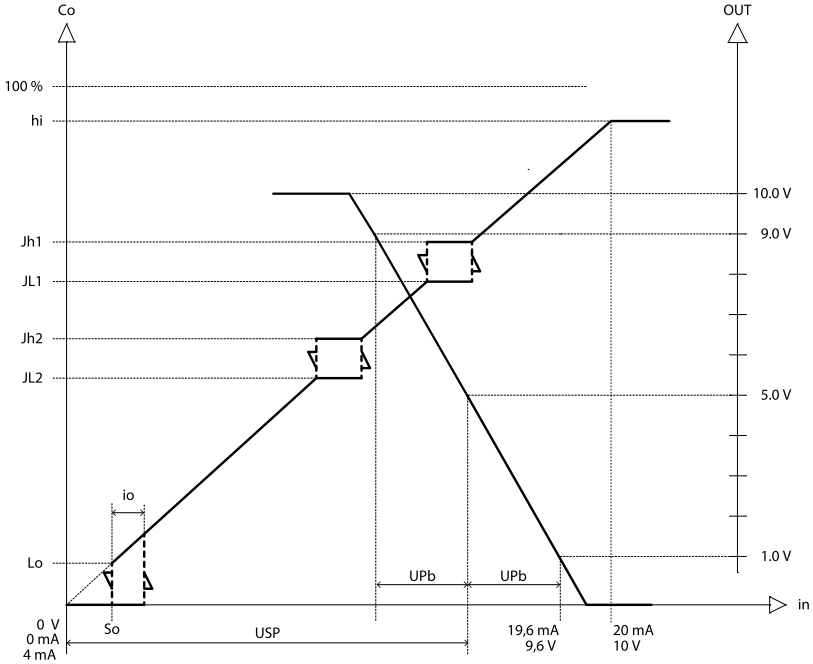


7.1.6 Slave regulation on OUT output to reversely control a motorized valve actuator

*menu **conF** > parameter **C7**=3*

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 **OUT** analog output is set to control an auxiliary motorized system (**C7**=3). It increases or decreases in inverse proportion to the **Co** parameter (regulation control value).



7.2 Master proportional mode

7.2.1 Applications

Signals from temperature sensors or transducers.

7.2.2 Operation

The three-phase output voltage varies to keep the magnitude measured by the prevalent input transducer within the proportional band (higher or lower in value).

The controller manages fans with its setpoint (**S1** or **S2**) and reference proportional band (**Pb1** or **Pb2**). The minimum (**Lo/L.o.**) and maximum (**hi/h.i.**) speed limits are enabled, with forcing and relevant hysteresis at 0% (**So/S.o.** + **io/i.o.**) and 100% (**Sh/S.h.** + **ih/i.h.**). Regulation jumps (**Jh1** + **JL1** and **Jh2** + **JL2**) are enabled, used to avoid particularly noisy zones.

7.2.3 Master regulation on OUT output for power Slave

*menu **conF** > parameter **C7**=0*

The **OUT** analog output is set to control one or more external power slave units. It increases or decreases in direct proportion to the **Co** parameter (regulation control value).

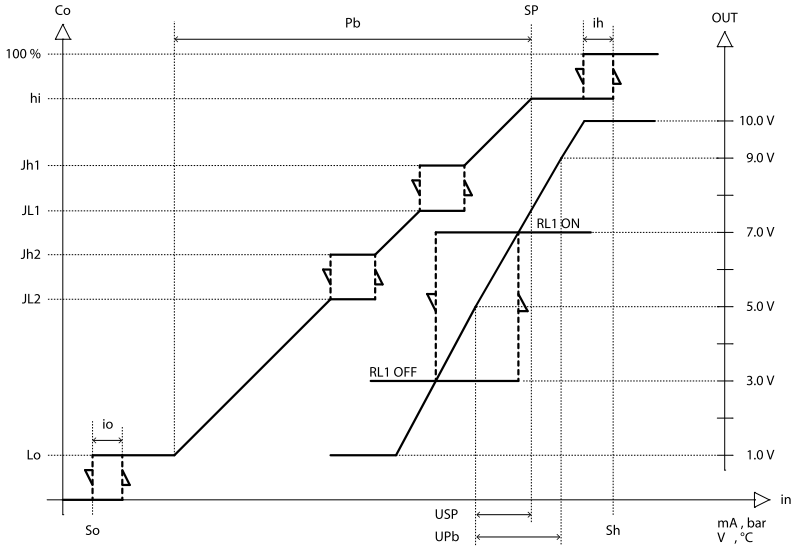
7.2.4 Master regulation on OUT output for spray and relay control for spray

*menu **conF** > parameter **C6**=3, **C7**= 1 (default)*

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The **OUT** analog output is set to control water spray units (**C7**=1). It increases or decreases in direct proportion to the **Co** parameter (regulation control value).

Relay RL1 is set to On/Off control a water spray unit (**C6**=3): it is On when input **IN** is higher than **S1**+**USP**+**UPb**/2 (or **S2**+**USP**+**UPb**/2), it is Off when input **IN** is lower than **S1**+**USP**-**UPb**/2 (or **S2**+**USP**-**UPb**/2)



Operating example

Following is an example of spray unit control via relay.

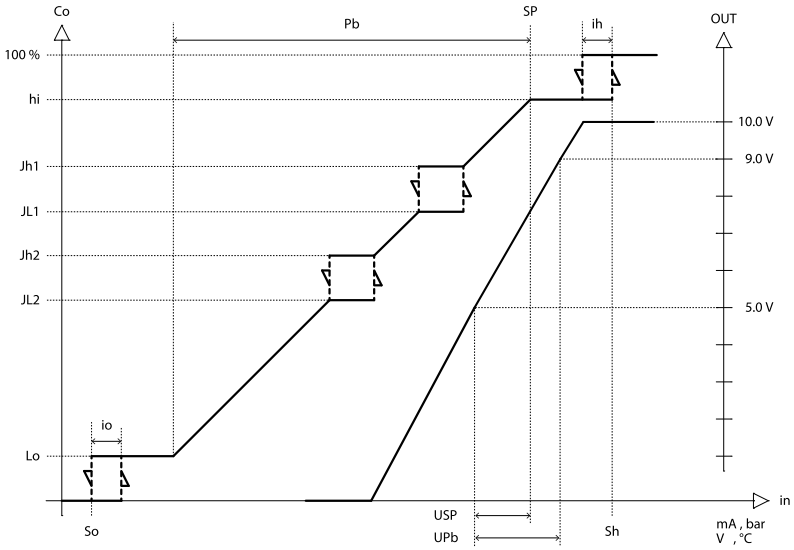
Selected setpoint	Setpoint	Proportional band	Effect on relay
S1 = 45.0 °C	**USP** = - 1,0 °C	**UPb** = 4,0 °C	Relay On with **IN1** or **IN2** = 46.0 °C Relay Off with **IN1** or **IN2** = 42.0 °C
S2 = 50.0 °C	**U.S.P.** = 3,0 °C	**U.P.b.** = 3,0 °C	Relay On with **IN1** or **IN2** = 54.5 °C Relay Off with **IN1** or **IN2** = 51.5 °C

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

*menu **conF** > parameter **C7**=**2***

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone.

The **OUT** analog output is set to control an auxiliary motorized system (**C7**=2). It increases and decreases in direct proportion to the **IN** input signal.

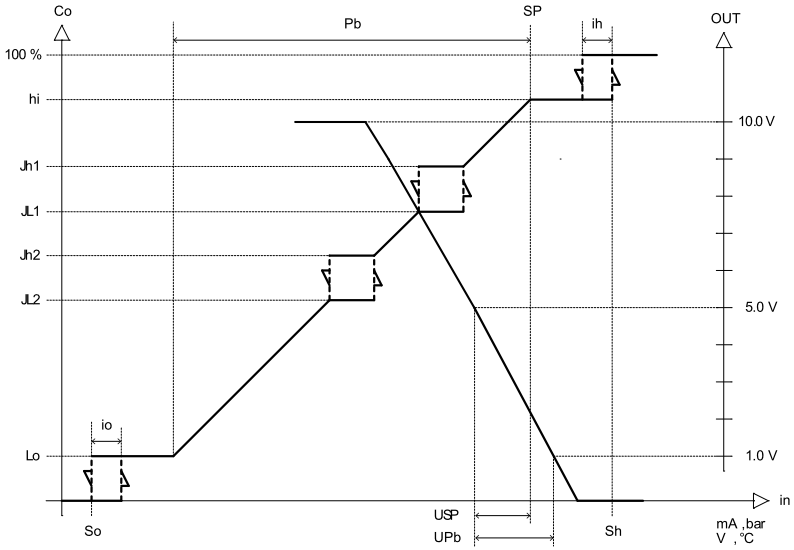


7.2.6 Master regulation on OUT output to reversely control a motorized valve actuator

*menu **conF** > parameter **C7**=**3***

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same IN input signal and overlaps the fan work zone.

The **OUT** analog output is set to control an auxiliary motorized system (**C7**=3). It increases and decreases in inverse proportion to the **IN** input signal.



7.3 Master PID mode

7.3.1 Applications

Signals from temperature sensors or transducers.

7.3.2 Operation

The three-phase output voltage varies to keep the prevalent input at the setpoint value. On the other hand, the analog output uses the same **IN** input but with a specific setpoint and proportional band.

***Note**: for correct PID regulation operations, accurately set the specific parameters*

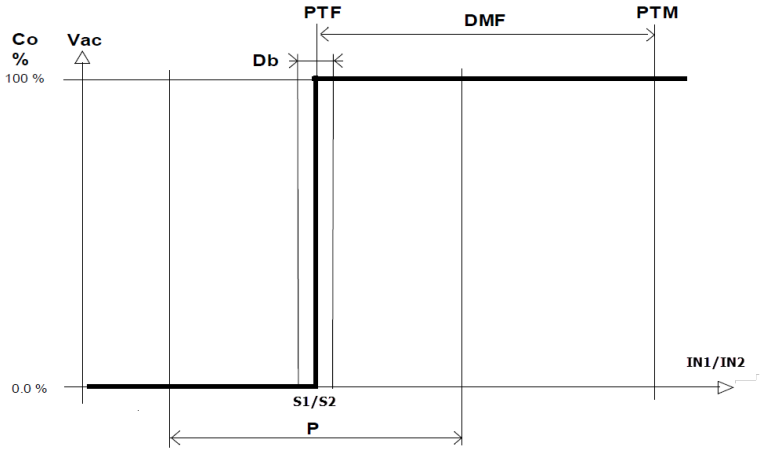
At full potential, meaning once the settlement transitions are depleted and far from the minimum and maximum limits (**Lo/L.o.**) and maximum limits (**hi/h.i.**), the PID controller maintains the set setpoint value of the magnitude measured by the prevalent transducer (**IN1** or **IN2**) at the setpoint (**S1** or **S2**). Fan control (**Co**) can have a free value that ranges from 0% to 100%, according to that required to keep the set work point.

During transitions, if the prevalent input value (**IN1** or **IN2**) moves around the setpoint (**S1** or **S2**),, but remains within the proportional band (**P**), fan control (**Co**) varies from 0% to 100% to return the input value (**IN1** or **IN2**) to the set setpoint (**S1** or **S2**).

If, instead, the prevalent input value (**IN1** or **IN2**) exits the proportional band (**P**), fan control gradually moves to 0%, or 100%, according to that needed.

A dead band zone (**Db**) can be enabled around the setpoint by setting DIP switch 2 On. This balances the small regulation system variations.

The minimum (**Lo/L.o.**) and maximum (**hi/h.i.**) speed limits are enabled, with forcing and relevant hysteresis at 0% (**So/S.o.** + **io/i.o.**) and 100% (**Sh/S.h.** + **ih/i.h.**). Regulation jumps (**Jh1** + **JL1** and **Jh2** + **JL2**) are enabled, used to avoid particularly noisy zones.



Key

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.
Db	*with DIP switch SW1 switch 2 = On* Dead band around the setpoint **(S1 or S2)**, equals +/- 2.5% of the proportional band (**P**). Freezes the fan control value if the prevalent input value **IN1** o **IN2** is within it.

7.3.3 Master PID regulation on OUT output for power Slave

*menu **conF** > parameter **C7**=**0***

The **OUT** analog output is set to control one or more external power slave units. It increases or decreases in direct proportion to the **Co** parameter (regulation control value).

7.3.4 Master PID regulation on OUT output for spray and relay control for spray

*menu **conF** > parameter **C6**=**3**, **C7**= **1** (default)*

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone. The **OUT** analog output is set to control water spray units (**C7**=1). It increases and decreases in direct proportion to the **IN** input signal.

Relay RL1 is set to On/Off control a water spray unit (**C6**=3): it is On when input **IN** is higher than **S1**+**USP**+**UPb**/2 (or **S2**+**USP**+**UPb**), it is Off when input **IN** is lower than **S1**+**USP**-**UPb**/2 (or **S2**+**USP**-**UPb)**. See diagram "Master regulation on OUT output for spray and relay control for spray" on page 37.

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

*menu **conF** > parameter **C7**=**2***

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone. The **OUT** analog output is set to control an auxiliary motorized system (**C7**=2). It increases and decreases in direct proportion to the **IN** input signal. See diagram "Master regulation on OUT output to directly control a motorized valve actuator" on page 37.

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

*menu **conF** > parameter **C7**=**3***

The controller enables a second work zone with independent setpoint **S1-USP** or **S2-USP** and **UPb** proportional band. The work zone uses the same **IN** input signal and overlaps the fan work zone. The **OUT** analog output is set to control an auxiliary motorized system (**C7**=3). It increases and decreases in inverse proportion to the **IN** input signal. See diagram "Master regulation on OUT output to reversely control a motorized valve actuator" on page 38.

7.4 Defrost and snow-free operation

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

7.4.1 Applications

To defrost the unit for heat pump applications or remove snow if the fans are installed outdoors.

7.4.2 Operation

It applies a constant voltage to the motor that keeps the fan blades rotating at constant speed. The circulating current heats the motor. The amount of voltage is set using the parameter **iCE**.

With **iCE** = 0, no voltage is dispensed.

With **icE** greater than 0, motor heating can be activated via the On/Off input **S1**, for example, by means of an antifreeze thermostat connected to the input **S1** terminals 1 and 2.

With **iCE** greater than 0, the voltage distribution to the motor can be activated with the start/stop contact, based on the settings of switch 4 of DIP switch SW1. See "DIP switch SW1" on page 14.

Function will automatically activate in the case of a closed contact, provided there is no regulation at device output.

***Note**: if **icE**= 0 (default) input **S1** is used to select the Direct/Reverse mode. The reverse mode (output voltage decreases as the input increases) is used to run the controller in heat pump mode.*

7.5 Overload protection function (optional)

***NOTICE**: this function cannot be added after the device is purchased.*

7.5.1 Operation

The device reads the value of the effective output current (Ampere RMS) and compares it to two current values: the maximum working current and the maximum pickup current.

The maximum working current is 1.2 times the rated current (In*1.2). When exceeded, the maximum time within which the overcurrent value (I-In) can be distributed is calculated. The higher the overcurrent, the shorter the distribution, and vice versa. The period is the result of an algorithm that takes into account the size of the controller. The relation between the overcurrent (I-In) and time is quadratic.

The maximum pickup current is 2 times the rated current (In*2). When exceeded, a fixed 5.0 s timer starts.

7.5.2 Controller behavior

When the distributed current...	Then...
is lower than the maximum working current (In*1.2)	distribution is not limited in time. Normal messages (parameter table, etc.) appear on the display.
is higher than the maximum working current (In*1.2)	The real-time distributed current blinks on the display. When the distributed current is kept above the maximum current beyond the calculated maximum time, the device alarm triggers and "ERR it" ("i.t" = thermal current) appears on the display. When the distributed current drops below the maximum current before the maximum time expires then the calculated time is deducted from the accumulated value until it returns to zero.
Greater than the maximum pickup current (In*2.0)	The real-time distributed current blinks on the display. Distribution continues for up to 5 seconds. When the distributed current is above the threshold for more than 5 seconds, the device alarm triggers and the following message is displayed: "ERR. i.P" ("i.P" = pickup current). When the distributed current drops below the threshold before 5 seconds, the residual time is reset.

7.5.3 Examples

The following table gives an indicative duration of the distribution time in seconds from the moment the distributed current (I) exceeds the rated current (In), depending on the I/In ratio:

I / In	Seconds	Description
1.3	120	I = In * 1,3: distribution for 120 seconds
1.4	67.5	I = In * 1,4: distribution for 67 seconds
1.5	43.2	I = In * 1,5: distribution for 43 seconds
1.6	30	I = In * 1,6: distribution for 30 seconds
1.7	22.4	I = In * 1,7: distribution for 22.4 seconds
1.8	16.9	I = In * 1,8: distribution for 16.9 seconds
1.9	13.3	I = In * 1,9: distribution for 13.3 seconds
2.0	10.8	I = In * 2,0: distribution for 10.8 seconds

8. Use the controller

8.1 Start-up

8.1.1 Warnings

CAUTION! Check again that the equipment and wiring are correct as required in this manual. Make sure that the fan absorption does not exceed the maximum stated on the identification label. Keep people or things out of the work area.

8.1.2 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 23
2	Complete the input connections (i.e. transducers) and remote controls. ***NOTICE**: follow the indicated steps for correct Modbus connection operations.*	"Connecting analog inputs in Slave mode" on page 25 "Analog input connections in Master mode" on page 26 "OUT analog output connections" on page 28 "RS485 Modbus RTU network connection (optional)" on page 31
3	Turn on power.	
4	Select the configuration suitable for the transducers used and the application	"Default configurations" on page 44
5	If necessary, enable reserved parameter editing on DIP switch SW1 and other functions	"DIP switch SW1" on page 14
6	Set the setpoint 1 or 2 and the night limit	"Basic parameters" on page 50
7	If necessary, set proportional bandwidth and setpoints for any external units and related parameters.	"Setpoint parameters (P ArA menu)" on page 52
8	If necessary, for PID mode, enable the dead band on the DIP switch and set parameters	"PID parameters (PID menu)" on page 60
9	If necessary, edit the configuration parameters	"Configuration parameters (menu conF)" on page 60
10	In communication with supervisor, set the communication parameters	"Modbus RTU communication parameters (conn menu)" on page 58
11	Disable reserved parameter editing on DIP switch SW1.	"DIP switch SW1" on page 14

8.1.3 Messages displayed when turned on

When the controller is turned on (or the **RESET** key pressed), the following messages are displayed:

Message	Description
3Ph nn	Device type: ■ **3Ph**: three-phase controllers ■ **nn**: current rating
rel. x.x	Firmware version.
rtE-01	Active configuration at that time. ***Note**: if the acronym is separated by dots it indicates that at least one configuration parameter has been changed (i.e. "r.t.E.-.0.1").*
in xx.x	Prevalent signal value between inputs **IN1** and **IN2**.

8.2 Default configurations

8.2.1 Configuration description

***Note**: in the default Master configuration, the setpoint coincides with the maximum fan speed (menu **conF** > **C4** = **hi**), and the controller automatically selects the sensor with the higher signal (menu **conF** > **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 signal in input and replicate it proportionally to the power output. Control, alarms, and value display are always in volt (rS-010) or milliamp (rS-020, rS-420).
rtE-01, rtE-02	NTC 10K@25 °C probe	**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.

8.2.2 Technical specifications of the configurations

Following are the specifications of each configuration:

Configuration	Mode	IN1/IN2 input	Signal/ Transducer/	Display	Setpoint	Proportional band
rS020	Slave	0–20 mA Ri= 100 Ω	0–20 mA	0–23 mA	-	-
rS-010	Slave	0–10 V dc Ri= 18 kΩ	0–10 V dc	0–11 V dc	-	-
rS-420	Slave	4–20 mA Ri= 100 Ω	4–20 mA	2–24 mA	-	-
rtE-01 (default)	Master	NTC 10 kΩ at 25 °C	NTC 10k@ 25 °C	from -20 to + 99 °C	45 °C	7.5 °C
rtE-02	Master	NTC 10 kΩ at 25 °C	NTC 10k@ 25 °C	from 14 to 99 °C	45 °C	7.5 °C
rPr420	Master	4–20 mA Ri= 100 Ω	4–20 mA	2–24 mA	14 mA	2.6 mA
rPr015	Master	4–20 mA Ri= 100 Ω	0–15 bar > 4–20 mA	0–19 bar	10.6 bar	2.4 bar
rPr025	Master	4–20 mA Ri= 100 Ω	0–25 bar > 4–20 mA	0–30 bar	17.0 bar	3.5 bar

Configuration	Mode	IN1/IN2 input	Signal/ Transducer/	Display	Setpoint	Proportional band
rPr030	Master	4–20 mA Ri= 100 Ω	0–30 bar > 4–20 mA	0–36 bar	17.0 bar	3.5 bar
rPr045	Master	4–20 mA Ri= 100 Ω	0–45 bar > 4–20 mA	0–54 bar	25.0 bar	5.2 bar
rUu05	Master	0–5 V dc Ri= 18 kΩ	0.5–4.5 V dc	0.5–5.5 V dc	2.9 V dc	0.8 V dc
rPu030	Master	0–5 V dc Ri= 18 kΩ	0–30 bar > 0–5 V dc	0–35 bar	17.0 bar	3.5 bar
rUu010	Master	0–10 V dc Ri= 18 kΩ	0–10 V dc	0–11 V dc	6 V dc	1.6 V dc

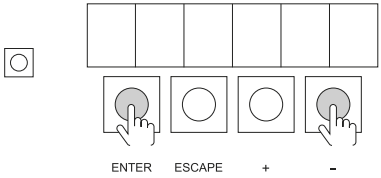
8.2.3 Select a configuration

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

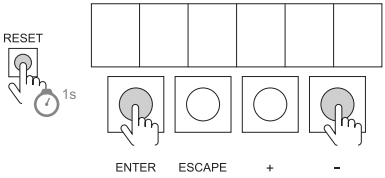
***Note**: if the microprocessor is executing complex algorithms, it may not be able to instantly recognize when keys are pressed. Wait a few seconds and retry.*

***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.*

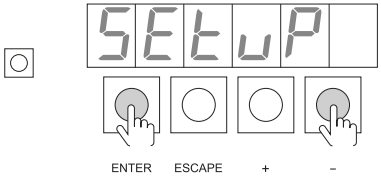
To change/restore a configuration:



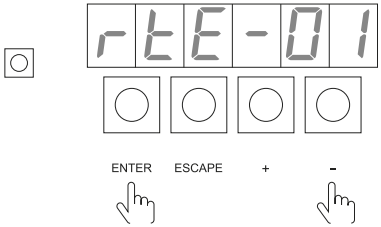
1. Simultaneously press and hold down the **ENTER** and **-** keys.



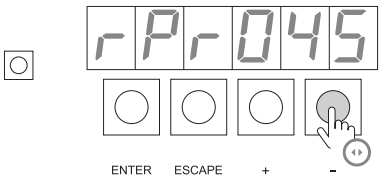
2. Press and hold down both keys, briefly press the **RESET** button (or turn the controller off and on).



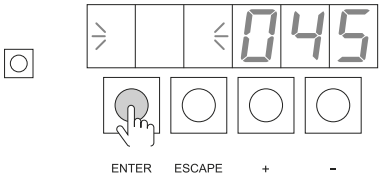
3. Wait until the "SEtuP" message appears.



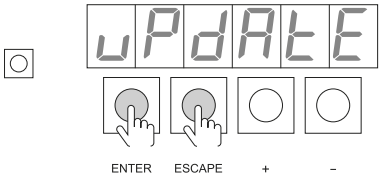
4. Simultaneously release the **ENTER** and **-** keys: the last set configuration appears.



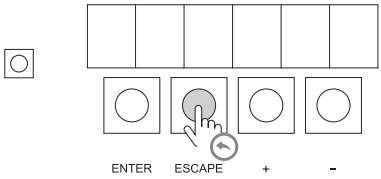
5. Press **-**(or **+**) to scroll settings.



6. Press the **ENTER** key for the selected configuration: the name of the configuration flashes.



7. To confirm, simultaneously press the **ENTER** and **ESCAPE** keys: the "uPdAtE" message appears and then the main page is displayed.



8. Or to cancel, press the **ESCAPE** key.

8.3 Parameter table

8.3.1 Organization of the table

The parameter table is made up of read-only parameters, freely editable parameters and parameters reserved to expert users. Reserved parameters are organized in menus.

Parameters are displayed in the following sequence:

Description	Menu
Measurements. Input value, setpoint value and other internal values.	**-**
Basic parameters freely editable. Values of two setpoints and night limits.	**-**
Parameters related to the two regulation setpoints **(*)**.	**PArA**
ModBus communication settings. Only enabled with Modbus card **(*)**.	**conn**
PID regulation parameters. Only visible and enabled with PID operating mode **(*)**.	**Pid**
Controller configuration parameters **(*)**.	**conF**
Controller measurements and data. Controller version, internal card temperature and output values	**-**

***Note** (*): parameters can only be edited with switch 1=On (DIP switch SW1).*

8.3.2 Display conditions for some parameters

Some parameters are only visible if the following conditions are met:

- PID on
- output current read option
- second input on
- Master proportional operating mode

8.3.3 Complete table

***Note**: setpoint 2 parameters are separated by "." (i.e. **P.b.** or **U.S.P.**).*

***Note**: parameters **S1** and **S2** and parameters **Pb** and **P.b.** are only visible with the controller in Master mode.*

Parameter	Description	Unit of measure
Input value, setpoint value and other internal value measurements		
in xx.x	Prevalent signal value between inputs **IN1** and **IN2**. displayed automatically when turned on or reset.	mA/ V dc/ bar/ °C
SP xx.x	Setpoint in use (**S1** or **S2**)	mA/ V dc/ bar/ °C
1 xx.x	Signal value at **IN1** input.	mA/ V dc/ bar/ °C
2 xx.x	Signal value at **IN2** input.	mA/ V dc/ bar/ °C
Basic parameters freely editable. Values of two setpoints and night limits		
S1	Setpoint 1	°C/ mA/ bar/ V dc
S2	Setpoint 2	°C/ mA/ bar/ V dc
Lh	Maximum night limit speed (% RPM)	
Jh1	Upper speed limit for jump 1 (% RPM)	
JL1	Lower speed limit for jump 1 (% RPM)	
Jh2	Upper speed limit for jump 2 (% RPM)	
JL2	Lower speed limit for jump 2 (% RPM)	
icE	% V ac output for motor heating. Antifreeze function.	
Parameters related to the two regulation setpoints		
Pb/ P.b.	Proportional band	°C/ mA/ bar/ V dc
hi/ h.i.	Maximum speed limit % RPM	%
Lo/ L.o.	Minimum output speed limit % RPM	%
dE/ d.E.	Acceleration/deceleration time of the starter	sec
Sh/S.h.	Value of the **IN1**/**IN2** prevalent input that forces the output to 100% ignoring the maximum speed limit % RPM (**hi**).	°C/ mA/ bar/ V dc
ih/ i.h.	**Sh** hysteresis	°C/ mA/ bar/ V dc
So/ S.o.	Value of the **IN1**/**IN2** prevalent input that forces the output to 0% ignoring the minimum speed limit % RPM (**Lo**).	°C/ mA/ bar/ V dc
io/ i.o.	**So** hysteresis	°C/ mA/ bar/ V dc
USP/ U.S.P.	Setpoint for the external unit connected to **OUT** output.	°C/ mA/ bar/ V dc
UPb/U.P.b.	Proportional band for the external unit connected to **OUT** output.	°C/ mA/ bar/ V dc
ModBus communication settings. With Modbus card only		
xxxx	Configuration symbol in use (i.e. **rtE-01**)	-
AddrES	Controller address.	-
SPEEd	Communication speed	-
tYPE	Communication mode	-
PID regulation parameters. Only with PID mode		

Parameter	Description	Unit of measure
P	Proportional band	°C/ mA/ bar/ V dc
i	Integral component weight	-
d	Derivative component weight	-
ti	Integration time	s
td	Derivation time	s
Controller configuration parameters		
C0	Operating modes and number of inputs used.	-
C1	Input to use. The other input is still visible from the display or from Modbus protocol.	-
C2	IN1 and IN2 type input.**(*)**.	
C3	Display value conversion **(*)**	
C4	Setpoint position.	-
C5	cosϕ regulation.	-
C6	Relay output setting (terminal board M3). See "Relay output" on page 20.	-
C7	**OUT** analog output settings.	-
Measurements and values of some magnitudes in the controller		
ECPLUS	Device type.	-
3Ph xx	Three-phase device. xx: rated current **(**)**	-
tL xx.x	Logic board real time temperature	°C
tP xx.x	Power board real-time temperature. ***Note**: only with devices equipped with output current reading.*	°C
Out xx.x	**OUT** analog output value	V dc
Co xxx	Power output regulation control value	%

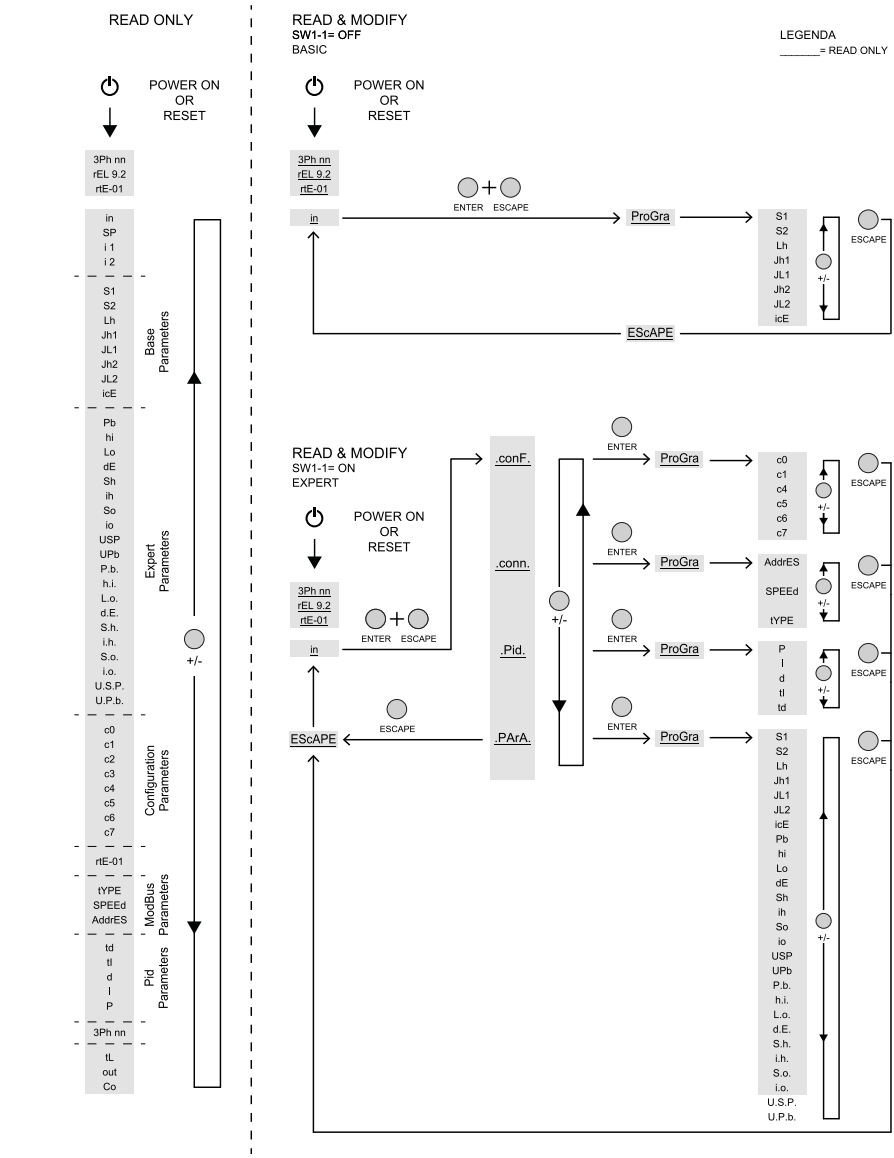
***Note** (*): read-only values. Selection is automatic according to the selected configuration.*
***Note** (**): with devices equipped with XX output current reading, it is replaced by the device rated current value.*

8.3.4 Display all parameters/measurements

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

1. Press **+** or **-** to scroll the entire parameter table: parameters appear in the indicated sequence.
2. Press the **ESCAPE** key to return to the measurement and value view (**in xx.x**)

8.4 Menu layout



***Note** (*): with Modbus card only.*
***Note** (**): with PID mode on only.*

8.5 Basic parameters

8.5.1 Description

The basic parameters are freely editable (DIP switch SW1 switch 1 = Off) and allow you to adjust setpoint values, night limit, speed jumps and anti-freeze function percentage.

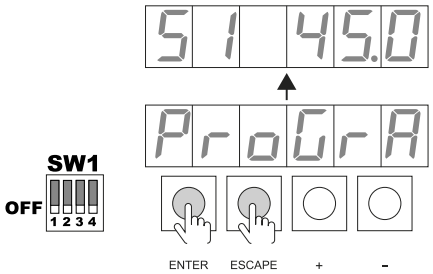
8.5.2 Parameter list

***Note**: parameters **S1** and **S2** are only visible with the controller in Master mode.*

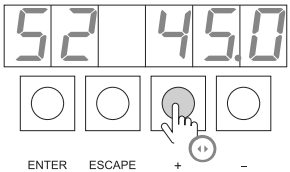
Parameter	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
S1	Setpoint 1	°C	-10.0	+90.0	45.0	NTC 10k @25 °C	rtE-01	
		°C	10.0	+90.0	45.0	NTC 10k @25 °C	rtE-02	
		mA	4.0	20.1	14.0	4–20 mA	rPr420	
		bar	0	15.0	10.6	0–15 bar > 4–20 mA	rPr015	
		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	
S2	Setpoint 2	°C	-10.0	+90.0	45.0	NTC 10k @25 °C	rtE-01	
		°C	10.0	+90.0	45.0	NTC 10k @25 °C	rtE-02	
		mA	4.0	20.1	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	
Lh	Maximum night limit speed (% RPM)	off	0%	100%	100%	All	All configurations	
Jh1	Upper speed limit for jump 1 (% RPM)	off	0%	100%	100%	All	All configurations	

Parameter	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
JL1	Lower speed limit for jump 1 (% RPM)	off	0%	100%	100%	All	All configurations	
Jh2	Upper speed limit for jump 2 (% RPM)	off	0%	100%	100%	All	All configurations	
JL2	Lower speed limit for jump 2 (% RPM)	off	0%	100%	100%	All	All configurations	
icE	% V ac output for motor heating. Antifreeze function.	off	5%	50%	5%	All	All configurations	

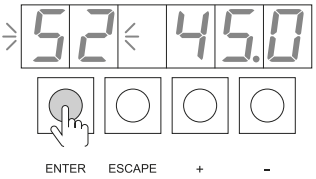
8.5.3 Edit a basic parameter



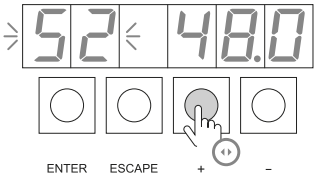
1. Leave DIP switch **SW1** switch 1 **OFF** and simultaneously press the **ENTER** and **ESCAPE** keys.



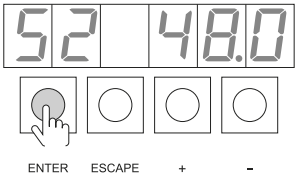
2. Press + (or -) to scroll through the parameters.



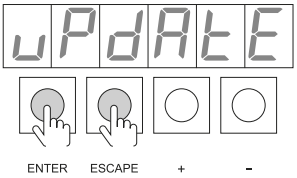
3. Press the **ENTER** key at the selected parameter: the parameter code blinks.



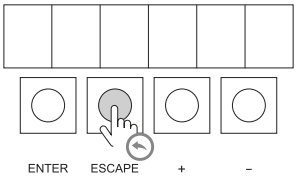
4. Press **+** (or **–**) to edit the selected parameter value.



5. Press the **ENTER** key to confirm the parameter change: the parameter code stops blinking.



6. To confirm, press the **ENTER** and **ESCAPE** keys at the same time: the message "uPdAtE" appears and then the main page is displayed.



7. Press the **ESCAPE** key to cancel changes.

8.6 Setpoint parameters (P ArA menu)

8.6.1 Description

Two parameter sets are available, one for setpoint 1 and one for setpoint 2. They are used by all Master configurations.

They appear on the display after the basic parameters.

8.6.2 Parameter list

***Note**: setpoint 2 parameters are separated by "." (i.e. **P.b.** or **U.S.P.**).*

***Note**: parameters **Pb** and **P.b.** are only visible with the controller in Master mode.*

***Note**: in Master configurations, the **OUT** output setpoint is the algebraic sum of the setpoint in use (**S1** or **S2**) and the setpoint for the external unit in use (**USP** or **U.S.P.**).*

***Note**: in Slave configurations, the **OUT** output setpoint is simply the setpoint for the external unit in use (**USP** or **U.S.P.**).*

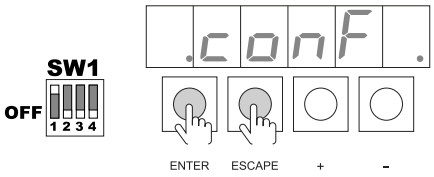
Parameter	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
Pb/ P.b.	Proportional band	°C	2.0	55.0	7.5	NTC 10k @25 °C	rtE-01	
		°C	2.0	55.0	7.5	NTC 10k @25 °C	rtE-02	
		mA	0.2	16.0	2.6	4–20 mA	rPr420	
		bar	0.5	15.0	2.4	0–15 bar > 4–20 mA	rPr015	
		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/ h.i.	Maximum speed limit % RPM	%	0	100	100	All	All settings	
Lo/ L.o.	Minimum output speed limit % RPM	%	0	100	00	All	All settings	
dE/ d.E.	Acceleration/deceleration time of the starter	sec	0.1	60.0	2.0	All	All settings	
Sh/S.h.	Value of the **IN1**/**IN2** prevalent input that forces the output to 100% ignoring the maximum speed limit % RPM (**hi**).	°C	-20.0	+90.0	90.0	NTC 10k @25 °C	rtE-01	
		°C	10.0	+90.0	90.0	NTC 10k @25 °C	rtE-02	
		mA	4	20	20.0	4–20 mA	rPr420	
		bar	0	15	15.0	0–15 bar > 4–20 mA	rPr015	
		bar	0	25	25.0	0–25 bar > 4–20 mA	rPr025	
		bar	0	30	30.0	0–30 bar > 4–20 mA	rPr030	
		bar	0	45	45.0	0–45 bar > 4–20 mA	rPr045	
		V dc	0	5	5.0	0.5–4.5 V dc	rUu-05	
		bar	0	30	30.0	0–30 bar > 0–5 V dc	rPu030	
		V dc	0	10.1	10.0	0–10 V dc	rUu010	

Parameter	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
ih/ i.h.	**Sh** hysteresis	°C	1	30	1	NTC 10k @25 °C	rtE-01	
		°C	1	30	1	NTC 10k @25 °C	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	
So/ S.o.	Value of the **IN1**/**IN2** prevalent input that forces the output to 0% ignoring the minimum speed limit % RPM (**Lo**).	mA	0	20.1	0	0–20 mA	rS-020	
		mA	4	20.1	4	4–20 mA	rS-420	
		V dc	0	10.1	0	0–10 V dc	rS-010	
		°C	-20.0	+90.0	-20.0	NTC 10k @25 °C	rtE-01	
		°C	10.0	+90.0	10.0	NTC 10k @25 °C	rtE-02	
		mA	4	20	4	4–20 mA	rPr420	
		bar	0	15	0	0–15 bar > 4–20 mA	rPr015	
		bar	0	25	0	0–25 bar > 4–20 mA	rPr025	
		bar	0	30	0	0–30 bar > 4–20 mA	rPr030	
		bar	0	45	0	0–45 bar > 4–20 mA	rPr045	
		V dc	0	5	0	0.5–4.5 V dc	rUu-05	
		bar	0	30	0	0–30 bar > 0–5 V dc	rPu030	
		V dc	0	10.1	0	0–10 V dc	rUu010	

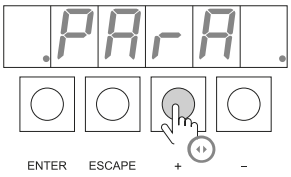
Parameter	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
io/ i.o.	**So** hysteresis	mA	0.2	10	0.2	0–20 mA	rS-020	
		mA	0.2	10	0.2	4–20 mA	rS-420	
		V dc	0.1	5.0	0.1	0–10 V dc	rS-010	
		°C	1	30	1	NTC 10k @25 °C	rtE-01	
		°C	1	30	1	NTC 10k @25 °C	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	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
USP/ U.S.P.	Setpoint for the external unit connected to **OUT** output.	mA	0	20.1	15.0	0–20 mA	rS-020	
		mA	0	20.1	11.0	4–20 mA	rS-420	
		V dc	0	10	7.5	0–10 V dc	rS-010	
		°C	-54.9	+55	-1.6	NTC 10k @25 °C	rtE-01	
		°C	-54.9	+55	-1.6	NTC 10k @25 °C	rtE-02	
		mA	-8	+8	-0.6	4–20 mA	rPr420	
		bar	-7.5	+7.4	-0.4	0–15 bar > 4–20 mA	rPr015	
		bar	-12.5	+12.4	-0.8	0–25 bar > 4–20 mA	rPr025	
		bar	-15	+14.9	-0.8	0–30 bar > 4–20 mA	rPr030	
		bar	-22.5	+22.4	-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	
		bar	-22.5	+22.4	-1.0	0–10 V dc	rPu045	
		V dc	-5.1	+4.9	-0.5	NTC 10k @25 °C	rUu010	
UPb/U.P.b.	Proportional band for the external unit connected to **OUT** output.	mA	0.5	20	4.2	0–20 mA	rS-020	
		mA	0.5	20	4.2	4–20 mA	rS-420	
		V dc	0.2	10	2.1	0–10 V dc	rS-010	
		°C	2.0	55.0	2.4	NTC 10k @25 °C	rtE-01	
		°C	2.0	55.0	2.4	NTC 10k @25 °C	rtE-02	
		mA	0.5	15.0	1.0	4–20 mA	rPr420	
		bar	0.5	15.0	0.7	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	1.5	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	

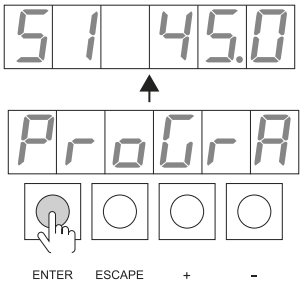
8.6.3 Edit a setpoint parameter



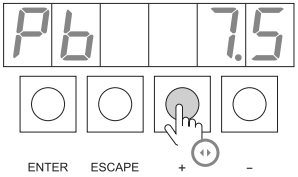
1. Turn **SW1** switch 1 **ON** and simultaneously press the **ENTER** and **ESCAPE** keys.



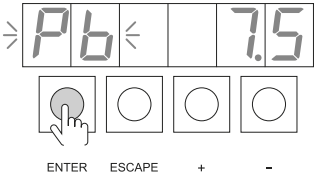
2. Press **+** (or **-**) to scroll menus.



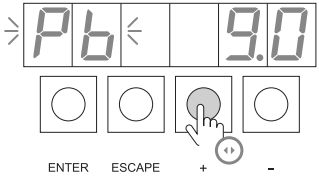
3. Press **ENTER** at the “PArA” menu: parameters appear.



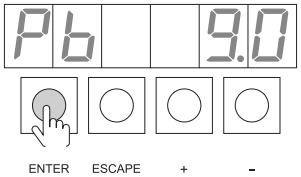
4. Press **+** (or **-**) to scroll through the parameters.



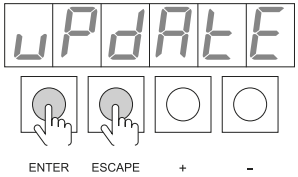
5. Press the **ENTER** key at the selected parameter: the parameter code blinks.



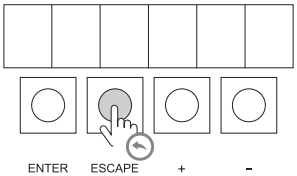
6. Press **+** (or **-**) to edit the selected parameter value.



7. Press the **ENTER** key to confirm the parameter change: the parameter code stops blinking.



8. To confirm, press the **ENTER** and **ESCAPE** keys at the same time: the message "uPdAtE" appears and then the main page is displayed.



9. Or to cancel, press the **ESCAPE** key.

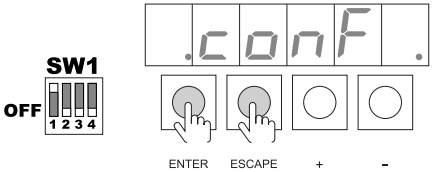
8.7 Modbus RTU communication parameters (conn menu)

8.7.1 Parameter list

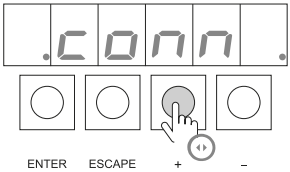
Parameter	Description	Minimum	Maximum	Default	System settings
AddrES	Controller address.	1	247	247	
SPEEd	Communication speed ■ **048**: 4800 baud ■ **096**: 9600 baud (default) ■ **192**: 19200 baud ■ **384**: 38400 baud	048	384	096	
tYPE	Communication mode ■ **8N1**: 8 bit , no parity, 1 stop bit ■ **8E1**: 8 bit, even parity, 1 stop bit (default) ■ **8O1**: 8 bit , odd parity, 1 stop bit	8N1	8O1	8E1	

8.7.2 Edit communication parameters

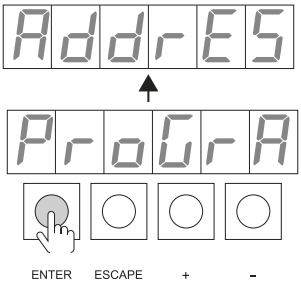
***Note**: with optional Modbus card only.*



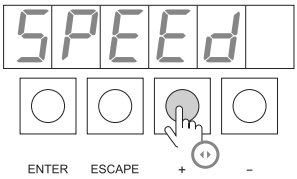
1. Turn **SW1** switch 1 **ON** and simultaneously press the **ENTER** and **ESCAPE** keys.



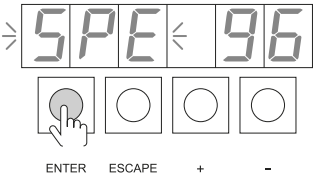
2. Press **+** (or **-**) to scroll menus.



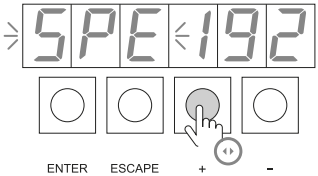
3. Press **ENTER** at the “conn” menu: parameters appear.



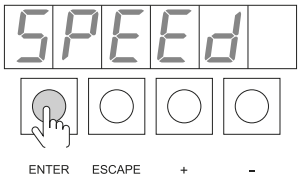
4. Press **+** (or **-**) to scroll parameters.



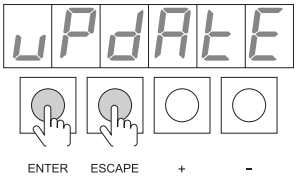
5. Press the **ENTER** key at the selected parameter: the parameter code blinks.



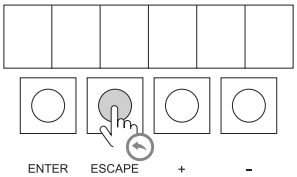
6. Press **+** (or **-**) to edit the selected parameter value.



7. Press the **ENTER** key to confirm the parameter change: the parameter code stops blinking.



8. To confirm, press the **ENTER** and **ESCAPE** keys at the same time: the message "uPdAtE" appears and then the main page is displayed.



9. Or to cancel, press the **ESCAPE** key.

8.8 PID parameters (PID menu)

8.8.1 Parameter list

Parameter	Description	Unit of measure	Minimum	Maximum	Default	Transducer/ sensor/ signal	Configuration	System settings
P	Proportional band	°C	2.0	55.0	7.5	NTC 10k @25 °C	rtE-01	
		°C	2.0	55.0	7.5	NTC 10k @25 °C	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	100	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	

8.8.2 Edit PID parameters

Proceed as with setpoint parameters, select the **Pid** menu. See "Setpoint parameters (P ArA menu)" on page 52

8.9 Configuration parameters (menu conF)

8.9.1 Configuration parameters (menu conF)

These parameters determine controller operations. Selecting a default configuration loads these parameters with their default values. They can be singularly edited according to need.

They define:

- the controller operating mode (Master, Slave or PID) and number of analog inputs used (**IN1** and **IN2**)
- for Master proportional mode, the position of the setpoint at the ends or at the center of the proportional band (for PID Master mode, the position is always at the center).
- the **IN1** and **IN2** analog input type (current, voltage signal, from NTC probe)
- how to manage the relay output on the terminal board M3
- how to manage the **OUT** analog output

8.9.2 Configuration parameter list (menu conF)

Parameter	Description	Values	Default	Configuration	System settings
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 protocol.	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**	rS-010, rS-020, rS-420, rtE-01, rtE-02, rPr420, rPr015, rPr025 rPr030, rPr045, rUu-05, rPu030, rUu010	
C2	IN1 and IN2 type input. **(*)**.	**020**: 0–20 mA current signal	_	rS020	
		420: 4–20 mA current signal	_	rPr420, rPr015, rPr025, rPr030, rPr045, rS-420	
		05: 0-5 V dc voltage signal	_	rUu-05, rPu030	
		010: 0-10 V dc voltage signal	_	rUu010, rS010	
		ntc: kOhm (10 kΩ @25 °C) signal	_	rtE-01, rtE-02	
C3	Display value conversion **(*)**	**oFF**: no conversion	_	rS010, rS020, rS-420, rtE-01, rtE-02, rPr420, rUu-05, rUu010	
		015: conversion 4–20 mA > 0-15 bar	-	rPr015	
		025: conversion 4–20 mA > 0-25 bar	-	rPr025	
		030: conversion 4–20 mA > 0-30 bar	-	rPr030	
		045: conversion 4–20 mA > 0-45 bar	-	rPr045	
		030: conversion 0.5-4.5 V dc> 0-30 bar	-	rPu030	

Parameter	Description	Values	Default	Configuration	System settings
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	
C5	cosϕ regulation.	**8**: Motor cosϕ compensation, adjustable from 0 to 15.	**08**	all	
C6	Relay output setting (terminal board M3). See "Relay output" on page 20.	**0**: relay Off during controller alarm. **1**: relay Off during controller alarm or regulation disabled (On/Off input **S2** closed) **2**: relay Off during controller alarm or regulation disabled (On/Off input **S2** closed) or stopped **3**: the relay operates as direct On/Off control for spray unit	**0**	all	
C7	**OUT** analog output settings.	**0**: control to rS power Slave unit, with 0–10 V dc input. **1**: control to Water-Spray unit 1–10 V dc (default) with specific setpoint and proportional band **2**: control to motorized actuator with input 0–10 V dc with specific setpoint and proportional band. **3**: reverse control to motorized actuator with input 10–0 V dc with specific setpoint and proportional band	1	all	

***Note** (*): read-only values. Selection is automatic according to the selected configuration.*

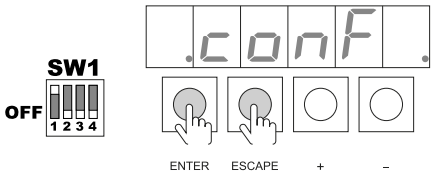
8.9.3 C0, C1 and C4 parameter combinations for each configuration

Configuration	C0	C1	C4
rS-010, rS-020, rS-420	**GP2 (*)**	**hi**	**oFF**
		Lo	**oFF**
	GP1	**oFF**	**oFF**
rtE-01, rtE-02, rPr420, rPr015, rPr025 rPr030, rPr045, rUu-05, rPu030, rUu010	**r2 (*)**	**hi**	**hi**
			Lo
		Lo	**hi**
			Lo
	r1	**oFF**	**hi**
			Lo
	rP1	**oFF**	**Mid**
	rP2	**hi**	**Mid**
		Lo	**Mid**

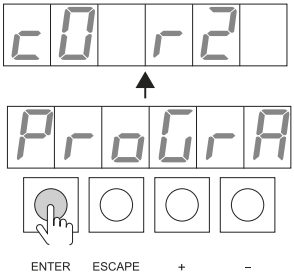
***Note** (*): default value.*

8.9.4 Edit a configuration parameter

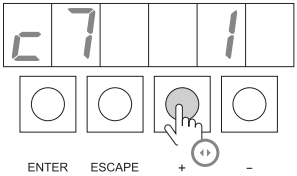
***NOTICE**: only edit these parameters if you know the effects on regulation.*



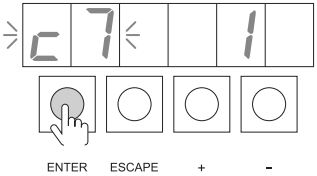
1. Turn **SW1** switch 1 **ON** and simultaneously press the **ENTER** and **ESCAPE** keys.



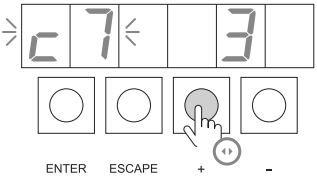
2. Press **ENTER** at the “conF” menu: parameters appear.



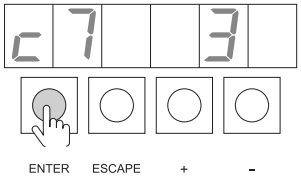
3. Press **+** (or **-**) to scroll through the parameters.



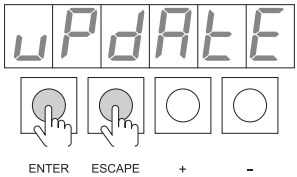
4. Press the **ENTER** key at the selected parameter: the parameter code blinks.



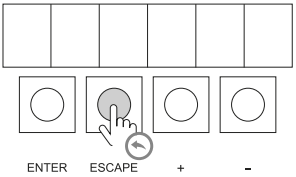
5. Press **+** (or **-**) to edit the selected parameter value.



6. Press the **ENTER** key to confirm the parameter change: the parameter code stops blinking.



7. Press the **ENTER** key and the ENTER and ESCAPE keys at the same time to save the change: the message "uPdAtE" is displayed and then the home page is displayed.



8. Or to cancel, press the **ESCAPE** key.

9. Diagnostics

9.1 Troubleshooting

9.1.1 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.

9.1.2 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 45.
The keys do not respond when pressed	The microprocessor is executing complex algorithms.	Wait a few seconds and retry.

9.1.3 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.*

In the event of the red LED FAIL alarm, the following messages appear blinking:

Message	Cause	Solution
Err P	No phase on the power supply	Make sure the power cables are correctly connected and that the terminal board screws are tight. If applicable, make sure the fuses in series at power supply are integral.
Err t	External thermal overload protection contact open **TK**	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.
Err t.P.	Regulation stopped due to power 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 dissipater is free of dirt, cobwebs, dust or anything else that hinders cooling. Clean the blades. Make sure the controller is correctly installed, see "Wall mount" on page 22.
Err t.L.	Regulation stopped due to control and regulation board exceeding the maximum working temperature (85 °C)	

Message	Cause	Solution
Err i.t.	Only with optional overload protection. Regulation stopped because maximum working current protection triggered. To know the current thresholds and trigger times, see chapter "Overload protection function (optional)" on page 41	Make sure the distributed current is less than or equal to the plate data.
cur NN,N	Only with optional overload protection. Real-time distributed current over the rated value. When the described time limits are exceeded, regulation stops, the relay opens (Off) and "Err.i.t." appears on the display	
Err i.P.	Only with optional overload protection. Regulation stopped because maximum pickup current protection triggered. To know the current thresholds and trigger times, see chapter "Overload protection function (optional)" on page 41	
Err U	Input signal under minimum value. See "Minimum and maximum limits for inputs IN1 and IN2" on page 65	Make sure the set configuration is suited to the control signal used. Make sure the transducer/sensor/probe is correctly connected.
Err o	Input higher than maximum value. See "Minimum and maximum limits for inputs IN1 and IN2" on page 65	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,

9.1.4 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	-	> 24	mA
rS-010	-	> 11	V dc
rS-420	< 2	> 24	mA
rtE-01	< -20	> 99	°C
rtE-02	< 14	> 99	°C
rPr420	< 2	> 24	mA
rPr015 (*)	< 2	> 24	mA
rPr025 (*)	< 2	> 24	mA
rPr030 (*)	< 2	> 24	mA
rPr045 (*)	< 2	> 24	mA
rPr050 (*)	< 2	> 24	mA
rUu-05	-	> 5.5	V dc
rPu030 (*)	-	> 35	V dc
rUu010	-	> 11	V dc

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

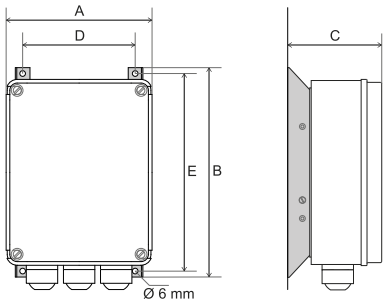
10. Technical specifications

10.1 Physical properties

10.1.1 Dimensions and weight

***NOTICE**: provide space around the controller as indicated in "Guarantee cooling" on page 22.*

Model	A	B	C	D	E	Weight (kg)
RGM312	200	285	128	153	255	3.4
RGM320	235	350	181	185	320	5.3
RGM328	235	350	204	172	320	6.1
RGM340	315	415	178	273	403	11.5
RGM360	315	491	228	255	436	16.7



10.1.2 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
M25 cable clamps	IP67 protection, class V2, polyamide PA6

10.1.3 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)

10.2 Electrical specifications

10.2.1 Applications

High-speed, three-phase, asynchronous motors with adjustable voltage applied to axial or centrifugal fans.

10.2.2 Specifications

Rated voltage	400 V ac ± 20% three-phase On request 230 V ac / 500 V ac
Frequency	50/60 Hz automatically recognized
Maximum pickup current (*)	I> 200% In, alarm trigger time is about 5 s
Maximum current (thermal) (*)	I = 130% In, alarm trigger time of about 120 s I = 160% In, alarm trigger time of about 30 s I = 190% In, alarm trigger time of about 13 s To know the current thresholds and trigger times, see "Overload protection function (optional)" on page 41
Minimum current	0.2 A
Over voltage protection	Surge category II (4 KV), EN 61000-4-5
Overload protection	Optional.
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

***Note (*)**: if overload protection is installed.*

10.2.3 Rated current and power

Model	RMS rated current Ampere (In)	Three-phase output	Environmental temperature downgrade > 50 °C (A/°C)	Rated power nominal kVA @ 400 Vac	Dissipated power command circuits	Power dissipated in the area
RGM312	12	Single, x4	0.6	8.0	10 W	72 W @ 12 A
RGM320	20	Double, x8	1	13.0	10 W	120 W @ 20 A
RGM328	28	Double, x8	1.4	17.0	10 W	168 W @ 28 A
RGM340	40	Single	2	27.0	10 W	240 W @ 40 A
RGM360	60	Single	3	41.0	10 W	360 W @ 60 A

10.2.4 Nominal current declassified due to height of installation

Installation height (m)	0	1000	1500	2000	2500	3000	3500
Rated current reduction (%)	100	95	90	85	80	75	70

10.2.5 Electric insulation

Case	Class I (use of grounded protection conductor)
Command circuits	4000 V ac between command input and mains voltage parts

10.2.6 Nominal cable sections

	Signal (min–max values)		Power output (min–max values)		Power supply (min–max values)	
Model	**mm²**	**AWG Cu**	**mm²**	**AWG Cu**	**mm²**	**AWG Cu**
RGM312 (single output)	0.5–1.5	20–16	1.0–2.5	17–13	1.0–2.5	17–13
RGM312 (output x4)	0.5–1.5	20–16	1.0–2.5	17–13	1.0–2.5	17–13

	Signal (min–max values)		Power output (min–max values)		Power supply (min–max values)	
Model	**mm2**	**AWG Cu**	**mm2**	**AWG Cu**	**mm2**	**AWG Cu**
RGM320 (double output)	0.5–1.5	20–16	1.5–4.0	15–11	1.5–4.0	15–11
RGM320 (output x8)	0.5–1.5	20–16	1.0–2.5	17–13	1.5–4.0	15–11
RGM328 (double output)	0.5–1.5	20–16	1.5–4.0	15–11	1.5–4.0	15–11
RGM328 (output x8)	0.5–1.5	20–16	1.0–2.5	17–13	1.5–4.0	15–11
RGM340	0.5–1.5	20–16	2.5–10	13–7	2.5–10	13–7
RGM360	0.5–1.5	20–16	4.0–16	11–5	4.0–16	11–5

10.2.7 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
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
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

10.3 Maintenance

10.3.1 Clean Up

If there is dust, dirt or cobwebs on the dissipater, remove them with a cloth.

10.3.2 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.

10.4 Conformity

10.4.1 Declaration of conformity

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

10.4.2 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

10.4.3 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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