



## AC50

Double PID atmosphere controller

### INSTALLATION AND INSTRUCTION MANUAL



code: 80495 - 05-2021



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# INTRODUCTION

## Warnings and safety

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Make sure that you always have the latest version of this manual, downloadable at no cost from SSI's website [www.supersystems.com](http://www.supersystems.com)

The devices described in this manual must be installed by trained personnel in conformity to current laws and regulations, following all of the instructions in this manual. Installers and/or maintenance personnel **MUST** read this manual and scrupulously follow all of the instructions contained herein and in the attachments.

SSI will not be liable for any damage/harm caused to persons and/or property, or to the device itself, if all of such instructions are not followed.

This manual must always be available to people who use or work on the devices described herein.

Before using the AC50 controller, the operator must be adequately instructed with regard to operating, emergency, diagnostics, and maintenance procedures.

If the AC50 controller is used in applications with risk of harm to persons or damage to machines or materials, auxiliary alarm devices must be installed.

It is advisable to provide the possibility, during normal operation, of checking whether any alarms have tripped.

**DO NOT** touch the terminals when the device is powered.

In case of supposed malfunction, and before contacting SSI Customer Service, we advise you to consult "Troubleshooting" in the Maintenance section.

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## Typographical conventions used in this manual

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Pay attention when you see these symbols in the manual.



Indicates very important information on correct product function or on safety, or an instruction that **MUST** be followed.



Indicates risk for the safety of the installer or user due to the presence of high voltage



Indicates a point to which the reader's attention is called



Indicates a suggestion that could be useful for better use of the device



Indicates a reference to other technical documents that can be downloaded from [www.supersystems.com](http://www.supersystems.com)

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## Glossary

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<b>4...20 mA</b>	Current used as signal transmitted by certain sensors or in a specific way to control a device, such as a motorized valve.	<b>Overshoot</b>	Situation in which PV exceeds SV because the control action stopped too late. The ON OFF controls have an overshoot greater than the PID controls.
<b>Alarm</b>	Output that trips when a certain condition is reached, for example, a defined temperature.	<b>PID</b>	Acronym for Proportional-Integration-Differentiation, indicating a system with negative feedback, i.e., a device that acquires a value from a process in input, compares it to a reference value, and uses the difference (error) to calculate the value of the controller output variable, which is the variable that controls the process. The output is controlled based on the current value of the error (proportional action), on a set of previous error values (integral action), and on the speed of change of the error value (derivative action).
<b>Auto Tune</b>	Function that lets you calculate and easily set the P, I and D parameters thanks to the controller's self-learning.	<b>Pt100</b>	A commonly used temperature measurement device. At 0°C its resistance is 100 ohm, and at room temperature about 106 ohm. The Pt100 can be tested for galvanic continuity and normal extension cables can be used.
<b>Hysteresis</b>	When, at a precise moment, the value of the controlled quantity depends not only on another reference quantity but also on the values that the controlled quantity had previously, there is hysteresis. Hysteresis can therefore be considered inertia that influences the control system, causing variable delays between the change of the reference quantity and the change of the controlled quantity.	<b>PV</b>	Acronym for Process Value, i.e., the value that the process variable (temperature, valve opening, etc.) has at that moment.
<b>ON-OFF</b>	Control procedure based on activation and deactivation of the output. For heating, the output stays on until PV is less than SV by a certain quantity (offset), and then stays off until PV is not greater than SV by the same quantity (or different quantity, depending on controller configuration). For cooling, the output stays on until PV > SV - offset and stays off until PV < SV + offset. This type of control is not intelligent, does not consider noise, and is not very accurate, but ensures a limited number of switchings of the output.	<b>Solid state relay</b>	Also known as SSR, this is a relay designed specifically for frequent switching. It has no moving parts or mechanical contacts, but may still break or short circuit. This type of relay is often used in temperature control systems such as PID.
		<b>Sensor</b>	Device that translates physical phenomena (such as change in resistance based on temperature) into electrical signals that can be acquired and processed by the controller.
		<b>Setpoint</b>	Set value (see SV).

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<b>SV</b>	Acronym for Set Value, i.e., the value that the process variable (temperature, valve opening, etc.) has to reach and maintain.	<b>Control output</b>	Output that controls the process and is switched on and off as needed.
<b>Thermocouple</b>	Sensor that transmits an electrical signal of a few millivolts. Cannot be tested for galvanic continuity. It needs specially designed extension cable.		
<b>Undershoot</b>	Situation in which PV does not reach SV because the control action stopped too soon. The ON OFF controls have an undershoot greater than the PID controls.		

## Disclaimer

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Although all of the information in this manual has been carefully checked, SSi assumes no liability regarding the presence of any errors or regarding damage to property and/or harm to individuals due to any improper use of this manual.

SSi also reserves the right to change the contents and form of this manual, as well as the characteristics of the devices described herein, at any time and without notice

The technical data and performance levels specified in this manual are to be considered a guide for the user in order to determine the device's suitability for a defined use, and do not constitute a guarantee. They may be the result of test conditions at SSi., and the user must compare them to his/her real application requirements.

Under no circumstances will SSi be liable for any damage to property and/or harm to individuals due to tampering, incorrect or improper use, or use not conforming to the characteristics of the controller and to the instructions contained in this manual.

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# 1. GENERAL DESCRIPTION

## 1.1. Profile



### Operator Interface

Large backlit LCD screen with high visibility and high contrast. Two to three rows on the screen display variables, setpoints and alphanumerical information, scrolling up to 75 configurable messages of 32 characters each in three different languages. The selection of languages and easily comprehensible scrolling texts regarding diagnostics, alarms, and process statuses ensure that the controllers speak the users' language.

### Control

One or two PID control loops with two universal inputs configurable for thermocouples, thermoresistances and linear inputs. The first PID can control enrichment atmospheres for carbon-cementing applications. They may be used independently to manage two different forms of control or they may interact with cascade or ratio control. The third linear analogue input can acquire the voltage signal from the zirconium oxide oxygen probe.

The controller is also equipped with advanced functions for the management and diagnostics of zirconium oxide oxygen probes.

If the appropriate four-point calibration is performed in the field, the controller meets the requirements of standard AMS2750 series and may be used in applications requiring the NADCAP directive.

### Easy Configuration

Set-up wizard for manual-free programming with only a few indispensable parameters, commented by online help messages. Opportunity to create your own password-protected "User menu" containing only the parameters required for the application.

Advanced set-up and work recipe creation can be achieved via PC and SuperSET software, even without powering the controllers. SuperSET may be used to define, for each menu and parameter, which values will be shown to the controller to ensure easy use in the field.

Controllers can still be configured directly in the field using only four keys, associated with led lights that provide feedback when a button is pressed and guide the user by indicating the appropriate operations. Factory settings can be restored if necessary, either on the keyboard or using the SuperSET software tool. Diagnostics, preventive maintenance and consumption monitoring.

Exhaustive diagnostics for breakage or incorrect connection of probes, total or partial load breakdown, off-scale variables and anomalies in the control ring. Counters for the number of relay and comparator switches, with alarm thresholds, permit scheduling of preventive maintenance to replace worn actuators. Two internal energy counters with alarms for anomalous variations count total energy consumption in kWh and its cost, permitting ongoing energy monitoring.

### Diagnostics, preventive maintenance and consumption monitoring.

Exhaustive diagnostics in the event of breakage or incorrect connection of probes, total or partial breakage of the load, off-scale variables and anomalies in the adjustment ring. Relay switch counters and comparators with alarm signals permit planning of preventive maintenance work for replacement of worn actuators. Two internal energy counters with alarms for signalling anomalous variations totalise energy consumption in kWh and its cost, permitting uninterrupted energy monitoring.

Automatic Purge and Burnoff cycle management of Zirconium oxide probes for carbon-cementing applications.

### Tuning

Advanced tuning algorithms refined over time guarantee stable, accurate control even with critical or very rapid thermal systems, automatically activated when necessary.

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## Connectivity

The AC50 controller has three different levels of communication with automation and supervision devices:

- RS485 Modbus RTU slave serial communication for interface with Master Modbus
- RS485 Modbus RTU master serial communication for reading/writing information toward Modbus slave devices such as power controllers or other controllers
- RJ45 Ethernet Modbus TCP port, which can also be used as a bridge toward Modbus RTU slave devices.

Using SuperSET software, a connection can be made via Ethernet.

## General features

Carbon Controller controllers are entirely configurable using the software and keyboard, without accessing their internal electronics, but the controller can be replaced at any time by simply pulling it out from the front, with no further operations, maintaining IP65 protection for the front.

## Main features

- Accuracy 0.1%, AMS2750 series compliance
- Sampling time 60ms
- Operator interface with large LCD display and three configurable bar graphs
- Diagnostic scroll messages, configurable, in the selected language
- Easy setup, wizard, copy/paste parameters even without power
- Preventive maintenance, with energy counters (kWh) and load switching
- Timers and algorithms to control motorised valves
- Advanced control parameter tuning
- Differentiated password levels
- 2 universal inputs configurable for thermocouples, thermoresistances, linear inputs
- 3rd linear input for Zirconium oxide oxygen probe
- 2 PID control loops
- Relay, logic, isolated analogue outputs
- Up to two TA inputs for interrupted load diagnostics
- Modbus RTU Master and Slave communication
- Ethernet Modbus TCP and Modbus bridge communication
- Weekly clock\calendar with RTC
- Extractable from the front for immediate replacement

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## 1.2. AC50 Controller

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Dimensions 96 × 96 × 80 mm (1/4 DIN)

### Main features

- Operator interface with large LCD Display and three configurable bargraphs
- Scrolling diagnostics messages, configurable, in the selected language
- Easy, guided configuration, copy/paste parameters even with power off
- Advanced tuning of control parameters
- Different password levels
- 2 configurable universal inputs for Thermocouples, Resistance Thermometers, Linear inputs
- 1 configurable linear analogue input for Zirconium oxide oxygen probe
- 2 PID control loops
- Relay, logic, isolated analog outputs
- RS485 serial communication in Modbus RTU slave
- RS485 serial communication in Modbus RTU master for reading/writing information to Modbus slave devices
- Ethernet Modbus TCP communication in Slave mode
- Web server for browser access to web pages residing in the device, for monitoring and setting parameters
- Bridge function for creation of Modbus RTU 485 sub-network
- Removable faceplate for immediate replacement
- Accuracy 0,1%, sampling time 60 ms



### 1.2.1. Display and keys



1	unit of measurement
2	state of outputs OUT1 OUT2 OUT3 OUT4
3	controller function states: * man = manual/automatic (off=automatic control, on = manual control); * rem = remote setpoint enabled
4	selects auto or manual control from the home screen. pressing the key returns you to the previous menu item or to the higher menu level, as appropriate. hold for 2 seconds to return to the main menu
5	navigate through user menu
6	probe test and burnoff key
7	up / down key
8	hold for more than 2 seconds to enter the configuration menus. navigates among controller menus and parameters, confirms parameter value, and selects next parameter
9	key pressed signals
10	displays percentage of power output
11	display of percentage of process variable and of setpoint
12	parameters, diagnostics and alarm messages.
13	sv display: parameter values. configurable with parameter ds.sp (default = setpoint).
14	pv display = process variable

1.2.2. Drilling dimensions and templates

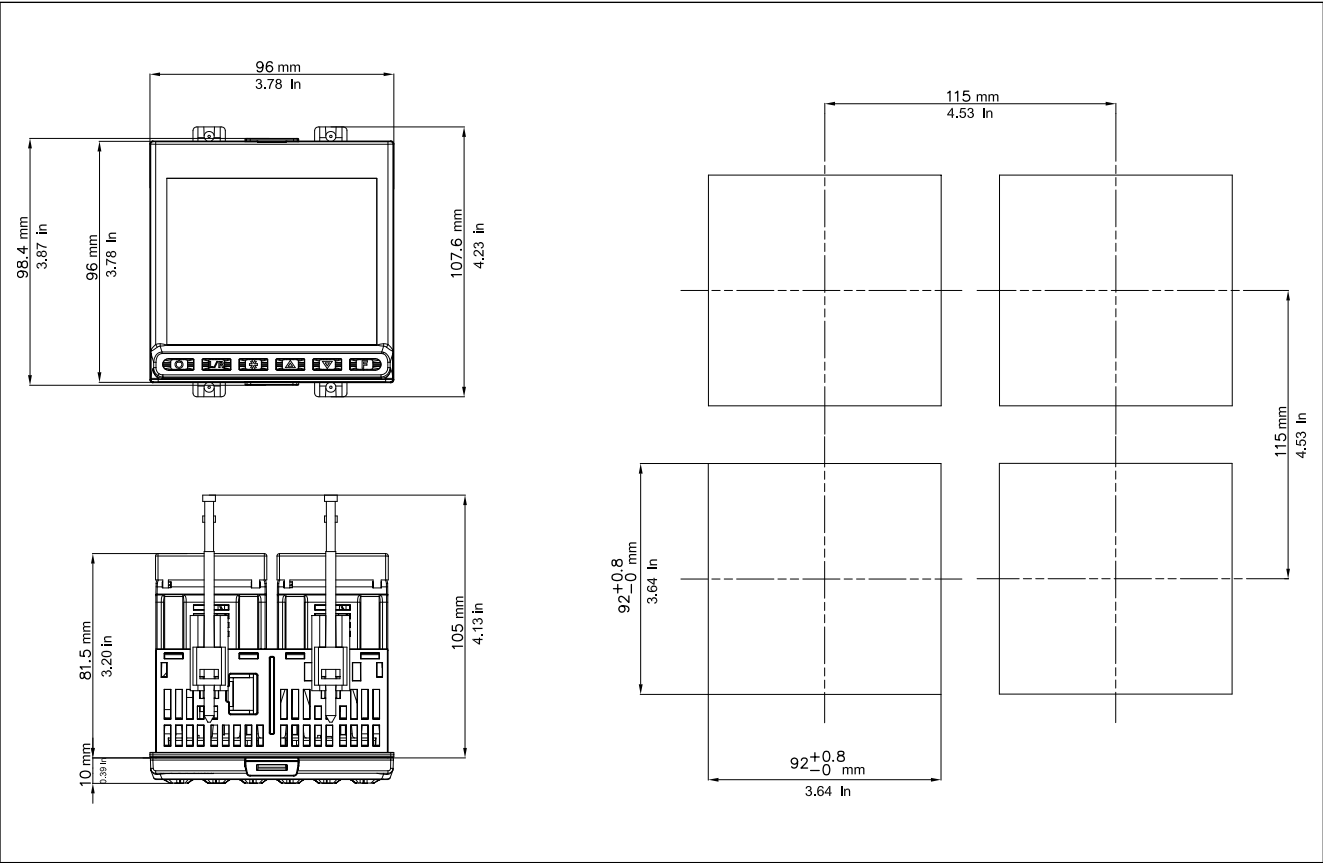


Figure 1 - AC50 drilling dimensions and templates

## 2. INSTALLATION



**Attention!** The devices described in this manual must be installed by trained personnel in conformity to current laws and regulations, following all of the instructions in this manual.

Before installing, check that the controller is in perfect condition and was not damaged in shipment. Make sure that the package contains all of the accessories listed on the accompanying document, especially the gasket and the fastening brackets.



**Attention!** If even one of the requirements mentioned above (trained technician in, device in perfect condition, correct configuration) is not satisfied, interrupt the installation and contact your SSi dealer or SSi Customer Service.

### 2.1. Mounting the controller

#### 2.1.1. General installation rules

The controller is designed for permanent indoor installation. It must be mounted on electrical panels or on panels controlling machines or production process plants that are able to protect the exposed terminals on the rear of the controller.

**Attention!** DO NOT install the controller in a potentially inflammable or explosive atmosphere. It can be connected to elements that work in such atmospheres only by means of appropriate interfaces that conform to safety regulations in force in the country of installation.



**Attention!** the controller is used in applications with risk of harm/damage to persons/property, it **MUST** be connected to dedicated alarm devices.

It is advisable to provide the possibility, during normal functioning of the controller and of the system or equipment that it controls, of checking whether any alarms have tripped.

The controller must be installed in a location that is not subject to sudden temperature changes or to freezing or condensation, and no corrosive gases must be present.

The controller can work in Pollution Degree 2 environments (presence of non-conductive dust, only temporarily conductive due to possible condensation).

Do not allow scrap or metal particles from machining or condensation products to reach the device.

The controller is sensitive to strong electromagnetic fields. Do not position it near radio devices or other equipment that may generate electromagnetic fields, such as power contactors, relays, thyristor power units (especially phase angle), motors, solenoids, transformers, high-frequency welders, etc.

#### 2.1.2. Drilling dimensions

For correct installation, respect the dimensions of each hole and the distance between adjacent holes shown in the figure “AC50 drilling dimensions and templates.”)



**Attention!** The support on which the operator panel is mounted must:

- be sufficiently rigid and robust to support the device without bending during use;
- be from 1 to 4 mm thick to allow the device to be fastened with the supplied bracket.

#### 2.1.3 Protection against infiltration of dust and water

The front of the controller has an IP65 protection index, so the device can be installed without problems in rooms that are very dusty or subject to splashing water provided:

- the housing in which the device is inserted is dust-tight and watertight;
- the support on which the device is installed is perfectly smooth and without undulations on the front;
- the hole on the support scrupulously respects the specified drilling dimensions;
- the device is fully tightened to the support to ensure that the gasket inserted between the device and the panel is watertight



**Attention!** If not adequately protected, the controller has an IP20 protection index (rear container and terminal board).

### 2.1.4 Vibrations

The controller can support vibrations from 10 to 150 Hz, 20 m/s<sup>2</sup> (2 g), in all directions (X, Y and Z).

If the device is mounted on a support that exceeds these limits, it is advisable to provide a suspension system to reduce vibrations.

### 2.1.5 Minimum space for ventilation

The temperature in the housing containing the controller must NEVER exceed 55°C.

NEVER block the ventilation slits.



**Advice.** The lower the temperature in which the device works, the longer the life of its electronic components.



**Attention!** Forced cooling (for example, with a fan) of the rear of the controller may cause measurement errors.

### 2.1.6 Positioning

The controller must be positioned so that the display is not subject to direct sunlight or to very strong sources of light. If necessary, filter direct light, for example, with a reflective screen.

The controller must be tilted between 30° and 120°, as shown in the figure.

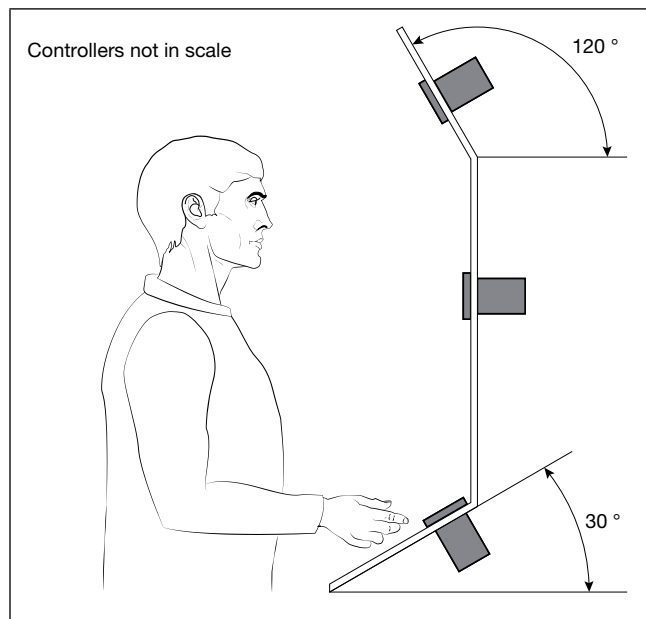


Figure 3 - Positioning the controller

### 2.1.7 Fastening to the panel

1. Insert the die-cut rubber gasket between the controller and the panel. The gasket (supplied) is indispensable for ensuring the declared protection index of the faceplate.
2. Insert the device into the hole previously made on the panel.
3. Place the supplied bracket(s) onto the rear of the controller.
4. Tighten the screws to fasten the device to the panel. The tightening torque must be between 0,3 and 0,4 N m.

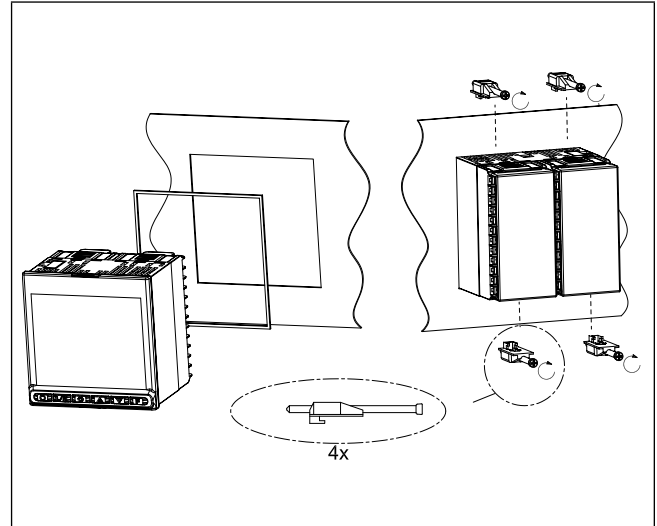


Figure 2 - Fastening the AC50

## 2.2. Connections



**Attention!** Failure to follow the instructions in this section may cause problems in electrical safety and electromagnetic compatibility, in addition to voiding the warranty.

### 2.2.1 General rules for connections

1. Connected external circuits must have double isolation.
2. In case of shielded cables, the shield must be grounded at a single point, possibly near the controller.
3. Input cables must be physically separated from power cables, output cables, and power connections.
4. Do not connect unused terminals.
5. Tighten the terminals without forcing. Loose terminals may cause sparks and fires.  
The recommended tightening torque is 0.5 Nm.
6. When making connections, respect polarity where required.
7. Do not bend or twist the cables beyond the limits specified by the manufacturers.
8. After connecting the cables, apply the transparent cover to protect the terminals.  
The terminal teeth limit and define the correct direction for applying the cover.

### 2.2.2 Electromagnetic compatibility (EMC)

For electromagnetic conformity, the strictest general rules have been applied, using the following test configuration:

Connection	Cable section	Length
Power supply	1 mm <sup>2</sup>	1 m
Relay	1 mm <sup>2</sup>	3,5 m
Serial port	0,35 mm <sup>2</sup>	3,5 m
Thermocouple	0,8 mm <sup>2</sup>	5 m compensated
Potentiometer, linear, "PT100" resistance thermometer	1 mm <sup>2</sup>	3 m
Analog retransmission output	1 mm <sup>2</sup>	3,5 m
Digital input/outputs	1 mm <sup>2</sup>	3,5 m
Ethernet port	UTP 4x2xAWG24 cat 6	4 m

### 2.2.3 Cables

Always use cables appropriate for the voltage and current limits specified in the Technical Characteristics.




Use copper cables with 60/75°C insulation.

Use twisted and shielded cables for non-power connections.

The controller's terminal board has screw terminals (M3) that accept stripped cables and crimped terminals for a tightening torque of 0.5 N m.

Two ring or crimped fork terminals can be connected on each terminal

The following table shows the characteristics of the cables and terminals that can be used.

Cable / terminal	Cable / terminal section	Terminal size
Rigid cable	0,8...2,5 mm <sup>2</sup> (18...14 AWG)	
Twisted	0,8...2,5 mm <sup>2</sup> (18...14 AWG)	
 Tag terminal (to be crimped)	0,25...2,5 mm <sup>2</sup> (23...14 AWG)	
 Fork terminal (to be crimped)		5,8 mm max
 Ring terminal (to be crimped)		5,8 mm max



**Attention!** Anchor the cables, at least in pairs, so that mechanical stresses do not discharge on the terminal connections.

### 2.2.4 Power supply



**Attention!** Before powering the controller, make sure that the supply voltage matches the one shown on the controller data plate.

Because the controller does not have a switch, a bipolar switch with fuse must be inserted upline. The switch, or isolator, must be positioned in the immediate vicinity of the device and must be easily reached by the operator. A single switch can control multiple controllers.

The controller must be powered by a line separated from the one used for electromechanical power devices (relays, contactors, solenoids, etc).

It is advisable to install a ferrite core on the power line, as close as possible to the device, to limit the controller's susceptibility to electromagnetic noise.

If the controller's power line is heavily disturbed by the switching of thyristor power units or by motors, it is advisable to use an isolation transformer only for the controller, grounding the shield.

Use appropriate line filters in the vicinity of high-frequency generators or arc welders.

Use a voltage stabilizer if there are wide shifts in line voltage.



**Attention!** Make sure the ground connection is efficient. Absent or inefficient grounding can make the device unstable due to excessive noise. Specifically, check that:

- voltage between mass and ground is  $< 1\text{ V}$ ;
- resistance is  $< 6\ \Omega$



**Attention!** If the controller is connected to devices that are NOT electrically isolated (such as thermocouples), ground with a specific conductor to prevent grounding directly through the machine structure.

## 2.2.5 Connecting inputs and outputs

The controller's input and output lines must be separated from the power line.

To prevent noise, the controller's input and output cables must be kept away from the power cables (high voltages or high currents).

The input and output cables and the power cables must not be placed parallel to one another.

Use shielded cables or separate cable trays.

To connect the output to an inductive load (relay, contactor, electrovalve, motor, fan, solenoid, etc.) that works in AC, mount a snubber, i.e., an RC group (resistor and condenser in series) placed parallel to the load. Installing this filter lengthens the life of the relays.

NOTE: All condensers must conform to VDE (class X2) standards and support voltage  $\geq 220\text{ VAC}$ .  
The power of the resistor must be  $\geq 2\text{ W}$ .

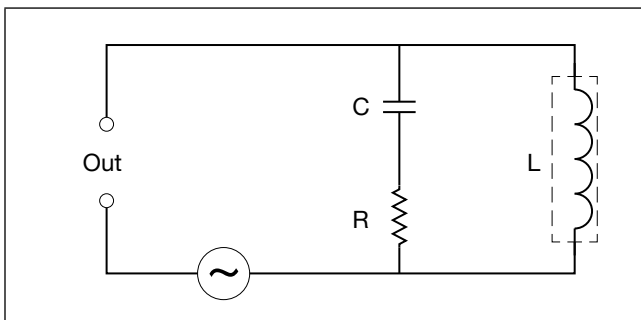


Figure 4 - Snubber connection diagram (AC)

For inductive loads that work in DC, mount a 1N4007 diode parallel to the coil.

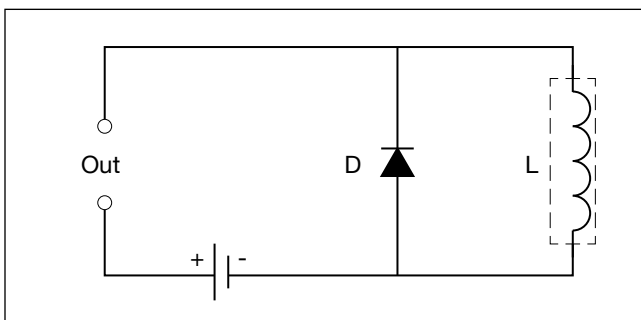
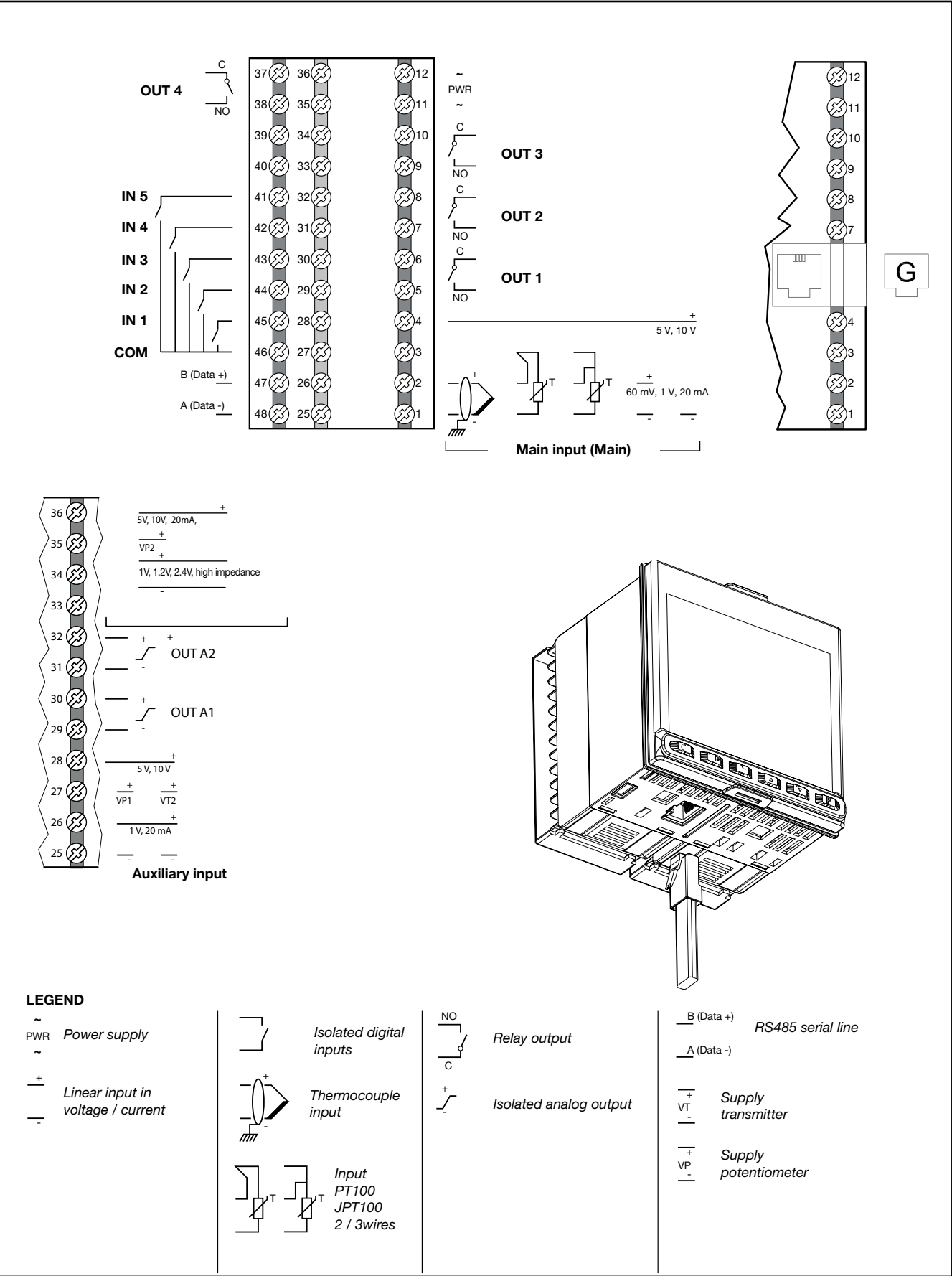


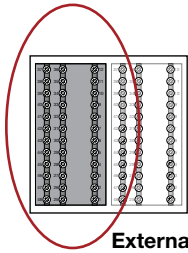
Figure 5 - Snubber connection diagram (DC)

The filters must be connected as close as possible to the controller.

2.3. AC50 connection diagrams

2.3.1. General diagram

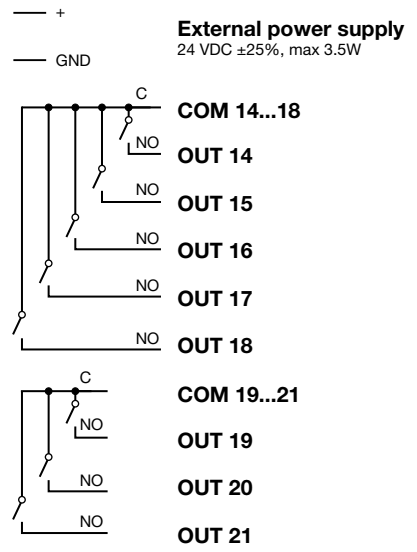
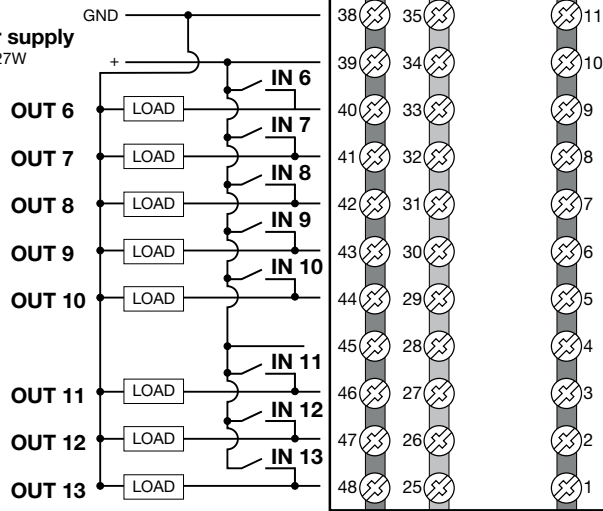




## 8 (PNP) digital Inputs/Outputs

## 8 Relays

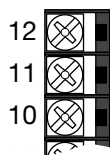
**External power supply**  
24 VDC  $\pm 25\%$ , max 27W





## 2.3.2 Power supply

### Power supply

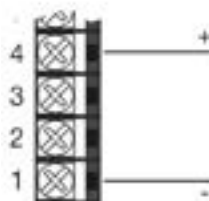


~  
~  
~  
PWR

Standard:  
100...240 VAC/VDC  $\pm$  10%  
50/60 Hz, max 12W



### Linear input (V)

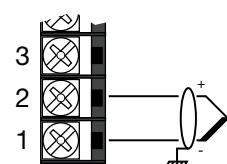


Linear input in direct voltage  
0...5 V / 0...10 V  $R_i > 400k\Omega$



## 2.3.2. Main input (MAIN)

### Input TC



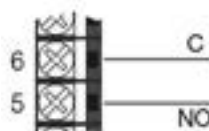
Available thermocouples:  
J, K, R, S, T, C, D, B, E, L,  
L-GOST, U, G, N,  
Pt20Rh-Pt40Rh  
ITS90 or custom linearization

Respect polarity  
For extensions, use a  
compensated cable



## 2.3.4 Output

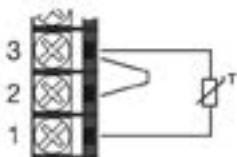
### Output Out 1 - relay 5 A



Relay 250 VAC, 5 A



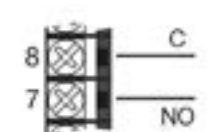
### Input PT100/JPT100 - -2 wires connection



**Attention:**  
with this type of connection the  
line resistance can introduce  
measurement error, we recommend  
that you use wires of adequate.



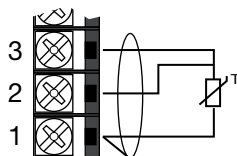
### Output Out 2 - relay 5 A



Relay 250 VAC, 5 A



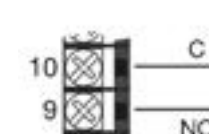
### Input PT100/JPT100 - 3 -wires connection



**Attention:**  
with this type of connection the  
line resistance can introduce  
measurement error, we recommend  
that you use wires of adequate.  
The resistance of the three wires  
must be equal, the line resistance  
must be less than 20 ohm.



### Output Out 3 - relay 5 A



Relay 250 VAC, 5 A



### Linear input (V, I)

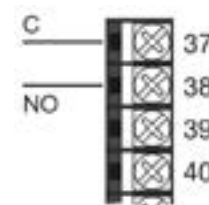


Linear input in direct voltage  
0...60 mV  $R_i > 100M\Omega$   
0...1 V  $R_i > 100M\Omega$

Linear input in direct current  
0/4...20mA,  $R_i = 50 \Omega$



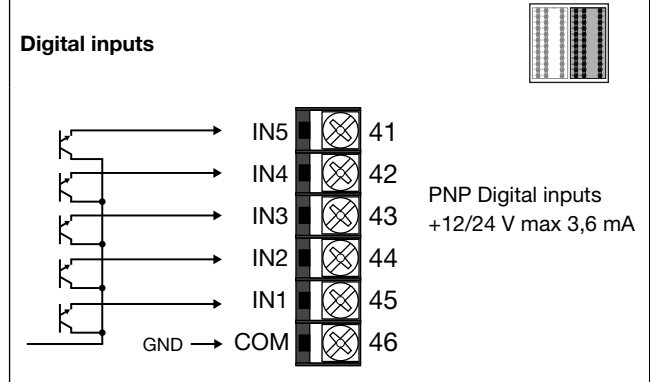
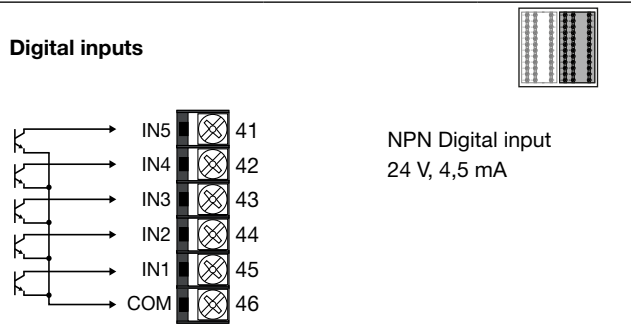
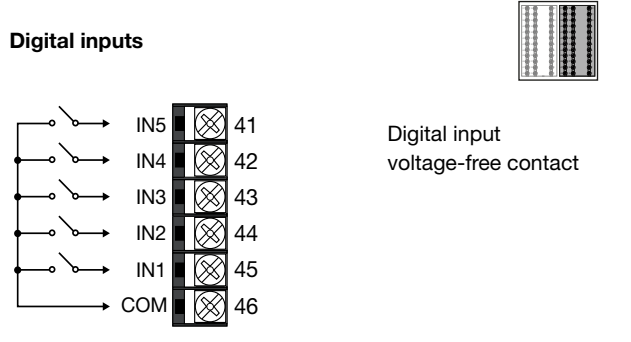
### Output Out 4 - relay 5 A



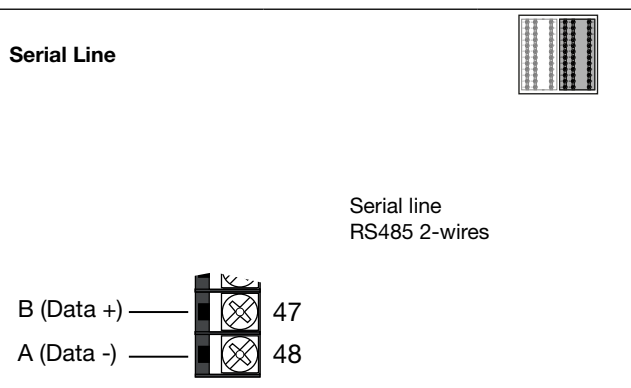
Relay 250 VAC, 5 A



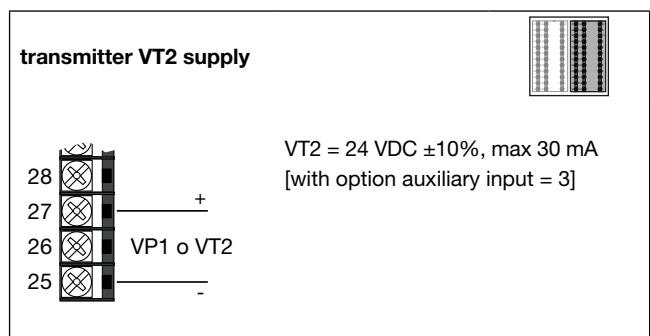
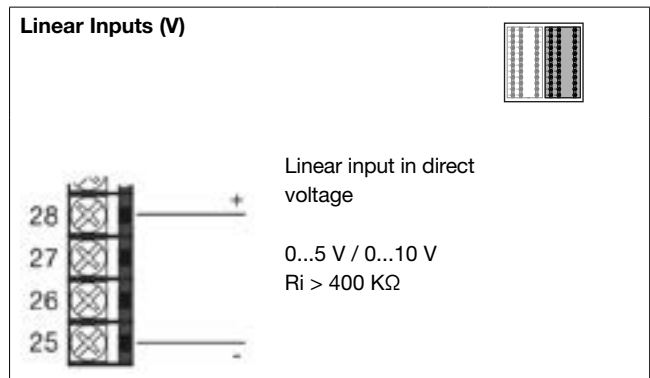
### 2.3.5 Digital inputs



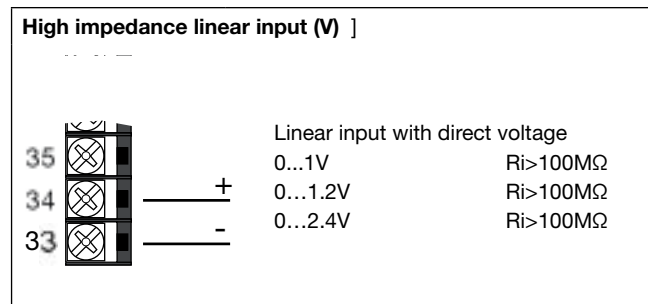
### 2.3.6 Serial line



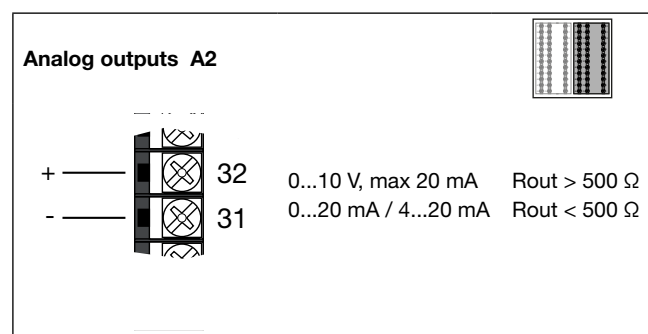
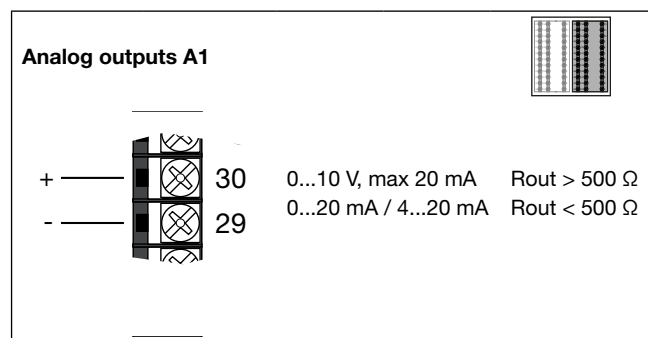
### 2.3.7 Auxiliary input (AUX1)



## 2.3.8 THIRD ANALOGUE INPUT (AUX2)

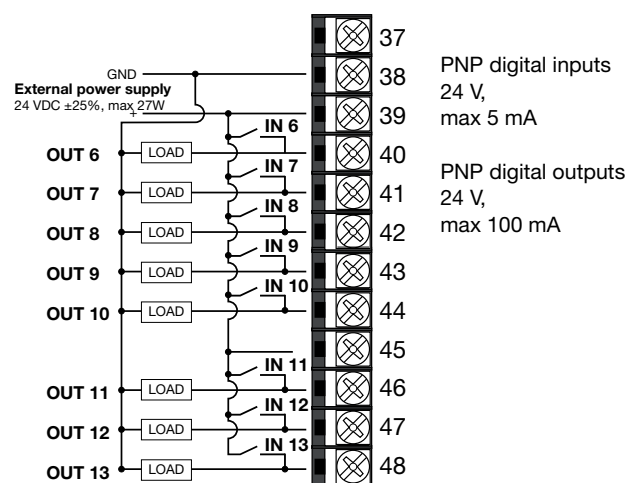


## 2.3.9 Analog outputs

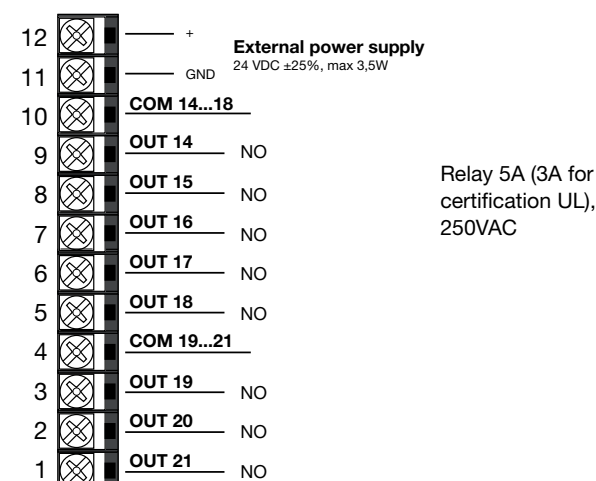


## 2.3.10 Connections with optional I/O

### 8 Inputs / Digital outputs (PNP)

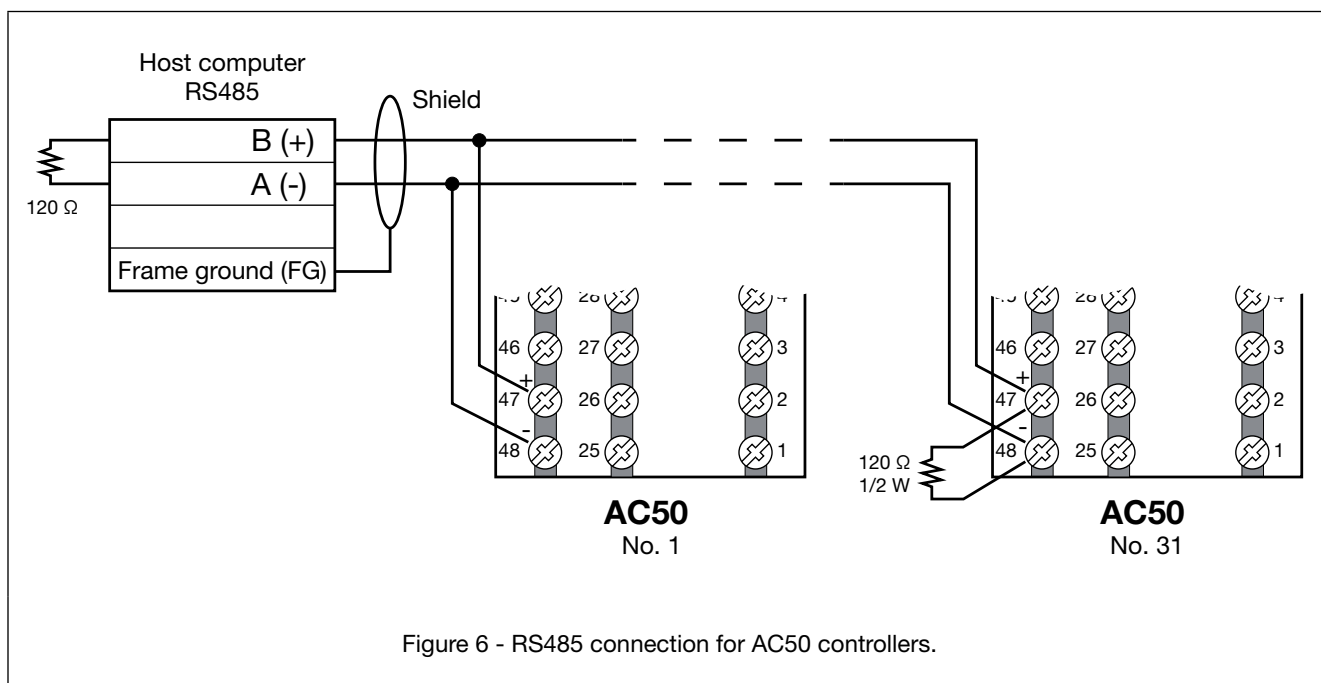


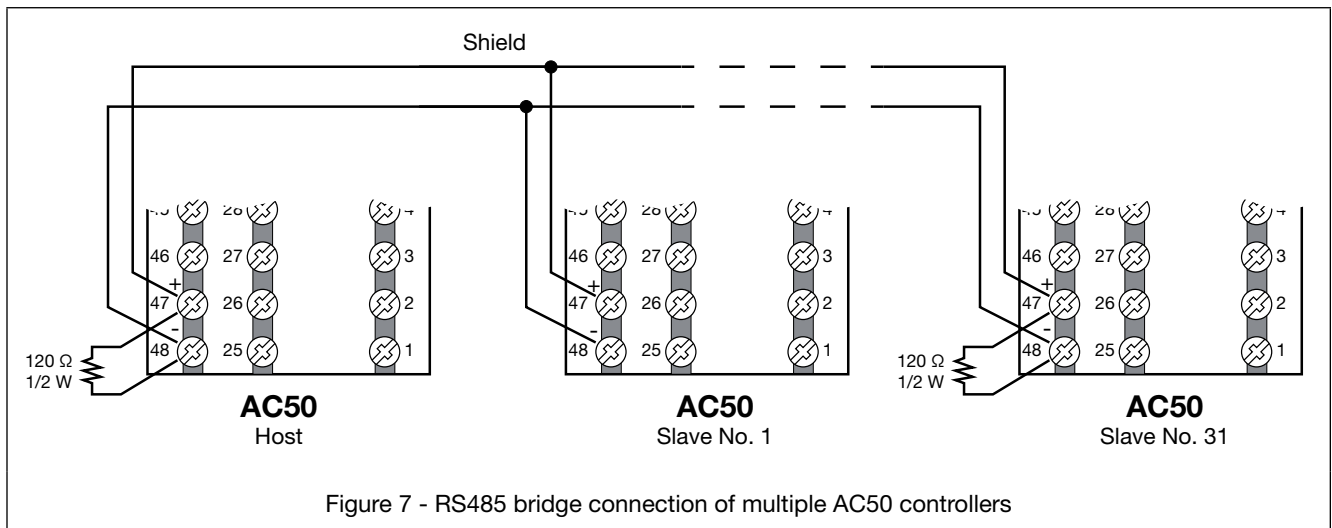
### 8 Relay



## 2.4. Serial RS485 Wiring Diagram

Up to 31 controllers may be connected in parallel on physical line RS485. The line must be terminated with a resistor (120  $\Omega$ , 1/2 W) at each end. The AC50 requires 120 Ohm termination outside the instrument





## 2.5. Ethernet port wiring diagram

The AC50 is equipped with an Ethernet 10/100BaseT port with direct connection via RJ45 connector.

For this connection, use a type UTP cable of category 5 or greater, crimped with a standard non-shielded RJ45 connector.

The instrument automatically recognises the polarity of the cable used, and so you may use either a straight or a cross cable equally well for point-to-point connections with a PC or to a switch.

The maximum connection length supported is 100m, according to standard IEEE 802.3u; if segments longer than 100

m are required, insert signal repeaters (switches) to break up the network.

Connector RJ45 has two signal and diagnostics LEDs:

- Amber LED: when steady on, indicates the presence of the signal carrier (link)
- Green LED: when flashing, indicates data exchange underway on port (activity).

## 3. COMMISSIONING

### 3.1. Information on displays and use of keys

#### 3.1.1 Navigating the menus

5 keys are used for navigating the menus and submenus and for changing parameters and confirming choices. Their function depends on the context and on how long they are pressed.



The LEDs above the keys not only give confirmation that each key has been pressed (by flashing), but also show which keys can be used in each situation.

The navigation functions assigned to the keys are:

**FUN**

Scrolls the user menu. Each time you press the key, the value of the displayed parameter is confirmed and you go to the next menu item.

**A/M**

Each time you press the key, you return to the previous menu item or to the higher menu level, as appropriate. Keep the key pressed for more than 2 seconds to return to the Main menu.

**MEN**

Scrolls through the programming/configuration menu's. Press and hold for 2 seconds or more to see the password protected configuration menu's. Each time you press the key, the value of the displayed parameter is confirmed and you go to the next menu item.



Press the key to enter a submenu or to reduce the value of the displayed parameter, as appropriate. Keep the key pressed to progressively increase the speed of reduction of the displayed parameter.



Press the key to raise the value of the displayed parameter. Keep the key pressed to progressively increase the speed of raising the displayed parameter.

When the process variable is displayed, in standard configuration the key **A/M** switches the controller function mode (manual/automatics).

#### 3.1.2 Displays

The controllers have 2 or 3 displays, depending on the model. The Main menu shows:

- PV display: value of process variable.
- SV display: value of parameter (default = setpoint, if parameter dS.SP = SETP).
- F Display: value of control output (if parameter dS.F = OUT.P).

According to the situation (programming, alarm, etc.), the controller displays can show other information, such as the name of the parameter, description of the parameter, diagnostics messages and alarm messages..



**Attention!** The displays show only the parameters and menus for a defined configuration.

##### 3.1.2.1 Display characters

The displays reproduce the various characters by combining 7 or 14 segments. The following tables show the shape of the various characters.

	!	"	#	\$	%	&	'	(	)
	⌈	⌈⌈	⌈⌈⌈	⌈⌈⌈⌈	⌈⌈⌈⌈⌈	⌈⌈⌈⌈⌈⌈	⌈⌈⌈⌈⌈⌈⌈	⌈⌈⌈⌈⌈⌈⌈⌈	⌈⌈⌈⌈⌈⌈⌈⌈⌈
*	+	,	-	.	/	0	1	2	3
✱	†	/	--	--	/	0	1	2	3
4	5	6	7	8	9	:	:	<	=
4	5	6	7	8	9	-	-	<	=
>	?	@	A	B	C	D	E	F	G
>	?	@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O	P	Q
H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z	[
R	S	T	U	V	W	X	Y	Z	[
\	]	^	-	`	a	b	c	d	e
\	]	^	-	`	a	b	c	d	e
f	g	h	i	j	k	l	m	n	o
f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y
p	q	r	s	t	u	v	w	x	y
z		~							
z		~							

Figure 8 - 14-segment font

	!	"	#	\$	%	&	'	(	)
*	+	,	-	.	/	0	1	2	3
4	5	6	7	8	9	:	;	<	=
>	?	@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z	[

Figure 9 - 7-segment font

### 3.1.1.2 Scrolling messages

The F display can show scrolling alphanumeric messages. These messages, up to 32 characters in length, appear:

- during configuration, describing the active parameter;
- during functioning, after the tripping of alarms, digital inputs and logic function outputs, if the relative messages were enabled

Message texts can be set via PC with SuperSET software.

There are 3 message groups, one for each of the 3 languages LAnG provided, selectable from the HMI menu with the parameter.

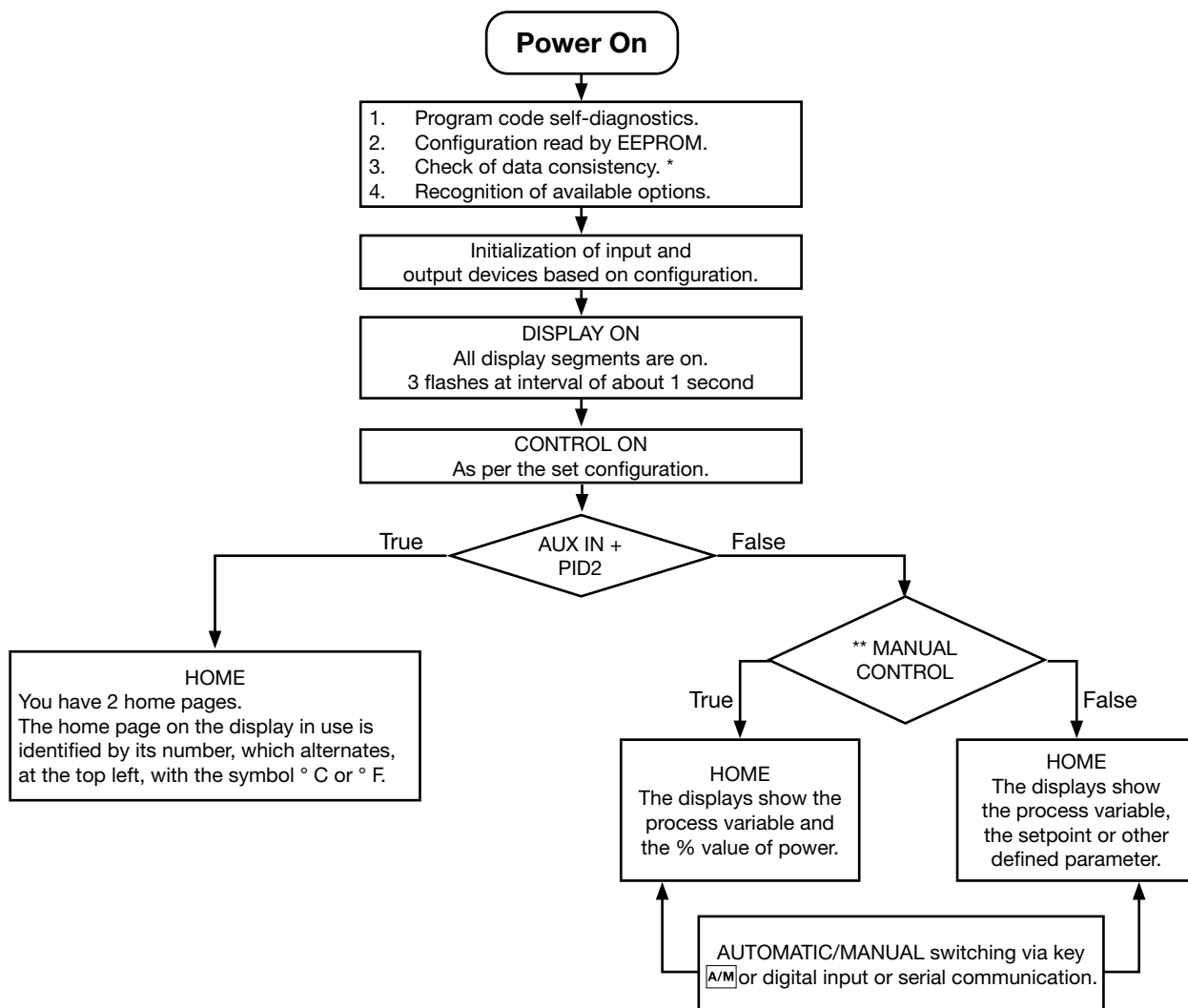
Each group contains up to 25 messages.

By setting LAnG=NONE the subdivision of the three groups is lost, obtaining up to 75 messages settability

## 3.2. Sequence at power-on

The following diagram shows the controller sequence at power-on.

**Note:** the USB-TTL programming cable must be disconnected.



(\*) Any error is signaled by the message EEPROM CHECKSUM ERROR.

(\*\*) Only if MANUAL mode was used before the controller was powered off.

---

## 4. CONFIGURATION

The fast configuration described in the previous chapter lets you rapidly put the controller into operation. To do this, the procedure configures the controller's main parameters only, which satisfies the most common application requirements.

On the other hand, to satisfy all application requirements and to configure the controller in detail, you have to set the parameters that are accessible only on the Programming/Configuration menu.

This type of configuration is also useful for common applications (the ones covered by fast configuration),

because optimum controller function depends a great deal on correct configuration and programming of the control parameters provided.

The controller can be configured with the buttons on its panel and from the PC with SuperSET software (see chapter "6. PROGRAMMING WITH PC").

### 4.1. Programming/Configuration Menu

#### 4.1.1 First: know what you're doing

Correctly setting the parameters needed to configure the controller requires thorough knowledge of the problems and techniques involved.

If you are unsure of your know-how, or are not fully aware of the consequences of incorrectly setting the parameters, we advise you not to configure the controller with this menu.



**Attention!** To prevent harm to persons and damage to property, the user must check that the parameters are correctly set before commissioning the controller.

In case of doubts, or if you need any explanations, please consult [www.Supersystems.com](http://www.Supersystems.com) or contact SSI Customer Care.

#### 4.1.2 Passwords

The configuration menu is protected by 3 passwords that allow access to three different menu sections.

The first section, accessed with PASSQ 1, groups the most operative submenus and parameters, i.e., the ones most involved in daily functioning of the controlled machine or system.

The second and third sections, accessed with passwords 2 and 3, groups the submenus and parameters used to configure HW resources

The factory password settings are:

- PASSQ = 5
- Password 1 = 5
- Password 2 = 5

The passwords can be changed and even disabled if you want. See "PASC1 - Setting level 1 password" and "PASC2 - Setting level 2 password".

#### 4.1.3 Password in the User Menu

Two passwords can be entered in the User menu, respectively:

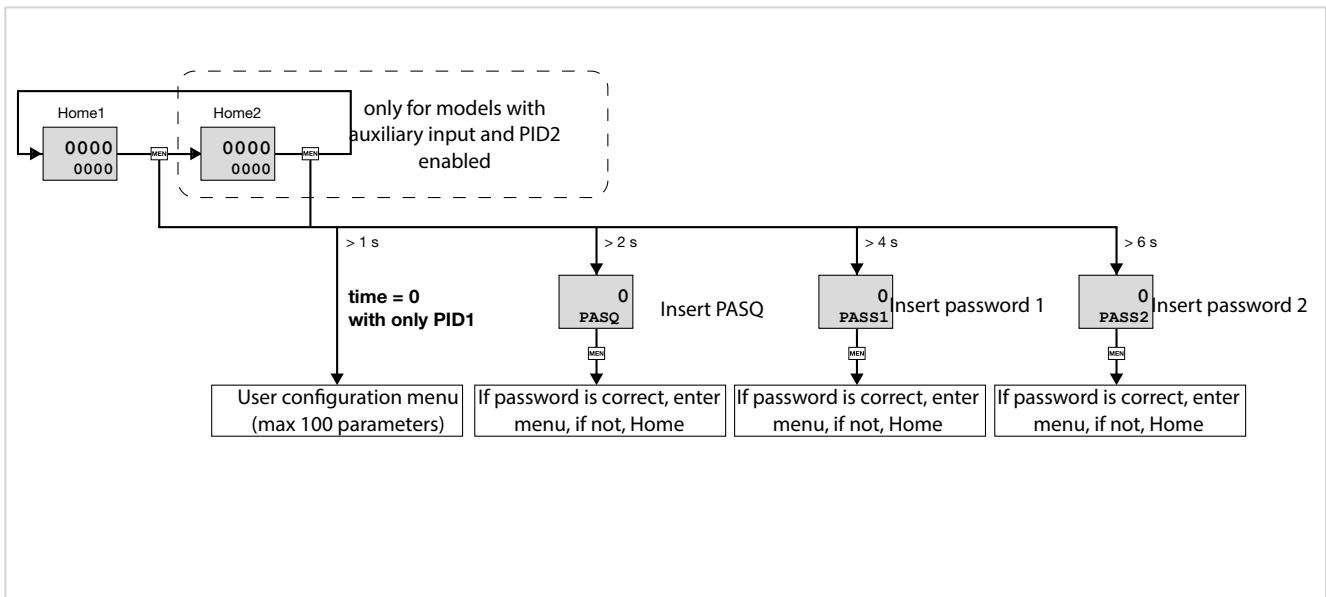
- Password 0 (default = 5 See "PASC0 - Setting level password 0" )
- Password 1 to inhibit navigation to parameters in positions subsequent to that assigned to the password.

Once one of the two passwords is reached:

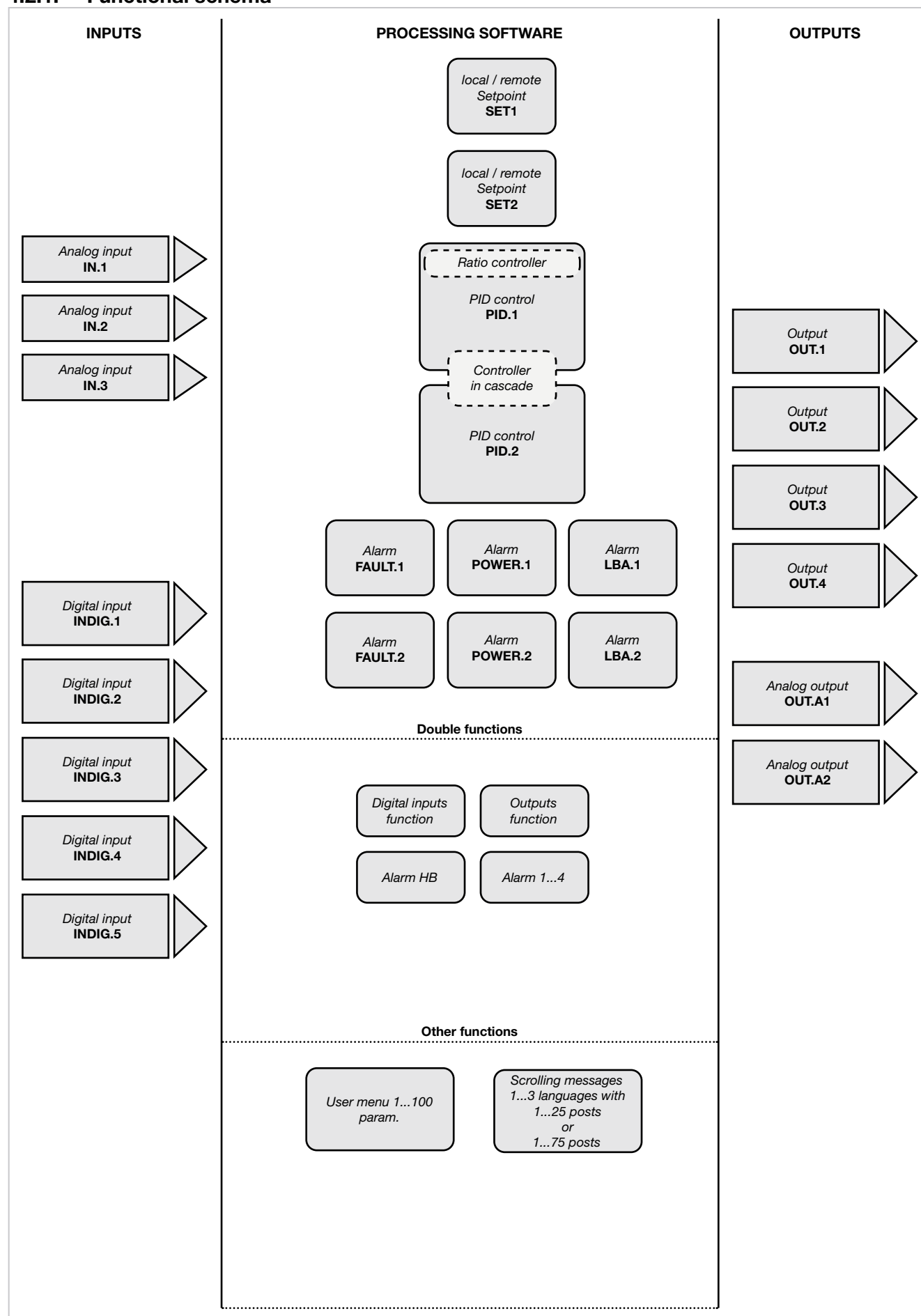
- if the value entered matches the value expected, navigation continues in the User Menu
- if the value entered does not match the value expected, the Home screen will be displayed



## 4.2. Main menu



## 4.2.1. Functional schema



## 4.3. Legend for submenus and parameters

The purposes and characteristics of submenus and parameters are described and summarized in the following tables.

### 4.3.1. Submenu

Acronym	Scrolling message	Password	Description
INFO	INSTRUMENT STATUS	Level 1	Gives information on controller state and HW configuration

1 2 3 4

1. Acronym of submenu as it appears on controller display.
2. Text of scrolling message as it appears on controller display.
1. Password needed to access submenu items.
2. Description of functions that manage submenu..

### 4.3.2. Parameter

Acronym	Scrolling message	Submenu	Attributes
Out1	OUTPUT TYPE	INFO	R
<p>• The parameter specifies the type of output 1.</p> <p>• Unit of measurement: -</p> <p>• Options: RELAY = Relay output DIGIT = Logic output 24 V CONTS = Continuous output</p>			

1 2 3 4 5 6 7 8 9

1. Acronym of parameter as it appears on controller display.
2. Text of scrolling message as it appears on controller display.
3. Submenu to which parameter belongs.
4. Attributes of parameter: R = readable, W = writable. If only R, the operator or technician can read the parameter value but cannot change it.
5. Description of use of parameter, including any warnings or suggestions.
6. Unit of measurement of value managed by parameter. The unit of measurement can be unique or depend on other configuration choices, for example, the unit of measurement of temperature, which can be set in degrees Centigrade or Fahrenheit. Not all parameters require the use of units of measurement.
7. Description of parameter values or information that can be read or written, as appropriate.
8. Value that the parameter can have. Value can be two types: discrete or pertaining to an interval of values, typically numerical. For a discrete value, all possible values are listed as they appear on the controller display. For intervals of values, the minimum and maximum parameter values are shown.
9. Any additional description of value of individual parameter.

## 4.4. Submenu INFO - Information display

Acronym	Scrolling message	Password	Description
INFO	INSTRUMENT STATUS	Level 1	Gives information on controller state and HW configuration.

### 4.4.1 SW.VER - Software version

Acronym	Scrolling message	Submenu	Attributes
SW.VER	SOFTWARE VERSION	INFO	R
The parameter shows the version (major.minor) of the controller software. <b>Unit of measurement:</b> - <b>Options:</b> -			

### 4.4.2 CODE - Identifying code of controller

Acronym	Scrolling message	Submenu	Attributes
CODE	INSTRUMENT ID CODE FOR SERIAL COMM	INFO	R
The parameter shows identifying code of the device for serial communication. <b>Unit of measurement:</b> - <b>Options:</b> 0...247			

### 4.4.3 ERR.1 - Main input error

Acronym	Scrolling message	Submenu	Attributes
ERR.1	INPUT ERROR	INFO	R
The parameter shows error detected by the main input.			
<b>Unit of measurement:</b> -			
<b>Options:</b>			
<b>Lou</b> = Value below minimum scale limit			
<b>HIGH</b> = Value above maximum scale limit			
<b>Err</b> = PT100 in short circuit or value below minimum limit (for example TC with wrong connection)			
<b>Sbr</b> = Sensor break or value above maximum limit			
<b>ECAL</b> = Calibration error			
<b>EAdC</b> = AD converter error			

### 4.4.4 ERR.2 - Auxiliary input error

Acronym	Scrolling message	Submenu	Attributes
ERR.2	INPUT ERROR	INFO	R
The parameter displays the error (if present) detected on the optional auxiliary input (if available).			
<b>Unit of measurement:</b> -			
<b>Options:</b>			
	<b>Lou</b>	= Value below minimum scale limit	
	<b>HIGH</b>	= Value above maximum scale limit	
	<b>Err</b>	= PT100 in short circuit or value below minimum limit (for example TC with wrong connection)	
	<b>Sbr</b>	= Sensor break or value above maximum limit	
	<b>ECAL</b>	= Calibration error	
	<b>EAdC</b>	= AD converter error	

#### 4.4.5 Auxiliary input error 2 (IN3)

Acronym	Scrolling message	Submenu	Attributes
ERR.3	INPUT ERROR	INFO	R
The parameter displays the error (if present) detected on the auxiliary input 2			
<b>Unit of measurement:</b> -			
<b>Options:</b>			
	<b>Lou</b>	= Value below minimum scale limit	
	<b>HIGH</b>	= Value above maximum scale limit	
	<b>Err</b>	= PT100 in short circuit or value below minimum limit (for example TC with wrong connection)	
	<b>Sbr</b>	= Sensor break or value above maximum limit	
	<b>ECAL</b>	= Calibration error	
	<b>EAdC</b>	= AD converter error	

#### 4.4.6 SAP.C - SAP code

Acronym	Scrolling message	Submenu	Attributes
SAP.C	SAP ORDER CODE	INFO	R
<p>The parameter shows the product number (Fxxxxxx).</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.4.7 SER.N - Serial number of controller

Acronym	Scrolling message	Submenu	Attributes						
SER.n	SERIAL NUMBER	INFO	R						
<p>The parameter shows the serial number of the controller (number shown on data plate). The serial number is displayed in the form <i>yy.ww nnnn</i>, where</p> <table><tr><td><i>yy</i></td><td>= last two digits of year of production</td></tr><tr><td><i>ww</i></td><td>= week of production</td></tr><tr><td><i>nnnn</i></td><td>= progressive in week of production</td></tr></table> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>				<i>yy</i>	= last two digits of year of production	<i>ww</i>	= week of production	<i>nnnn</i>	= progressive in week of production
<i>yy</i>	= last two digits of year of production								
<i>ww</i>	= week of production								
<i>nnnn</i>	= progressive in week of production								

#### 4.4.8 xxxxx - Model of controller

Acronym	Scrolling message	Submenu	Attributes
xxxxx	MODEL	INFO	R
<p>The parameter shows the model of the controller. xxxxx indicates the controller model.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> AC50</p>			

#### 4.4.9 xxxxx - Type of controller

Acronym	Scrolling message	Submenu	Attributes
xxxxx	MODEL OPTION	INFO	R
<p>The parameter shows the type (xxxxx) of function of the controller.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> CONTR = The device functions only as a controller</p>			

#### 4.4.10 CALEN – Calendar Available

Acronym	Scrolling message	Submenu	Attributes
CALEN	CALENDAR AVAILABLE	INFO	R
<p>If present, this parameter indicates that the calendar option is installed in the controller.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.4.11 IN.AUX - Auxiliary input available

Acronym	Scrolling message	Submenu	Attributes
IN.AUX	AUXILIARY INPUT AVAILABLE	INFO	R
<p>If present, the parameter indicates that an auxiliary input is installed on the controller.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.4.12 I.AUX2 - Auxiliary input 2 available

Acronym	Scrolling message	Submenu	Attributes
I.AUX2	AUXILIARY INPUT 2 AVAILABLE	INFO	R
If present, the parameter indicates that an auxiliary input 2 is installed on the controller.			
<b>Unit of measurement:</b> -			
<b>Options:</b> -			

#### 4.4.13 OUT.AN - Analog output available

Acronym	Scrolling message	Submenu	Attributes
OUT.AN	ANALOG OUTPUT AVAILABLE	INFO	R
If present, the parameter indicates that one or two analog outputs, configurable in voltage or current, are installed on the controller.			
<b>Unit of measurement:</b> -			
<b>Options:</b> O.A1+2 = The device has 2 analog outputs			

#### 4.4.14 x.IN.DG - Digital input available

Acronym	Scrolling message	Submenu	Attributes
x.IN.DG	DIGITAL INPUT AVAILABLE	INFO	R
If present, the parameter indicates how many digital inputs are installed on the controller.			
<b>Unit of measurement:</b> -			
<b>Options:</b> 5.IN.DG = 5 digital inputs installed on the controller.			

#### 4.4.15 RS485 - RS485 serial port available

Acronym	Scrolling message	Submenu	Attributes
RS485	FIELD BUS AVAILABLE	INFO	R
If present, the parameter indicates that an RS485 is installed on the controller.			
<b>Unit of measurement:</b> -			
<b>Options:</b> -			

#### 4.4.16 MAC.E – MAC Address

Acronym	Scrolling message	Submenu	Attributes
MAC.E	-	INFO	R
If present, this parameter indicates that the controller has an Ethernet communication module. The parameter shows the physical MAC address of the Ethernet in the scrolling message. The information is shown in the format xx-xx-xx-xx-xx-xx.			
<b>Unit of measurement:</b> -			
<b>Options:</b> -			

#### 4.4.17 PS.AUX – Sensor power supply available for auxiliary input

Acronym	Scrolling message	Submenu	Attributes
PS.AUX	AUX SENSOR POWER SUPPLY AVAILABLE	INFO	R
If present, the parameter indicates that the controller has a transmitter power supply or potentiometer power supply on the auxiliary input.  <b>Unit of measurement:</b> -  <b>Options:</b> <b>VT2</b> = Power supply for 24V transmitter. <b>VP1</b> = 1V potentiometer power supply.			

#### 4.4.18 OUT1 - Output Type 1

Acronym	Scrolling message	Submenu	Attributes
Out1	OUTPUT TYPE	INFO	R
The parameter specifies the type of output 1.  <b>Unit of measurement:</b> -  <b>Options:</b> <b>RELAY</b> = Relay output			

#### 4.4.19 OUT2 - Output Type 2

Acronym	Scrolling message	Submenu	Attributes
Out2	OUTPUT TYPE	INFO	R
If present, the parameter indicates that output 2 is available on the controller and specifies the type.  <b>Unit of measurement:</b> -  <b>Options:</b> <b>RELAY</b> = Relay output			

#### 4.4.20 OUT3 - Output Type 3

Acronym	Scrolling message	Submenu	Attributes
Out3	OUTPUT TYPE	INFO	R
If present, the parameter indicates that output 3 is available on the controller and specifies the type.  <b>Unit of measurement:</b> -  <b>Options:</b> <b>RELAY</b> = Relay output			

#### 4.4.21 OUT4 - Output Type 4

Acronym	Scrolling message	Submenu	Attributes
Out4	OUTPUT TYPE	INFO	R
If present, the parameter indicates that output 4 is available on the controller and specifies the type.  <b>Unit of measurement:</b> -  <b>Options:</b> <b>RELAY</b> = Relay output			



#### 4.4.22 OUT1.S - Number of switchings - output 1

Acronym	Scrolling message	Submenu	Attributes
OUT1.S	NUMBER X 1000 OF CYCLES	INFO	R
If output 1 is relay or logic, the parameter shows the number of switchings (in thousands).			
<b>Unit of measurement:</b> Number (× 1000)			
<b>Options:</b> -			

#### 4.4.23 OUT2.S - Number of switchings - output 2

Acronym	Scrolling message	Submenu	Attributes
OUT2.S	NUMBER X 1000 OF CYCLES	INFO	R
If output 2 is available on the controller, the parameter shows the number of switchings (in thousands).			
<b>Unit of measurement:</b> Number (× 1000)			
<b>Options:</b> -			

#### 4.4.24 OUT3.S - Number of switchings - output 3

Acronym	Scrolling message	Submenu	Attributes
OUT3.S	NUMBER X 1000 OF CYCLES	INFO	R
If output 3 is available on the controller, and if it is relay or logic, the parameter shows the number of switchings (in thousands).			
<b>Unit of measurement:</b> Number (× 1000)			
<b>Options:</b> -			

#### 4.4.25 OUT4.S - Number of switchings - output 4

Acronym	Scrolling message	Submenu	Attributes
OUT4.S	NUMBER X 1000 OF CYCLES	INFO	R
If output 4 is available on the controller, the parameter shows the number of switchings (in thousands).			
<b>Unit of measurement:</b> Number (× 1000)			
<b>Options:</b> -			

#### 4.4.26 T.DAYS - Total working days

Acronym	Scrolling message	Submenu	Attributes
T.DAYS	TOTAL DAYS OF OPERATION	INFO	R
<p>The parameter shows total number of working days of the controller since first power-on. Each working day equals 24 hours of actual functioning, only if the Zirconium temperature probe measures a temperature higher than the set parameter T.THR.H.</p> <p><b>Unit of measurement:</b> Day</p> <p><b>Options:</b> 0...9999</p>			

#### 4.4.27 P.DAYS - Partial working days

Acronym	Scrolling message	Submenu	Attributes
P.DAYS	PARTIAL DAYS OF OPERATION	INFO	R
<p>The parameter shows the number of working days of the controller since the last counter reset, Each working day equals 24 hours of actual functioning, only if the Zirconium temperature probe measures a temperature higher than the set parameter T.THR.H.</p> <p>The counter can be reset with the Us.cal function.</p> <p><b>Unit of measurement:</b> Day</p> <p><b>Options:</b> 0...9999</p>			

#### 4.4.28 T.INT - Internal temperature of controller

Acronym	Scrolling message	Submenu	Attributes
T.INT	INTERNAL TEMPERATURE	INFO	R
<p>The parameter shows the instantaneous internal temperature of the controller.</p> <p><b>Unit of measurement:</b> °C</p> <p><b>Options:</b> -</p>			

#### 4.4.29 T.MIN - Minimum internal temperature of the controller

Acronym	Scrolling message	Submenu	Attributes
T.MIN	MIN INTERNAL TEMPERATURE	INFO	R
<p>The parameter shows the minimum internal temperature of the controller measured during work.</p> <p><b>Unit of measurement:</b> °F</p> <p><b>Options:</b> -</p>			

#### 4.4.30 T.MAX - Maximum internal temperature of the controller

Acronym	Scrolling message	Submenu	Attributes
T.MAX	MAX INTERNAL TEMPERATURE	INFO	R
<p>The parameter shows the maximum internal temperature of the controller measured during work.</p> <p><b>Unit of measurement:</b> °C</p> <p><b>Options:</b> -</p>			

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#### 4.4.31 TIME - Internal time

Acronym	Scrolling message	Submenu	Attributes
tiME		INFO	R
<p>The parameter shows the internal time in 24-hour format. Hours, minutes and seconds are shown with scrolling text: hours, minutes and seconds.</p> <p><b>Unit of measurement:</b> hh:mm:ss</p> <p><b>Options:</b> -</p>			

#### 4.4.32 DATE - Internal date

Acronym	Scrolling message	Submenu	Attributes
dAtE		INFO	R
<p>The parameter shows the complete internal date of the controller: month, day, year, day of week, with scrolling text.</p> <p><b>Unit of measurement:</b> MM / DD / YYYY</p> <p><b>Options:</b> -</p>			

## 4.5. INFO.E Submenu - Displaying Ethernet Information

Acronym	Scrolling message	Submenu	Attributes
INFO.E	ETHERNET STATUS	Level 1	Supplies various information on the state of Ethernet communications.

### 4.5.1 VERS.E – Ethernet Software Version

Acronym	Scrolling message	Submenu	Attributes
VERS.E	ETHERNET SOFTWARE VERSION	INFO.E	R

This parameter displays the software version (major.minor) on the controller's Ethernet card.

### 4.5.2 TY.S.E – Ethernet assignment mode status

Acronym	Scrolling message	Submenu	Attributes
ty.S.E	ETHERNET ASSIGNMENT MODE STATUS	INFO.E	R

This parameter shows the assignment mode of the Ethernet IP address, subnet mask and gateway parameters.

**Unit of measurement:** -

**Options:**           **FIXED** = Manually entered parameters are used  
                  **DHCP** = Parameters received from the network DHCP server are used

### 4.5.3 CON.E – Ethernet Connection status

Acronym	Scrolling message	Submenu	Attributes
Con.E	CONNECTION STATUS	INFO.E	R

This parameter shows the status of the controller's Ethernet connection.

**Unit of measurement:** -

**Options:**           **NO.CON** = No connection  
                  **CONNE** = Active connection  
                  **DUP.IP** = Duplicate IP address

### 4.5.4 LIN.E – Ethernet link status

Acronym	Scrolling message	Submenu	Attributes
Lin.E	ETHERNET LINK STATUS	INFO.E	R

This parameter shows the status of the controller's Ethernet connection

**Unit of measurement:** -

**Options:**           **UP** = active network  
                  **DOWN** = network not active

### 4.5.5 SPD.E – Ethernet speed status

Acronym	Scrolling message	Submenu	Attributes
SPd.E	ETHERNET SPEED STATUS	INFO.E	R

This parameter shows the status of the controller's Ethernet connection

**Unit of measurement:** -

**Options:**           **NONE** = Speed not detected  
                  **10/H** = 10Mbps Half Duplex  
                  **10/F** = 10Mbps Full Duplex  
                  **100/H** = 100Mbps Half Duplex  
                  **100/F** = 100Mbps Full Duplex

#### 4.5.6 I.P.E – Ethernet IP Address

Acronym	Scrolling message	Submenu	Attributes
I.P.E	-	INFO.E	R
<p>This parameter shows the IP address identifying the controller on the Ethernet network. This information is displayed in the form of a scrolling message with the format xxx.xxx.xxx.xxx</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.5.7 SUB.E – Subnet mask Ethernet

Acronym	Scrolling message	Submenu	Attributes
Sub.E	-	INFO.E	R
<p>This parameter shows the Subnet mask identifying the controller on the Ethernet network. This information is displayed in the form of a scrolling message with the format xxx.xxx.xxx.xxx</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.5.8 GAT.E – Ethernet Gateway address

Acronym	Scrolling message	Submenu	Attributes
GAt.E	-	INFO.E	R
<p>This parameter shows the Gateway address identifying the controller on the Ethernet network. This information is displayed in the form of a scrolling message with the format xxx.xxx.xxx.xxx</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.5.9 STA.E – Ethernet Network status

Acronym	Scrolling message	Submenu	Attributes
StA.E	ETHERNET STATUS	INFO.E	R
<p>This parameter shows connection status identifying the controller on the Ethernet network.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OK</b>       = No error                   <b>FAIL.N</b> = NTP server not available</p>			

#### 4.5.10 N.SOCK – Socket Number Available

Acronym	Scrolling message	Submenu	Attributes
N.SOCK	SOCKET NUMBER AVAILABLE	INFO.E	R
<p>This parameter shows the number of currently available sockets.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

## 4.6. INFO.C submenu - Zirconium oxide probe controller status parameters

Acronym	Scrolling message	Password	Description
INFO.C	ATMOSPHERE STATUS	Level 1	Shows Atmosphere status parameters

### 4.6.1 B.STA - Burnoff procedure status

Acronym	Scrolling message	Submenu	Attributes
B.STA	BURNOFF STATE	INFO.C	R

This parameter shows the current status of the Burnoff procedure.

**Unit of measurement:** -

**Options:**

- IDLE** = procedure waiting to start
- CHECK** = checking start conditions
- P.BURN** = preparing blowing phase
- R.BURN** = blowing phase
- DELTA** = verifying minimum delta in mV after blowing
- P.RE.MI** = preparing recovery phase within minimum recovery time
- RE.MIN** = recovery within minimum recovery time threshold
- W.RECO** = wait recovery within maximum recovery time threshold

### 4.6.2 R.TIME - Last recovery time measured during Burnoff

Acronym	Scrolling message	Submenu	Attributes
R.TIME	RECOVERY TIME	INFO.C	R

This parameter shows the duration of the last RECOVERY time measured during a Burnoff procedure.

**Unit of measurement:** mm:ss (minutes:seconds)

**Options:** -

### 4.6.3 FRZ.MV - Frozen Zirconia probe voltage value during Burnoff

Acronym	Scrolling message	Submenu	Attributes
FRZ.MV	FREEZED PROBE VOLTAGE DURING BURNOFF	INFO.C	R

This parameter shows the voltage value at the Zirconia probe output, frozen before the Burnoff procedure started. During Burnoff, the carbon percentage continues to be calculated and the PID continues to adjust using this value until the end of the procedure.

**Unit of measurement:** -

**Options:** -

### 4.6.4 FRZ.TE - Frozen Zirconia probe temperature value during Burnoff

Acronym	Scrolling message	Submenu	Attributes
FRZ.TE	FREEZED PROBE TEMPERATURE DURING BURNOFF	INFO.C	R

This parameter shows the temperature measured by the Zirconia probe, frozen before the start of the Burnoff procedure. During Burnoff, the carbon percentage continues to be calculated and the PID continues to adjust using this value until the end of the procedure.

**Unit of measurement:** -

**Options:** -

#### 4.6.5 D.STA - Zirconia Probe Diagnostics Procedure Status

Acronym	Scrolling message	Submenu	Attributes
D.STA	STATUS OF PROBE DIAGNOSTIC TEST PROCEDURE	INFO.C	R
<p>The parameter shows the current status of the Probe Diagnostics procedure.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <ul style="list-style-type: none"><li><b>IDLE</b> = procedure waiting to start</li><li><b>CHECK</b> = checking start conditions</li><li><b>P.IMPE</b> = preparing for impedance measurement</li><li><b>IMP.CA</b> = impedance measurement under way</li><li><b>P.SHOR</b> = probe short-circuit preparation</li><li><b>SHORT</b> = probe short circuit</li><li><b>RECOV</b> = recovery after short circuit</li></ul>			

#### 4.6.6 D.FR.MV - Frozen value of Zirconia probe voltage during diagnostics

Acronym	Scrolling message	Submenu	Attributes
D.FR.MV	FROZEN PROBE VOLTAGE DURING DIAGNOSTICS	INFO.C	R
<p>This parameter shows the voltage value measured by the Zirconia probe, frozen before the start of the probe diagnostics procedure. During Probe diagnostics, the carbon percentage continues to be calculated and the PID continues to adjust using this value until the end of the procedure.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.6.7 D.FR.TE - Frozen Zirconia probe temperature value during diagnostics

Acronym	Scrolling message	Submenu	Attributes
D.FR.TE	FREEZED PROBE TEMPERATURE DURING DIAGNO	INFO.C	R
<p>This parameter shows the temperature value measured by the Zirconia probe, frozen before the start of the probe diagnostics procedure; the carbon percentage continues to be calculated and the PID continues to adjust using this value until the end of the procedure.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.6.8 IMPED - Probe Measured Impedance Value

Acronym	Scrolling message	Submenu	Attributes
IMPED	PROBE CALCULATED IMPEDANCE	INFO.C	R
<p>The parameter shows the impedance value of the Zirconia probe, measured during the Probe Diagnostics procedure.</p> <p><b>Unit of measurement:</b> Kohm</p> <p><b>Options:</b> -</p>			

#### 4.6.9 D.RECO - Last recovery time measured during probe diagnostics

Acronym	Scrolling message	Submenu	Attributes
D.RECO	DIAGNO RECOVERY TIME	INFO.C	R
<p>This parameter shows the duration of the last RECOVERY time measured during the probe diagnostics procedure.</p> <p><b>Unit of measurement:</b> mm:ss (minutes:seconds)</p> <p><b>Options:</b> -</p>			

## 4.7. AT.SET submenu - Configuration of Atmosphere calculation parameters

Acronym	Scrolling message	Password	Description
AT.SET	ATMOSPHERE SETUP	Level 1	Allows you to configure parameters for calculation of atmosphere

### 4.7.1 AT.SE - Setting PV calculation mode

Acronym	Scrolling message	Submenu	Attributes
AT.SE	SET ATMOSPHERE PV	AT.SET	R W
This parameter shows and sets the calculation options for the instrument. <b>Unit of measurement:</b> - <b>Options:</b> <b>NONE</b> = use in the event of control based on standard inputs <b>%C</b> = calculation of carbon percentage <b>DEW.P</b> = calculation of dewpoint temperature <b>mV</b> = calculation of milivolts <b>O2</b> = calculation of oxygen concentration			

### 4.7.2 ALLOY - ALLOY factor setting

Acronym	Scrolling message	Submenu	Attributes
ALLOY	ALLOY FACTOR	AT.SET	R W
This parameter shows and sets the ALLOY factor. <b>Unit of measurement:</b> - <b>Options:</b> <b>0.500...1.500</b>			

### 4.7.3 COF - Carbon Monoxide factor setting

Acronym	Scrolling message	Submenu	Attributes
COF	CO FACTOR	AT.SET	R W
This parameter shows and sets the desired Carbon Monoxide factor. <b>Unit of measurement:</b> % <b>Options:</b> <b>0.00...99.99</b>			

#### 4.7.3.1 COF.r - Remote COF enabling (Not available on AC50 unit, accessed via SuperSet software)

This parameter sets remote enabling of the Carbon Monoxide Factor.

### 4.7.4 H2F - Diatomic hydrogen factor setting

Acronym	Scrolling message	Submenu	Attributes
H2F	H2 FACTOR	AT.SET	R W
This parameter shows and sets the desired H2 Factor <b>Unit of measurement:</b> % <b>Options:</b> <b>0.00...99.99</b>			

#### 4.7.4.1 H2F.r - Remote H2F enabling (Not available on AC50 unit, accessed via SuperSet software)

This parameter sets remote enabling of the H2 Factor.



#### 4.7.5 AT.OFF - Offset setting

Acronym	Scrolling message	Submenu	Attributes
AT.OFF	ATMOSPHERE OFFSET	AT.SET	R W
This parameter shows and sets the corrective offset that acts directly on the calculated Atmosphere value. <b>Unit of measurement:</b> - <b>Options:</b> 0.00...99.99			

#### 4.7.6 C.LO.SP - Lower limit for atmosphere setpoint

Acronym	Scrolling message	Submenu	Attributes
C.LO.SP	LOW LIMIT FOR ATMOSPHERE SETPOINT	AT.SET	R W
This parameter shows and sets the lower limit for definition of the atmosphere setpoint if the parameter AT.SET is different from NONE (these parameters overwrite the parameters in the INPUT menu). <b>Unit of measurement:</b> - <b>Options:</b> -			

#### 4.7.7 C.HI.SP - High limit for atmosphere setpoint

Acronym	Scrolling message	Submenu	Attributes
C.HI.SP	HIGH LIMIT FOR ATMOSPHERE SETPOINT	AT.SET	R W
This parameter shows and sets the upper limit for definition of the atmosphere setpoint if the parameter AT.SET is different from NONE (these parameters overwrite the parameters in the INPUT menu). <b>Unit of measurement:</b> - <b>Options:</b> -			

#### 4.7.8 C.LO.AL - Low limit for alarms

Acronym	Scrolling message	Submenu	Attributes
C.LO.AL	LOW LIMIT FOR ATMOSPHERE ALARM	AT.SET	R W
This parameter shows and sets the lower limit for definition of atmosphere alarms if the parameter AT.SET is different from NONE (these parameters overwrite those of the INPUT menu). <b>Unit of measurement:</b> - <b>Options:</b> -			

#### 4.7.9 C.HI.AL - High limit for atmosphere alarms

Acronym	Scrolling message	Submenu	Attributes
C.HI.AL	HIGH LIMIT FOR ATMOSPHERE ALARM	AT.SET	R W
<p>This parameter shows and sets the upper limit for definition of atmosphere alarms if the parameter AT.SET is different from NONE (these parameters overwrite those of the INPUT menu).</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.7.10 C.MIN.T - Minimum Temperature of Zirconia Probe for Calculation

Acronym	Scrolling message	Submenu	Attributes
C.MIN.T	MIN TEMPERATURE CALC	AT.SET	R W
<p>Minimum temperature limit of the Zirconia probe for calculation of the PV. Below this value, the outputs are forced to zero, if the parameter LOC.OU is set to ENABLE.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.7.11 C.MAX.T - Maximum temperature of Zirconia probe for calculation

Acronym	Scrolling message	Submenu	Attributes
C.MAX.T	MAX TEMPERATURE CALC	AT.SET	R W
<p>Maximum temperature limit of the Zirconia probe for calculation of the PV. Above this value, the outputs are forced to zero, if the parameter LOC.OU is set to ENABLE.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.7.12 P.MIN.V - Minimum voltage of Zirconia probe for calculation

Acronym	Scrolling message	Submenu	Attributes
P.MIN.V	MIN VOLTAGE PROBE	AT.SET	R W
<p>Minimum voltage limit of the Zirconia probe for calculation of the PV. Below this value, the outputs are forced to zero, if the parameter LOC.OU is set to ENABLE.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.7.13 P.MAX.V - Maximum voltage of Zirconia probe for calculation

Acronym	Scrolling message	Submenu	Attributes
P.MAX.V	MAX VOLTAGE PROBE	AT.SET	R W
<p>Maximum voltage limit of the Zirconia probe for calculation of the PV. Above this value the outputs are forced to zero, if the parameter LOC.O is set as ENABLE.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.7.14 C.SAT.L - Saturation limit (Soot line)

Acronym	Scrolling message	Submenu	Attributes
C.SAT.L	CARBON PERCENTAGE SATURATION LIMIT	AT.SET	R W
Maximum limit beyond which the Saturation limit alarm is triggered . Also known as 'Soot line'.			
<b>Unit of measurement:</b> -			
<b>Options:</b> -			

#### 4.7.15 T.THR.H - Temperature threshold for counting the hours of use of the Zirconia probe

Acronym	Scrolling message	Submenu	Attributes
T.THR.H	TEMPERATURE THRESHOLD FOR WORKING HOURS	AT.SET	R W
The parameter shows and sets the temperature threshold above which the working hours counter is increased.			
<b>Unit of measurement:</b> -			
<b>Options:</b> -			

#### 4.7.16 CLEA - Clear Atmosphere Potential errors

Acronym	Scrolling message	Submenu	Attributes
CLEA	ATMOSPHERE ERRORS CLEAR ENABLE	AT.SET	R W
The parameter shows and sets clearing of all errors related to Atmosphere management.			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>DISAB</b> = Disabled <b>ENAB</b> = Enabled			

#### 4.7.17 LOC.O - Output deactivation

Acronym	Scrolling message	Submenu	Attributes
LOC.O	ALARM LOCK OUT ENABLE	AT.SET	R W
This parameter shows and sets the deactivation of outputs in the presence of errors. If this parameter is enabled, the control outputs are disabled in the event of a serious error			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>DISAB</b> = Disabled <b>ENAB</b> = Enabled			

#### 4.7.18 M.LO.TE - Message associated with probe temperature too low for calculation

Acronym	Scrolling message	Submenu	Attributes
M.LO.TE	NUM SCROLLING MSG WHEN TEMP IS LOW	AT.SET	R W
This parameter shows and sets the message number associated with the probe temperature too low for calculation error. <b>Unit of measurement:</b> Message identification number <b>Options:</b> 0...75			

#### 4.7.19 M.HI.TE - Message associated with probe temperature too high for calculation

Acronym	Scrolling message	Submenu	Attributes
M.HI.TE	NUM SCROLLING MSG WHEN TEMP IS HIGH	AT.SET	R W
This parameter shows and sets the message number associated with the probe temperature too high for calculation error. <b>Unit of measurement:</b> Message identification number <b>Options:</b> 0...75			

#### 4.7.20 M.LO.MV - Message associated with probe voltage too low for calculation

Acronym	Scrolling message	Submenu	Attributes
M.LO.MV	NUM SCROLLING MSG WHEN VOLTAGE PROBE IS LOW	AT.SET	R W
This parameter shows and sets the message number associated with the probe voltage too low for calculation error. <b>Unit of measurement:</b> Message identification number <b>Options:</b> 0...75			

#### 4.7.21 M.HI.MV - Message associated with probe voltage too high for calculation

Acronym	Scrolling message	Submenu	Attributes
M.HI.MV	NUM SCROLLING MSG WHEN VOLTAGE PROBE IS HIGH	AT.SET	R W
The parameter shows and sets the message number associated with the probe voltage too high for calculation error. <b>Unit of measurement:</b> Message identification number <b>Options:</b> 0...75			

#### 4.7.22 M.SAT.L - Message associated with saturation alarm

Acronym	Scrolling message	Submenu	Attributes
M.SAT.L	NUM SCROLLING MSG WHEN SATURATION IS OVER LIMIT	AT.SET	R W
This parameter shows and sets the message number associated with the saturation alarm (Saturation limit). <b>Unit of measurement:</b> Message identification number <b>Options:</b> 0...75			

#### 4.7.23 M.O2.L - Message associated with O2 too low for calculation.

Acronym	Scrolling message	Submenu	Attributes
M.O2.L	NUM SCROLLING MSG WHEN O2 IS UNDER LIMIT	AT.SET	R W
This parameter shows and sets the message number associated with the O2 out of range. <b>Unit of measurement:</b> Message identification number <b>Options:</b> 0...75			

## 4.8. BURN.S submenu - Parameter configuration for Burnoff

Acronym	Scrolling message	Password	Description
BURN.S	ATMOSPHERE BURNOFF SETUP	Level 1	Allows you to configure the Burnoff procedure

### 4.8.1 B.TIME - Burnoff air blowing time

Acronym	Scrolling message	Submenu	Attributes
B.TIME	BURNOFF TIME	BURN.S	R W
<p>The parameter shows and sets the duration in seconds of the air blowing phase during a Burnoff. This is the time during which the outlet is raised to introduce air into the probe to clean it.</p> <p><b>Unit of measurement:</b> s (seconds)</p> <p><b>Options:</b> 0...5999</p>			

### 4.8.2 AUT.B - Burnoff start mode

Acronym	Scrolling message	Submenu	Attributes
AUT.B	BURNOFF START MODE	BURN.S	R W
<p>This parameter shows and sets the Burnoff start mode, manual or automatic, every B.FREQ minutes. When switching from Automatic to Manual the time counter of the automatic cycles is reset.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>        <b>MAN</b>    = Automatic Burnoff disabled                   <b>AUTO</b>    = Automatic Burnoff enabled</p>			

### 4.8.3 B.FREQ - Automatic Burnoff repeat frequency

Acronym	Scrolling message	Submenu	Attributes
B.FREQ	BURNOFF FREQUENCY IN MINUTES	BURN.S	R W
<p>The parameter shows and sets the automatic burnoff repetition frequency in minutes.</p> <p><b>Unit of measurement:</b> min</p> <p><b>Options:</b> 0...9999</p>			

### 4.8.4 B.MIN.T - Burnoff Minimum Recovery Time

Acronym	Scrolling message	Submenu	Attributes
B.MIN.T	BURNOFF MIN RECOVERY TIME	BURN.S	R W
<p>This parameter shows and sets the minimum Burnoff time in seconds. After the blowing phase, the time B.MIN.T must elapse for the probe voltage value to return to pre-blowing levels. If the mV value reaches 98% of the D.FR.MV value before B.MIN.T has elapsed, the B.MIN.T time still has to elapse before moving on to the next step. If after this time the signal is &gt;98% of the initial signal, control may be resumed immediately.</p> <p><b>Unit of measurement:</b> s (seconds)</p> <p><b>Options:</b> 0...5999</p>			

### 4.8.5 B.MAX.T - Burnoff Maximum Recovery Time

Acronym	Scrolling message	Submenu	Attributes
B.MAX.T	BURNOFF MAX RECOVERY TIME	BURN.S	R W
<p>This parameter shows and sets the maximum Burnoff recovery time in seconds. After the Recovery phase within the minimum time B.MIN.T, we wait until the probe voltage value has returned to pre-blowing levels. If the mV value reaches 98% of the FRZ.MV value, the Burnoff procedure is considered completed. If after this time the signal is &lt; 98% of the FRZ.MV value, the <b>Probe Recovery Failure</b> alarm is triggered.</p> <p><b>Unit of measurement:</b> s (seconds)</p> <p><b>Options:</b> 0...5999</p>			

#### 4.8.6 M.TEMP - Minimum temperature required for a Burnoff

Acronym	Scrolling message	Submenu	Attributes
M.TEMP	MIN TEMPERATURE TO BURNOFF	BURN.S	R W
<p>The parameter shows and sets the minimum temperature in degrees C or F above which a Burnoff procedure can start. Below this temperature, the operation does not start and an error is signalled (Burnoff FAILURE): complete combustion of soot would not occur.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.8.7 LIM.TE - Temperature limit for a Burnoff

Acronym	Scrolling message	Submenu	Attributes
LIM.TE	LIMIT BURNOFF TEMPERATURE	BURN.S	R W
<p>This parameter shows and sets the maximum temperature in degrees C or F above which a Burnoff cannot occur. Above this temperature, the probe cleaning phase is interrupted (a sign of a potentially damaging exothermic reaction!) and the probe switches to the recovery phase.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.8.8 M.VAR - Minimum voltage variation during Burnoff

Acronym	Scrolling message	Submenu	Attributes
M.VAR	MINIMUM BURNOFF VARIATION	BURN.S	R W
<p>The parameter shows and sets the minimum voltage delta that the instrument must detect at the ends of the Zirconia probe during the air blowing phase. If the M.VAR value is not reached, this means that the probe has not been blown sufficiently; the Burnoff switches to the recovery phase and signals an error. The value is assessed during the "DELTA" phase of B.STA.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> 0...9999</p>			

#### 4.8.9 MSG.VA - Message associated with failure to reach M.VAR value

Acronym	Scrolling message	Submenu	Attributes
MSG.VA	NUMBER OF SCROLLING MESSAGE WHEN MINIMUM VAR IS NOT REACHED	BURN.S	R W
<p>This parameter shows and sets the message number associated with the warning of failure to reach the M.VAR value during a Burnoff.</p> <p><b>Unit of measurement:</b> Message identification number</p> <p><b>Options:</b> 0...75</p>			

#### 4.8.10 MSG.MT - Message associated with burnoff max probe temperature alarm

Acronym	Scrolling message	Submenu	Attributes
MSG.MT	NUMBER OF SCROLLING MESSAGE WHEN MAX TEMP BURNOFF IS REACHED	BURN.S	R W
<p>This parameter shows and sets the message number associated with the maximum permissible Burnoff temperature alarm (LIM.TE parameter).</p> <p><b>Unit of measurement:</b> Message identification number</p> <p><b>Options:</b> 0...75</p>			

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#### 4.8.11 MSG.RT - Message associated with Recovery Burnoff timeout

Acronym	Scrolling message	Submenu	Attributes
MSG.RT	NUMBER OF SCROLLING MESSAGE WHEN BURNOFF RECOVERY TIME IS OUT	BURN.S	R W
The parameter displays and sets the message number associated with the exceeded maximum burnoff timeout alarm.			
<b>Unit of measurement:</b> Message identification number			
<b>Options:</b> 0...75			

## 4.9. DIAG.S submenu - Parameter configuration for zirconium oxide probe diagnostics

Acronym	Scrolling message	Password	Description
DIAG.S	ATMOSPHERE DIAGNO SETUP	Level 1	Allows you to configure the parameters of the Zirconium oxide probe diagnostics procedure

### 4.9.1. D.TIME - Probe short-circuit duration during diagnostics

Acronym	Scrolling message	Submenu	Attributes
D.TIME	PROBE DIAGNOSTIC TIME	DIAG.S	R W
The parameter shows and sets the duration in seconds of the probe short-circuit phase during diagnostics. <b>Unit of measurement:</b> s (seconds) <b>Options:</b> 0...5999			

### 4.9.2. D.MAX.T - Maximum recovery time during probe diagnostics

Acronym	Scrolling message	Submenu	Attributes
D.MAX.T	PROBE DIAGNO MAX RECOVERY TIME	DIAG.S	R W
This parameter shows and sets the maximum recovery time after a probe short circuit (in seconds). If the probe voltage value reaches 98% of the D.FR.MV value, the Probe Diagnostics procedure is considered complete. <b>Unit of measurement:</b> s (seconds) <b>Options:</b> 0...5999			

### 4.9.3. IMPE.L - Maximum impedance value

Acronym	Scrolling message	Submenu	Attributes
IMPE.L	MAX PROBE IMPEDANCE IN KOHM	DIAG.S	R W
The parameter shows and sets the maximum impedance value of the Zirconia probe accepted, above which the corresponding warning is signalled. <b>Unit of measurement:</b> Kohm <b>Options:</b> 00.00...99.99			

### 4.9.4. AUT.D - Diagnostics start mode

Acronym	Scrolling message	Submenu	Attributes
AUT.D	AUTOMATIC BURNOFF ENABLE	DIAG.S	R W
The parameter shows and sets the Burnoff start mode, in manual or automatic every D.FREQ minutes. <b>Unit of measurement:</b> - <b>Options:</b> <b>MAN</b> = Automatic diagnostics disabled <b>AUTO</b> = Automatic diagnostics enabled <b>BURN</b> = Diagnostics following Burnoff			

### 4.9.5. D.FREQ - Probe diagnostics automatic repetition frequency

Acronym	Scrolling message	Submenu	Attributes
D.FREQ	DIAGNO FREQUENCY IN MINUTES	DIAG.S	R W
This parameter shows and sets the frequency of automatic diagnostics repetition, in minutes. <b>Unit of measurement:</b> min <b>Options:</b> 0...9999			



#### 4.9.6. D.MIN.T - Minimum temperature for probe diagnostics start

Acronym	Scrolling message	Submenu	Attributes
D.MIN.T	MIN TEMPERATURE FOR DIAGNO	DIAG.S	R W
This parameter shows and sets the minimum temperature required to carry out the probe diagnostics procedure.			
<i>Unit of measurement:</i> -			
<i>Options:</i> -			

#### 4.9.7. MSG.IM - Message associated with exceeding probe impedance threshold

Acronym	Scrolling message	Submenu	Attributes
MSG.IM	NUMBER OF SCROLLING MESSAGE WHEN IMPEDANCE IS OUT OF RANGE	DIAG.S	R W
The parameter shows and sets the message number associated with the alarm exceeding the maximum permissible Zirconia probe impedance value (IMPE.L parameter).			
<i>Unit of measurement:</i> Message identification number			
<i>Options:</i> 0...75			

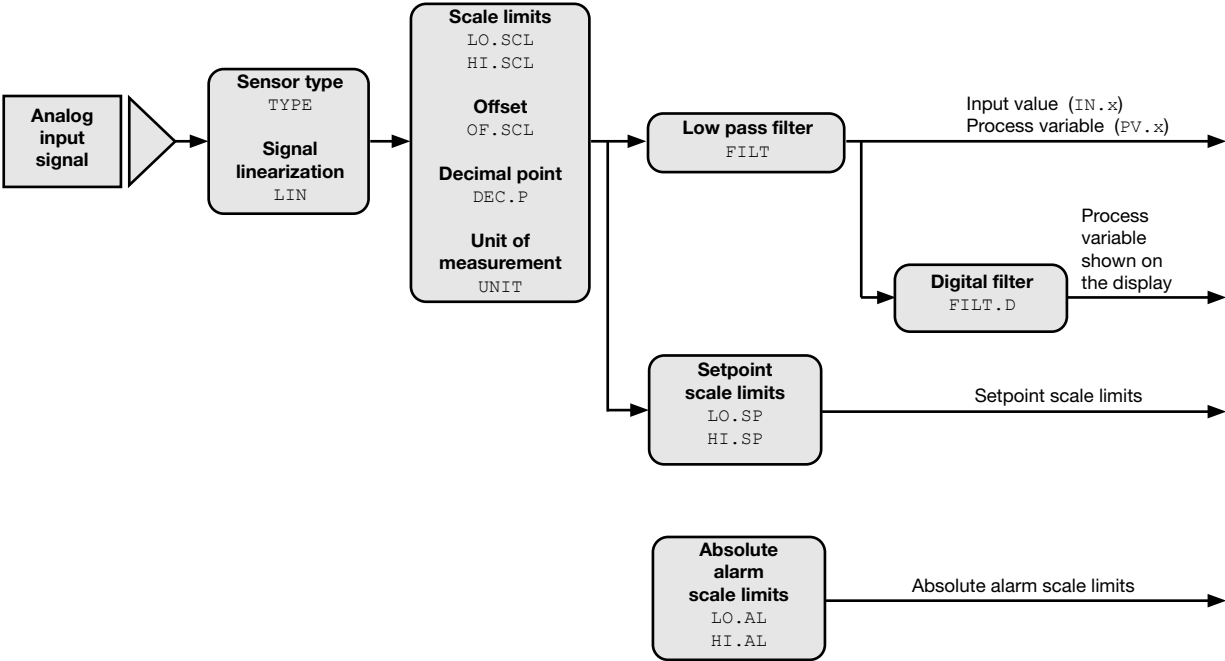
#### 4.9.8. MSG.RE - Message associated with Diagnostics Recovery timeout

Acronym	Scrolling message	Submenu	Attributes
MSG.RE	NUMBER OF SCROLLING MESSAGE WHEN RECOVERY TIME IS OUT	DIAG.S	R W
This parameter shows and sets the message number associated with the maximum recovery timeout alarm after a probe short circuit ends.			
<i>Unit of measurement:</i> Message identification number			
<i>Options:</i> 0...75			

4.10. Submenu INPUT - Configuring analog inputs

Acronym	Scrolling message	Password	Description
INPUT	INPUT CONFIG	Level 1	Lets you configure the controller's analog inputs (main and auxiliary).

4.10.1 Functional schema



4.10.2 INP.N - Selecting the analog input

Acronym	Scrolling message	Submenu	Attributes
INP.N	INPUT NUMBER	INPUT	R W

The parameter shows and sets the identifying number of the analog input.

**Unit of measurement:**    Number

**Options:**                    1...3

#### 4.10.3 TYPE - Selecting sensor type

Acronym	Scrolling message	Submenu	Attributes
TYPE	INPUT.1 (or INPUT.2) or INPUT.3 TYPE OF PROBE	INPUT	R W

The parameter shows and sets the sensor type of the main or auxiliary input.

The functions for calibrating Custom sensors are on the US.CAL menu.

When a 4...20 mA input is used and the current is less than 2 mA, an Err message is generated and the relay state specified with the FAUL.T parameters is activated.

The table shows the scale limits for each sensor type or input based on the set number of decimals.

Sensor type	Sensor	Unit of measurement	Scale limits for DEC.P = 0	Scale limits for DEC.P = 1	Error @ 25°C
Thermocouple	J	°C	-210...1200	-199.9...999.9	±0,05
	K	°C	-270...1372	-199.9...999.9	±0,06
	R	°C	-50...1768	-50.0...999.9	±0,02
	S	°C	-50...1768	-50.0...999.9	±0,02
	T	°C	-270...400	-199.9...400.0	±0,04
	C	°C	0...2315	0.0...999.9	±0,011
	D	°C	0...2315	0.0...999.9	±0,023
	B	°C	40...1820	40.0...999.9	±0,03
	E	°C	-270...1000	-199.9...999.9	±0,19 per T<-200°C ±0,03 per T>-200°C
	L	°C	-200...900	-199.9...900.0	±0,09
	L-GOST	°C	-200...800	-199.9...800.0	±0,014
	U	°C	-200...600	-199.9...600.0	±0,135
	G	°C	0...2315	0.0...999.9	±0,042
	N	°C	-270...1300	-199.9...999.9	±0,047
Infrared characteristic of the Tc K model see note	Pt20Rh Pt40Rh	°C	0...1888	0...999.9	±0,017
	1	°C	10...70	10.0...70.0	±0,06
	2	°C	60...120	60.0...120.0	±0,06
	3	°C	115...165	115.0...165.0	±0,06
Thermoresistance	4	°C	140...260	140.0...260.0	±0,06
	PT100	°C	-200...850	-199.9...850.0	±0,062
	PT100 LIM	°C	-50...250	-50.0...250.0	±0,062
	JPT100	°C	-200...600	-199.9...600.0	±0,062
Voltage /Current	0...60 mV		-1999...9999	-199.9...999.9	-
	0...20 mA				
	4...20 mA				
	0...10 V				
	2...10 V				
	0...5 V				
	1...5 V				
	0...1 V				
	0...2,4V HI 0...1,2V HI 0...1V HI				
Custom	RTD		-1999...9999	-199.9...999.9	-
	0...60 mV				
	0...20 mA				
	4...20 mA				
	0...10 V				
	2...10 V				
	0...5 V				
	1...5 V				
	0...1 V				
	0...2,4V HI 0...1,2V HI				

**Note:** the infrared temperature sensor has an output in voltage for direct connection to the input terminals of the temperature controller. An external thermometer is needed in order to correct the sensor error.

After identifying the work temperature range (for example, 140 – 260°C), set an SP near the minimum scale value, and after reaching it make a note of value A1 indicated by the instrument and of value A2 indicated by the external thermometer. Set an SP near the maximum scale value, and after reaching it make a note of value B1 indicated by the instrument and of value B2 indicated by the external thermometer. Enable 4-point linearization (see Correcting 4-point input) and enter the four requested values (A1, B1 and A2, B2).

**Unit of measurement:**

-

**Options:**

TYPE 1

<b>J.TC</b>	= Thermocouple J
<b>K.TC</b>	= Thermocouple K
<b>R.TC</b>	= Thermocouple R
<b>S.TC</b>	= Thermocouple S
<b>T.TC</b>	= Thermocouple T
<b>C.TC</b>	= Thermocouple C
<b>D.TC</b>	= Thermocouple D
<b>B.TC</b>	= Thermocouple B
<b>E.TC</b>	= Thermocouple E
<b>L.TC</b>	= Thermocouple L
<b>L.GO.TC</b>	= Thermocouple L.GOST
<b>U.TC</b>	= Thermocouple U
<b>G.TC</b>	= Thermocouple G
<b>N.TC</b>	= Thermocouple N
<b>PT2.TC</b>	= Thermocouple Pt20Rh / Pt40Rh
<b>INFR1</b>	= IR type sensor 1
<b>INFR2</b>	= IR type sensor 2
<b>INFR3</b>	= IR type sensor 3
<b>INFR4</b>	= IR type sensor 4
<b>PT100</b>	= Thermoresistance Pt100
<b>PT.LIM</b>	= Thermoresistance Pt 100 limited
<b>JPT10</b>	= Thermoresistance JPT100
<b>60MV</b>	= Sensor 0...60 mV
<b>20MA</b>	= Sensor 0...20 mA
<b>4-20M</b>	= Sensor 4...20 mA
<b>10V</b>	= Sensor 0...10 V
<b>2-10V</b>	= Sensor 2...10 V
<b>5V</b>	= Sensor 0...5 V
<b>1-5V</b>	= Sensor 1...5 V
<b>1V</b>	= Sensor 0...1 V
<b>0.2-1V</b>	= Sensor 0,2...1 V
<b>C.RTD</b>	= Sensor RTD with custom calibration
<b>C.60MV</b>	= Sensor 0...60 mV with custom calibration
<b>C.20MA</b>	= Sensor 0...20 mA with custom calibration
<b>C.4-20</b>	= Sensor 4...20 mA with custom calibration
<b>C.10V</b>	= Sensor 0...10 V with custom calibration
<b>C.2-10</b>	= Sensor 2...10 V with custom calibration
<b>C.5V</b>	= Sensor 0...5 V with custom calibration
<b>C.1-5V</b>	= Sensor 1...5 V with custom calibration
<b>C.1V</b>	= Sensor 0...1 V with custom calibration
<b>C.0.2-1</b>	= Sensor 0,2...1 V with custom calibration

TYPE 2

*without options VP o VT2*

<b>J.TC</b>	= Thermocouple J
<b>K.TC</b>	= Thermocouple K
<b>R TC</b>	= Thermocouple R
<b>S TC</b>	= Thermocouple S
<b>T.TC</b>	= Thermocouple T
<b>C.TC</b>	= Thermocouple C
<b>D.TC</b>	= Thermocouple D
<b>B.TC</b>	= Thermocouple B
<b>E.TC</b>	= Thermocouple E
<b>L TC</b>	= Thermocouple L
<b>L.GO.TC</b>	= Thermocouple L.GOST
<b>U.TC</b>	= Thermocouple U
<b>G.TC</b>	= Thermocouple G
<b>N.TC</b>	= Thermocouple N
<b>PT2.TC</b>	= Thermocouple Pt20Rh / Pt40Rh
<b>INFR1</b>	= IR type sensor 1
<b>INFR2</b>	= IR type sensor 2
<b>INFR3</b>	= IR type sensor 3
<b>INFR4</b>	= IR type sensor 4

*without options VP o VT2:*

<b>PT100</b>	= Thermoresistance Pt100
<b>PT.LIM</b>	= Thermoresistance Pt 100 limitata
<b>JPT10</b>	= Thermoresistance JPT100
<b>60MV</b>	= Sensor 0...60 mV

*with options VP o VT2:*

<b>20MA</b>	= Sensor 0...20 mA
<b>4-20M</b>	= Sensor 4...20 mA
<b>10V</b>	= Sensor 0...10 V
<b>2-10V</b>	= Sensor 2...10 V
<b>5V</b>	= Sensor 0...5 V
<b>1-5V</b>	= Sensor 1...5 V
<b>1V</b>	= Sensor 0...1 V
<b>0.2-1V</b>	= Sensor 0,2...1 V

*with options VP o VT2:*

<b>C.RTD</b>	= Sensor RTD with custom calibration
<b>C.60MV</b>	= Sensor 0...60 mV with custom calibration

*with options VP o VT2:*

<b>C.20MA</b>	= Sensor 0...20 mA with custom calibration
<b>C.4-20</b>	= Sensor 4...20 mA with custom calibration
<b>C.10V</b>	= Sensor 0...10 V with custom calibration
<b>C.2-10</b>	= Sensor 2...10 V with custom calibration
<b>C.5V</b>	= Sensor 0...5 V with custom calibration
<b>C.1-5V</b>	= Sensor 1...5 V with custom calibration
<b>C.1V</b>	= Sensor 0...1 V with custom calibration
<b>C.0.2-1</b>	= Sensor 0,2...1 V with custom calibration

TYPE 3

**20MA** = Sensor 0...20 mA  
**4-20M** = Sensor 4...20 mA  
**10V** = Sensor 0...10 V  
**2-10V** = Sensor 2...10 V  
**5V** = Sensor 0...5 V  
**1-5V** = Sensor 1...5 V

**2.4VHI** = Sensor 0...2.4V high impedance  
**1.2VHI** = Sensor 0...1.2V high impedance  
**1VHI** = Sensor 0...1V high impedance

**C.20MA** = Sensor 0...20 mA with custom calibration  
**C.4-20** = Sensor 4...20 mA with custom calibration  
**C.10V** = Sensor 0...10 V with custom calibration  
**C.2-10** = Sensor 2...10 V with custom calibration  
**C.5V** = Sensor 0...5 V with custom calibration  
**C.1-5V** = Sensor 1...5 V with custom calibration

**C2.4VH** = Sensor 0...2.4 V high impedance with custom calibration  
**C1.2VH** = Sensor 0...1.2 V high impedance with custom calibration

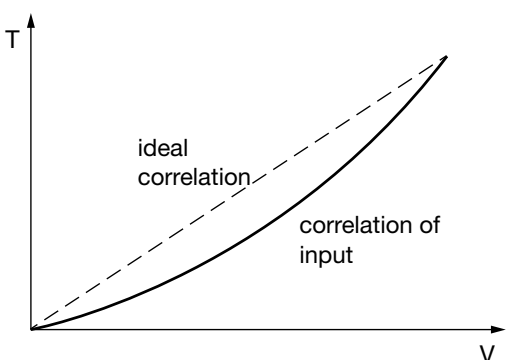
#### 4.10.4 SBR.E - Enabling SBR error

Acronym	Scrolling message	Submenu	Attributes
SBR.E	INPUT.1 (or INPUT.2) SBR ENABLE	INPUT	R W
<p>Enables open thermocouple probe error detection, also permitting infrared sensor management with maximum 4Kohm output impedance.</p> <p>This parameter only appears when a thermocouple type input is selected.</p> <p>When OFF, the parameter will be forced to ON (see options) at each Power On</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b> = Disable SBR alarm                   <b>On</b> = Enable SBR alarm                   <b>On.t</b> = Enable SBR alarm with timing</p>			

#### 4.10.5 LIN - Selecting linearization type

Acronym	Scrolling message	Submenu	Attributes
Lin	INPUT.1 (or INPUT.2 or INPUT.3) CUSTOM LINEARIZATION	INPUT	R W

The parameter sets linearization for the selected sensor type.  
The function corrects any linearity and proportionality errors in the correlation between the value sent by the input and the actual value of the physical quantity measured..



This correction can be made with two different algorithms: 32-step linearization and 4-point linearization. Values are set (33 for 32-step linearization and 4 for 4-point linearization) with the LINRZ submenu parameters.Z and LIN.4.P. submenu .

For an explanation of 4-point linearization, see “4-point input correction”.

**Unit of measurement:** -

**Options:**

- NONE** = No linearization
- 32.STP** = 32-step linearization
- 4.POIN** = 4-point linearization

#### 4.10.6 UNIT - Selecting the displayed unit of measurement

Acronym	Scrolling message	Submenu	Attributes
Unit	INPUT.1 (or INPUT.2 or INPUT.3) UNIT OF MEASURE	INPUT	R W

The parameter shows and sets the unit of measurement displayed for input in use. The unit appears on the Home.x page of the display.

For thermocouple or resistance thermometer inputs, the °C / °F selection automatically converts the temperature value; the related scale limits and setpoint limits must be set.

**Unit of measurement:** -

**Options:**

- NONE** = No unit of measurement
- °C** = Degrees Celsius
- °F** = Degrees Fahrenheit
- CUST** = Custom, settable with SuperSET

#### 4.10.7 FILT - Digital filter

Acronym	Scrolling message	Submenu	Attributes
FILT	INPUT.1 (or INPUT.2) DIGITAL FILTER	INPUT	R W

The parameter shows and sets the value of the digital filter time constant.  
With 0.00 no filter is applied.

**Unit of measurement:** Seconds

**Options:** 0.00...20.00

#### 4.10.8 FILT.D - Digital filter on PV display

Acronym	Scrolling message	Submenu	Attributes
FILT.D	INPUT.1 (or INPUT.2 or INPUT.3) DIGITAL FILTER ON DISPLAY PV	INPUT	R W
<p>The parameter shows and sets the allowed tolerance between the real PV value and the value on the PV display: if the variation in real PV is within the interval displayed value - FILT.D... displayed value + FILT.D the displayed value does not change. With 0.00 no filter is applied..</p> <p><b>Unit of measurement:</b> The one set with the Unit parameter</p> <p><b>Options:</b> 0.0...9.9</p>			

#### 4.10.9 DEC.P - Number of decimals displayed

Acronym	Scrolling message	Submenu	Attributes
DEC.P	INPUT.1 (or INPUT.2 or INPUT.3) DECIMAL POINT POSITION	INPUT	R W
<p>The parameter shows and sets the decimal point position for the process value (PV) displayed, i.e., defines its number of decimal figures.</p> <p>The number of decimal set may reduce the limits of the measurement scale used.</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...3 = Number of decimals displayed 0 / 1 = Number of decimals displayed, only for TC and RTD sensors</p>			



#### 4.10.10 LO.SCL - Lower limit of scale

Acronym	Scrolling message	Submenu	Attributes
LO.SCL	INPUT.1 (or INPUT.2 or INPUT.3) INPUT LOW LIMIT	INPUT	R W

The parameter shows and sets the lower limit of the measurement scale used for the main or auxiliary input, based on input (or sensor) type, unit of measurement, and number of decimals selected.

The upper value of LO.SCL is not limited by the value of HI.SCL.

**Unit of measurement:** The one set with the Unit parameter

**Options:** A numerical value within the temperature range of the input or sensor

Type	Unit = °C DEC.P = 0	Unit = °F DEC.P = 0		Unit = °C DEC.P = 0	Unit = °F DEC.P = 0
<b>J.TC</b>	-210...1200	-346...2192	60MV	-1999...9999	-199.9...999.9
<b>K.TC</b>	-270...1372	-454...2502	20MA	-1999...9999	-199.9...999.9
<b>R TC</b>	-50...1768	-58...3214	<b>4-20M</b>	-1999...9999	-1999...9999
<b>S TC</b>	-50...1768	-58...3214	<b>10V</b>	-1999...9999	-1999...9999
<b>T.TC</b>	-270...400	-454...752	<b>2-10V</b>	-1999...9999	-1999...9999
<b>C.TC</b>	0...2315	32...4199	<b>5V</b>	-1999...9999	-1999...9999
<b>D.TC</b>	0...2315	32...4199	<b>1-5V</b>	-1999...9999	-1999...9999
<b>B</b>	40...1820	104...3308	<b>1V</b>	-1999...9999	-1999...9999
<b>E</b>	-270...1000	-454...1832	<b>0.2-1V</b>	-1999...9999	-1999...9999
<b>L</b>	-200...900	-328...1652	<b>2.4 VHI</b>	-1999...9999	-1999...9999
<b>L-GOST</b>	-200...800	-328...1472	<b>1.2VHI</b>	-1999...9999	-1999...9999
<b>U</b>	-200...600	-328...1112	<b>C1VH</b>	-1999...9999	-1999...9999
<b>G</b>	0...2315	32...4199	<b>C.20MA</b>	-1999...9999	-1999...9999
<b>N</b>	-270...1300	-454...2372	<b>C.4-20</b>	-1999...9999	-1999...9999
<b>PT2.TC</b>	0...1888	32...3430	<b>C.10V</b>	-1999...9999	-1999...9999
<b>INFR1</b>	10...70	50...158	<b>C.2-10</b>	-1999...9999	-1999...9999
<b>INFR2</b>	60...120	140...248	<b>C.5V</b>	-1999...9999	-1999...9999
<b>INFR3</b>	115...165	239...329	<b>C.1-5V</b>	-1999...9999	-1999...9999
<b>INFR4</b>	140...260	284...500	<b>C.1V</b>	-1999...9999	-1999...9999
<b>PT100</b>	-200...850	-328...1562	<b>C.0.2-1</b>	-1999...9999	-1999...9999
<b>PT.LIM</b>	-50...250	-58...212	<b>C2.4 VH</b>	-1999...9999	-1999...9999
<b>JPT10</b>	-200...600	-328...1112	<b>C1.2VH</b>	-1999...9999	-1999...9999

#### 4.10.11 HI.SCL - Upper limit of scale

Acronym	Scrolling message	Submenu	Attributes
HI.SCL	INPUT.1 (or INPUT.2 or INPUT.3) INPUT HIGH LIMIT	INPUT	R W

The parameter shows and sets the upper limit of the measurement scale used for the main or auxiliary input, based on input (or sensor) type, unit of measurement, and number of decimals selected.

The lower value of HI.SCL is limited by the value of LO.SCL.

**Unit of measurement:** The one set with the Unit parameter

**Options:** A value in the interval corresponding to the input or sensor type (see tables for LO.SCL parameter).

#### 4.10.12 OF.SCL - Scale offset correction

Acronym	Scrolling message	Submenu	Attributes
OF.SCL	INPUT.1 (or INPUT.2 or INPUT.3) INPUT OFFSET	INPUT	R W
<p>The parameter shows and sets the offset applied to the value read in input to make it correspond to the expected value for a certain temperature. It corrects any constant read error of the sensor. This offset is applied linearly to all reads; therefore it cannot be used to correct any sensor linearity errors.</p> <p><b>Unit of measurement:</b> The one set with the Unit parameter</p> <p><b>Options:</b> -999...999</p>			

#### 4.10.13 LO.SP - Lower limit for setpoint

Acronym	Scrolling message	Submenu	Attributes
LO.SP	INPUT.1 (or INPUT.2 or INPUT.3) LOW LIMIT FOR SETPOINT	INPUT	R W
<p>The parameter shows and sets the lower limit for defining the setpoint, i.e., the minimum value for setting a setpoint.</p> <p><b>Unit of measurement:</b> The one set with the Unit parameter</p> <p><b>Options:</b> LO.SCL...HI.SCL</p>			

#### 4.10.14 HI.SP - Upper limit for setpoint

Acronym	Scrolling message	Submenu	Attributes
HI.SP	INPUT.1 (or INPUT.2) HIGH LIMIT FOR SETPOINT	INPUT	R W
<p>The parameter shows and sets the upper limit for defining the setpoint, i.e., the maximum value for setting a setpoint. The lower value of HI.SP is limited by the value of LO.SP.</p> <p><b>Unit of measurement:</b> The one set with the Unit parameter</p> <p><b>Options:</b> LO.SP...HI.SCL</p>			

#### 4.10.15 LO.AL - Lower limit for alarms

Acronym	Scrolling message	Submenu	Attributes
LO.AL	INPUT.1 (or INPUT.2 or INPUT.3 ) LOW LIMIT FOR ABSOLUTE ALARMS	INPUT	R W
<p>The parameter shows and sets the lower limit for defining alarms, i.e., the minimum value for setting an alarm.</p> <p><b>Unit of measurement:</b> The one used for the alarm limit.</p> <p><b>Options:</b> -1999...9999</p>			

#### 4.10.16 HI.AL - Upper limit for alarms

Acronym	Scrolling message	Submenu	Attributes
HI.AL	INPUT.1 (or INPUT.2 or INPUT.3) HIGH LIMIT FOR ABSOLUTE ALARMS	INPUT	R W
<p>The parameter shows and sets the upper limit for defining alarms, i.e., the maximum value for setting an alarm.</p> <p><b>Unit of measurement:</b> The one used for the alarm limit.</p> <p><b>Options:</b> -1999...9999</p>			

#### 4.10.17 MSG.LO - Selecting the message assigned to Low

Acronym	Scrolling message	Submenu	Attributes
MSG.LO	INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS LOW ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to Low (input < minimum scale limit), i.e., the scrolling message shown on the display.

As default, MSG.LO is assigned the message “1” (for LANG1 corresponds to “IN 1 (or IN 2 or IN 3) UNDER LOW LIMIT”

**Unit of measurement:** Message number

**Options:** 0...25 (with LAnG=LANG1 or LANG2 or LANG3)  
0...75 (with LAnG=NONE)

#### 4.10.18 MSG.HI - Selecting the message assigned to HIGH

Acronym	Scrolling message	Submenu	Attributes
MSG.HI	INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS HI ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to HIGH (input > maximum scale limit), i.e., the scrolling message shown on the display.

If the parameter is set to “0” no message will be displayed for Hi GH.

As default, MSG.HI is assigned the message “2” (for LANG1 corresponds to “IN 1 (or IN 2 o IN 3) OVER HIGH LIMIT ”

**Unit of measurement:** Message number

**Options:** 0...25 (with LAnG=LANG1 or LANG2 or LANG3)  
0...75 (with LAnG=NONE)

#### 4.10.19 MSG.ER - Selecting the message assigned to Err

Acronym	Scrolling message	Submenu	Attributes
MSG.ER	INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS ERR ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to Err (Pt100 in short circuit or input values below minimum limit), i.e., the scrolling message shown on the display.

As default, MSG.ER is assigned the message “3” (for LANG1 corresponds to “INPUT SENSOR 1”)

**Unit of measurement:** Message number

**Options:** 0...25 (with LAnG=LANG1 or LANG2 or LANG3)  
0...75 (with LAnG=NONE)

#### 4.10.20 MSG.SB - Selecting the message assigned to Sbr

Acronym	Scrolling message	Submenu	Attributes
MSG.SB	INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS SB ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to Err (sensor break in short circuit or input values above maximum limit), i.e., the scrolling message shown on the display.

If the parameter is set to “0” no message will be displayed for Sbr.

As default, MSG.SB is assigned the message “4” (for LANG1 corresponds to ““SENSOR BROKEN”

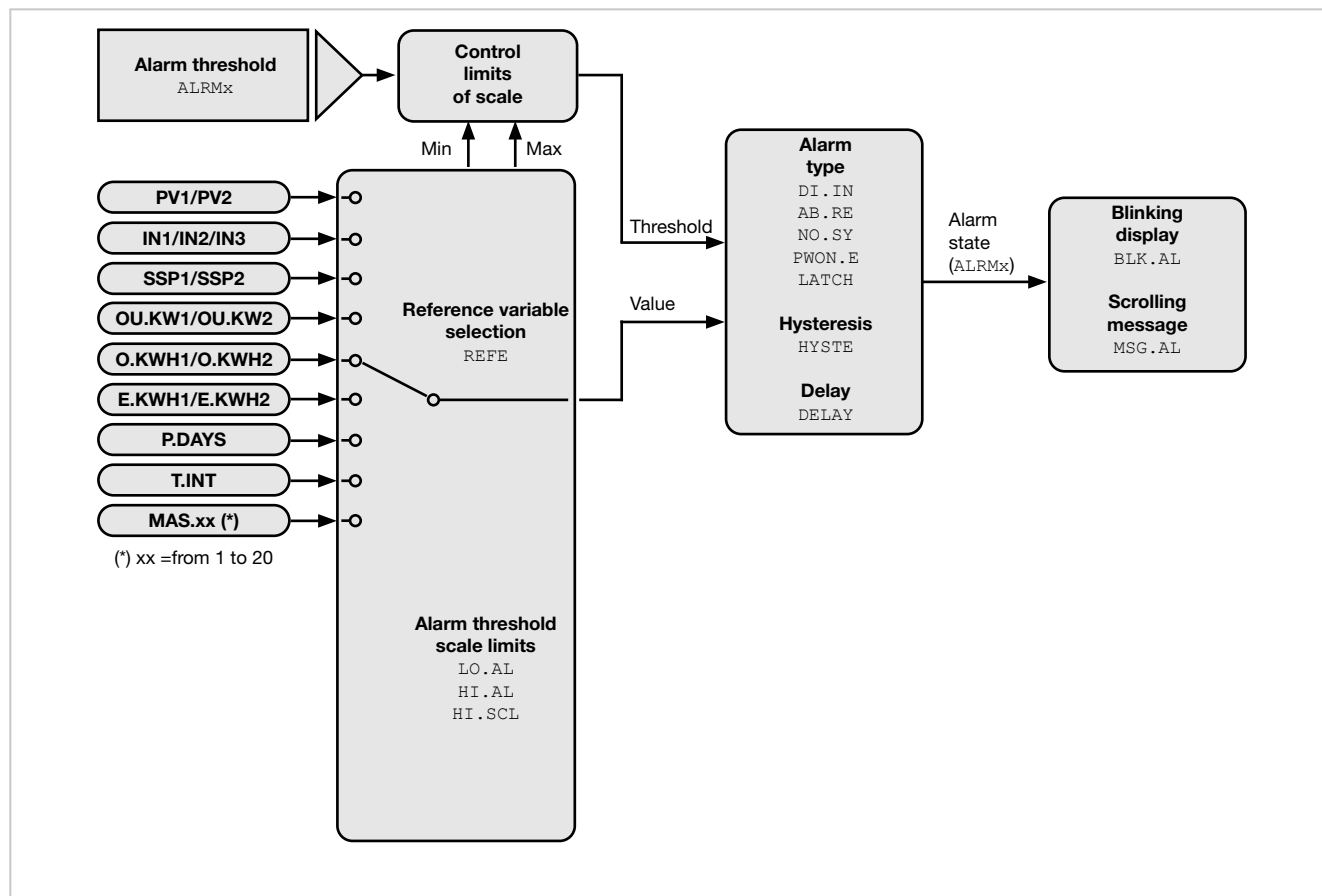
**Unit of measurement:** Number message

**Options:** 0...25 (with LAnG=LANG1 or LANG2 or LANG3)  
0...75 (with LAnG=NONE)

## 4.11 Submenu ALARM - Configuration of alarms

Acronym	Scrolling message	Password	Description
ALARM	ALARM CONFIG	Level 1	Lets you configure the generic alarms.

### 4.11.1 Functional diagram



### 4.11.2 ALRM.N -Selecting the alarm to be configured

Acronym	Scrolling message	Submenu	Attributes
ALRM.N	ALARM NUMBER	ALARM	R W

The parameter shows and sets the alarm to be configured, identified by its number.

**Unit of measurement:** Number

**Options:** 1...ALRM.N = Identifying number of alarm, where ALRM.N is the total number of alarms, setting by submenu MODE..

### 4.11.3 REFE - Selecting the alarm reference

Acronym	Scrolling message	Submenu	Attributes
REFE	ALARM.1 (or ALARM.2...ALARM.4) SELECTING REFERENCE SIGNAL	ALARM	R W
<p>The parameter shows and sets the reference of alarm number “x” selected with the previous parameter ALARM, where the reference can be an input or value to be monitored.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <p><b>PV1</b> = Process variable for PID.1</p> <p>if model with auxiliary input:</p> <p><b>IN2</b> = Auxiliary input</p> <p><b>SSP1</b> = Active Setpoint for PID.1</p> <p>if energy count function is enabled in MODE.1:</p> <p><b>OU.KW1</b> = Power transferred to the load ENERG.1</p> <p><b>O.KWH1</b> = Energy transferred to load ENERG.1</p> <p><b>E.KWH1</b> = Totalizer of energy transferred to load ENERG.1</p> <p><b>T.INT</b> = Temperatura interna</p> <p><b>IN1</b> = Main input</p> <p><b>P.DAYS</b> = Partial working days</p> <p><i>if PID2.E function is enabled in EN.FUN:</i></p> <p><b>PV2</b> = Process variable PID.2</p> <p><b>SSP2</b> = Active Setpoint for PID.2</p> <p><i>if energy count function is enabled in MODE.2:</i></p> <p><b>OU.KW2</b> = Power transferred to load ENERG.2</p> <p><b>O.KWH2</b> = Energy transferred to load ENERG.2</p> <p><b>E.KWH2</b> = Totalizer of energy transferred to load ENERG.2</p> <p><i>if model with auxiliary input 2:</i></p> <p><b>IN3</b> = Auxiliary input 2</p> <p><i>if model with Master Modbus serial and Master parameter configured::</i></p> <p><b>MAS.01</b> = Master Value 1</p> <p><b>MAS.02</b> = Master Value 2</p> <p><b>MAS.03</b> = Master Value 3</p> <p><b>MAS.04</b> = Master Value 4</p> <p><b>MAS.05</b> = Master Value 5</p> <p><b>MAS.06</b> = Master Value 6</p> <p><b>MAS.07</b> = Master Value 7</p> <p><b>MAS.08</b> = Master Value 8</p> <p><b>MAS.09</b> = Master Value 9</p> <p><b>MAS.10</b> = Master Value 10</p> <p><b>MAS.11</b> = Master Value 11</p> <p><b>MAS.12</b> = Master Value 12</p> <p><b>MAS.13</b> = Master Value 13</p> <p><b>MAS.14</b> = Master Value 14</p> <p><b>MAS.15</b> = Master Value 15</p> <p><b>MAS.16</b> = Master Value 16</p> <p><b>MAS.17</b> = Master Value 17</p> <p><b>MAS.18</b> = Master Value 18</p> <p><b>MAS.19</b> = Master Value 19</p> <p><b>MAS.20</b> = Master Value 20</p> <p><b>CARBO</b> = Percent Carbon</p> <p><b>DEWP</b> = DEWPOINT</p> <p><b>IMPED</b> = Probe impedance</p> <p><b>MV</b></p> <p><b>OXY</b> = Oxygen</p>			

#### 4.11.4 DI.IN - Selecting direct or inverse alarm

Acronym	Scrolling message	Submenu	Attributes
di.in	ALARM.1 (or ALARM.2...ALARM.4) DIRECT/INVERSE DEFINITION	ALARM	R W
<p>The parameter shows and sets the behavior of alarm number “x” with respect to the alarm limit and hysteresis. Direct or inverse defines when the alarm has to trip. For a detailed explanation of this behavior, see “AL1...AL4 Generic alarms” .</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>DIREC</b> = Direct Alarm                   <b>INVRS</b> = Inverse Alarm</p>			

#### 4.11.5 AB.RE - Selecting absolute or deviation alarm

Acronym	Scrolling message	Submenu	Attributes
Ab.rE	ALARM.1 (or ALARM.2...ALARM.4) ABSOLUTE/RELATIVE DEFINITION	ALARM	R W
<p>The parameter shows and defines the reference value of alarm number “x” for the alarm limit. For a detailed explanation of the difference between absolute and deviation, see “AL1...AL4 Generic alarms”</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>ABSLT</b> = Absolute alarm                   <b>RELAT</b> = Deviation alarm</p>			

#### 4.11.6 NO.SY - Method for applying hysteresis

Acronym	Scrolling message	Submenu	Attributes
no.SY	ALARM.1 (or ALARM.2...ALARM.4) NORMAL/SYMMETRIC DEFINITION	ALARM	R W
<p>The parameter shows and sets the method for applying hysteresis for alarm number “x” with respect to the alarm limit value. With normal, hysteresis is added to / subtracted from the alarm limit(s) based on the general alarm configuration. With symmetrical, hysteresis is added to / subtracted from the alarm limit itself. For a detailed explanation of the difference between normal and symmetrical, see “AL1...AL4 Generic alarms”</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>NORML</b> = Normal alarm                   <b>SYMMT</b> = Symmetrical alarm (window)</p>			

#### 4.11.7 PWON.E - Disabling the alarm at power-on

Acronym	Scrolling message	Submenu	Attributes
PWON.E	ALARM.1 (or ALARM.2...ALARM.4) DISABLE AT SWITCH ON	ALARM	R W
<p>The parameter shows and sets the behavior of the alarm (being configured) when the controller is powered on. If the parameter is “OFF,” the alarm will trip when the controller is powered on if the process variable exceeds the alarm setpoint limits. If the parameter is “On,” the alarm will not trip until the alarm limit value is reached at least once after the controller is powered on.</p> <p>ATTENTION! The setpoint can be reached in increment or in decrement, or it may never be reached. Therefore, with “On” the alarm might never trip even if the value of the process variable exceeds the alarm setpoint limits.</p> <p><b>Example – Minimum, inverse and absolute alarm</b> When the system is off, the process variable equals room temperature (20 °C). The alarm setpoint is set at 150°C ± 10°C. The controller powers on with the system. So with “OFF” the alarm trips as soon as the controller is powered on because the temperature of the process variable exceeds the alarm setpoint limits. Instead, with “On” the alarm trips only after the temperature of 150°C is reached at least once for the process variable.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b> = Alarm enabled at power-on                   <b>On</b> = Alarm disabled at power-on (until setpoint is reached)</p>			

#### 4.11.8 SP1C.E - Disabling alarm on Setpoint1 change

Acronym	Scrolling message	Submenu	Attributes
SP1C.E	ALARM.1 (o ALARM.2...ALARM.4) DISABLE AT SETP1 CHANGE	ALARM	R/W
<p>The parameter shows and sets the behaviour of the alarm when the SETP of PID1 is changed, for the alarm being configured. Setting the parameter from OFF to ON takes effect at the next setpoint change and masks the alarm.</p> <p>Example ALARM.1 set as Direct Alarm, Absolute, Normal on PV1 with PV1 = 43 and ALARM.1 = 26 (alarm is active)</p> <p>If SP1C.E = OFF and the SETP of PID1 changes, the alarm remains active. If SP1C.E = On and the SETP of PID1 changes, the alarm is inhibited; at this point, if PV1 falls below ALARM.1 and then rises again, with the same SETP, the alarm becomes active again, until the next SETP change</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b>     = Alarm enabled on SETP1 change                          <b>On</b>       = Alarm disabled on SETP1 change</p>			

#### 4.11.9 SP1.TM\_1 - Smart alarm 1

Acronym	Scrolling message	Submenu	Attributes
SP1.TM_1	ALARM 1 TIMEOUT SETPOINT 1 CHANGE	ALARM	R/W
<p>The parameter shows and sets the duration to wait for the PV to come within band after a setpoint change before re-enabling the alarm.</p> <p>Example If SP1.TM_1 = 600, and SP1C.E = ON, the alarm will become active if PV has not come into band within 10 minutes time.</p> <p><b>Unit of measurement:</b>   Seconds</p> <p><b>Options:</b>                0...5999</p>			

#### 4.11.10 SP2.TM\_1 - Smart alarm 2

Acronym	Scrolling message	Submenu	Attributes
SP2.TM_1	ALARM 2 TIMEOUT SETPOINT 1 CHANGE	ALARM	R/W
<p>The parameter shows and sets the duration to wait for the PV to come within band after a setpoint change before re-enabling the alarm.</p> <p>Example If SP2.TM_1 = 600, and SP2C.E = ON, the alarm will become active if PV has not come into band within 10 minutes time.</p> <p><b>Unit of measurement:</b>   Seconds</p> <p><b>Options:</b>                0...5999</p>			

#### 4.11.11 LATCH - Memorizing the alarm

Acronym	Scrolling message	Submenu	Attributes
LATCH	ALARM.1 (or ALARM.2...ALARM.4) MEMORY DEFINITION	ALARM	R W
<p>The parameter shows and sets enabling of memorization of the alarm being configured. Memorization maintains the active alarm state even after the alarm conditions are eliminated. The alarm state can be deleted by from the digital input, serial input, or key.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b>     = Alarm not latched                          <b>On</b>       = Alarm latched</p>			

#### 4.11.12 HYTE - Hysteresis

Acronym	Scrolling message	Submenu	Attributes
HYSTE	ALARM.1 (or ALARM.2...ALARM.4) HYSTERESIS	ALARM	R W

The parameter shows and sets the hysteresis applied to the alarm setpoint value for the alarm being configured.

**Unit of measurement:** Scale points

**Options:**            **0...999**        = For absolute (A.r.x = ABSLT) and symmetrical alarm (n.S.x = SYMMT)  
                         **-999...999**    = For other types of alarms

#### 4.11.13 DELAY - Alarm trip delay

Acronym	Scrolling message	Submenu	Attributes
DELAY	ALARM.1 (or ALARM.2...ALARM.4) DELAY OF ACTIVATION	ALARM	R W

The parameter shows and sets the alarm trip delay for the alarm being configured, i.e., the time that the value of the process variable has to exceed the alarm setpoint for the alarm to trip.

This parameter prevents repeated alarms due to instantaneous and insignificant exceeding of that value.

If the parameter is set to "0.00" the alarm will be instantaneous, regardless of the time in which the process variable exceeds the alarm setpoint.

For a detailed explanation of this behavior, see "AL1...AL4 Generic alarms" .

**Unit of measurement:** Minutes.seconds

**Options:**            **0.00...99.59**

#### 4.11.14 MSG.AL - Message associated with tripping of alarm

Acronym	Scrolling message	Submenu	Attributes
MSG.AL	ALARM.1 (or ALARM.2...ALARM.4) SCROLLING MESSAGE AT ALARM ACT	ALARM	R W

The parameter shows and sets the number of the message associated with tripping of the alarm being configured, i.e., the scrolling message shown on the display.

For more information on scrolling messages, see "AL1...AL4 Generic alarms"

If the parameter is set to "0" no message will be displayed when the alarm trips.

The same message number can be assigned to different alarms

**Unit of measurement:** Message number

**Options:**            **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**  
                         **0...75 (with LAnG=NONE)**

#### 4.11.15 BLK.AL - Flashing of PV display

Acronym	Scrolling message	Submenu	Attributes
BLK.AL	ALARM.1 (or ALARM.2...ALARM.4) BLINK DISPLAY PV DEF	ALARM	R W

The parameter shows and sets the flashing of the PV display in case of alarm, for the alarm being configured.

If the parameter is "On," the value shown on the PV display starts to flash in case of alarm.

**Unit of measurement:** -

**Options:**            **OFF**        = PV display does not flash in case of alarm  
                         **On**         = PV display flashes in case of alarm



## 4.12 Submenu PID - Configuring control parameters

Acronym	Scrolling message	Password	Description
PID	PID CONFIG	Level 1	Lets you configure the control parameters.

### 4.12.1 CNTR - Selecting type of control

Acronym	Scrolling message	Submenu	Attributes
Cntr	PID.1 (or PID.2) TYPE OF CONTROL	PID	R W
The parameter shows and sets the type control performed by the controller. For more information on the control function, see “Controls”			
<b>Unit of measurement:</b> -			
<b>Options:</b>			
<b>H.PROP</b>	=	Proportional incr	
<b>H.PI</b>	=	Proportional/integral incr	
<b>H.PID</b>	=	Proportional integral/derivative incr	
<b>C.PROP</b>	=	Proportional decr	
<b>C.PI</b>	=	Proportional/integral decr	
<b>C.PID</b>	=	Proportional integral/derivative decr	
<b>HC.P</b>	=	Proportional incr/decr	
<b>HC.PI</b>	=	Proportional/integral incr/decr	
<b>HC.PID</b>	=	Proportional integral/derivative incr/decr	
<b>H.ONOF</b>	=	incr ON-OFF	
<b>C.ONOF</b>	=	decr ON-OFF	
<b>HC.ONO</b>	=	incr/cooling ON-OFF	
<b>HP.CON</b>	=	PID incr / decr ON-OFF	
<b>HON.CP</b>	=	incr ON-OFF / PID decr	
<b>PID.RG</b>	=	incr / PID decr with relative gain	

### 4.12.2 DERVS - Derivative sampling time

Acronym	Scrolling message	Submenu	Attributes
DERV.S	PID.1 (or PID.2) DERIVATIVE SAMPLE TIME	PID	R W
<p>The parameter shows and sets the derivative sampling time.</p> <p>The parameter is shown if the derivative action was enabled with parameter Cntr.</p> <p><b>Unit of measurement:</b>    Seconds</p> <p><b>Options:</b>                    0.240</p> <p>                                  1</p> <p>                                  4</p> <p>                                  8</p>			

#### 4.12.3 H.PB - Proportional increase band or hysteresis in ON-OFF control

Acronym	Scrolling message	Submenu	Attributes
H.PB	PID.1 (or PID.2) INCREASE PROPORTIONAL BAND OR ON/OFF HYST	PID	R W
The parameter shows and sets the proportional incr band or hysteresis in the ON-OFF control, calculated as a percentage of full scale of the main or auxiliary input.  <b>Unit of measurement:</b> %			
<b>Options:</b> 0.0...999.9			

#### 4.12.4 H.IT - Integral increase time

Acronym	Scrolling message	Submenu	Attributes
H.IT	PID.1 (or PID.2) INCREASE INTEGRAL TIME	PID	R W
The parameter shows and sets the integral incr time.  <b>Unit of measurement:</b> Minutes			
<b>Options:</b> 0.00...99.99			

#### 4.12.5 C.PB - Proportional decrease band or hysteresis in ON-OFF control

Acronym	Scrolling message	Submenu	Attributes
C.PB	PID.1 (or PID.2) DECREASE PROPORTIONAL BAND OR ON/OFF HYST	PID	R W
The parameter shows and sets the proportional decr band or hysteresis in the ON-OFF control, calculated as a percentage of full scale of the main or auxiliary input.  <b>Unit of measurement:</b> %			
<b>Options:</b> 0.0...999.9			

#### 4.12.6 C.IT - Integral decrease time

Acronym	Scrolling message	Submenu	Attributes
C.IT	PID.1 (or PID.2) DECREASE INTEGRAL TIME	PID	R W
The parameter shows and sets the integral decr time.  <b>Unit of measurement:</b> Minutes			
<b>Options:</b> 0.00...99.99			

#### 4.12.7 RESET - Manual reset

Acronym	Scrolling message	Submenu	Attributes
RESET	PID.1 (or PID.2) MANUAL RESET	PID	R W
<p>The parameter shows and sets the Manual reset value, i.e., the value which, when added to setpoint, becomes the reference for the control. It is useful in a PID control with non-variable setpoint to compensate the error at full scale.</p> <p><b>Unit of measurement:</b> Scale points of main or auxiliary input</p> <p><b>Options:</b> -999...999</p>			

#### 4.12.8 P.RST - Power reset

Acronym	Scrolling message	Submenu	Attributes
P.RST	PID.1 (or PID.2) RESET POWER	PID	R W
<p>The parameter shows and sets the Reset power value, i.e., the value added to the control power. For example, in proportional control it corresponds to the output at zero value (PV = SV).</p> <p><b>Unit of measurement:</b> %</p> <p><b>Options:</b> -100.0...100.0</p>			

#### 4.12.9 A.RST - Antireset

Acronym	Scrolling message	Submenu	Attributes
A.RST	PID.1 (or PID.2) ANTIRESET	PID	R W
<p>The parameter shows and sets the Antireset value. If set to other than "0", it defines band width (below the setpoint if incr, above the setpoint if decr) within which the integral action is applied, if provided (PI or PID control).</p> <p><b>Unit of measurement:</b> Scale points of main or auxiliary input</p> <p><b>Options:</b> 0...9999</p>			

#### 4.12.10 FEEDF - Feedforward power

Acronym	Scrolling message	Submenu	Attributes
FEEDF	PID.1 (or PID.2) FEEDFORWARD	PID	R W
<p>The parameter shows and sets the feedforward power value, i.e., the value that generates an additional factor at the control output based on the setpoint value.</p> $U = \frac{\text{setpoint} - \text{end of scale} - \text{start of scale}}{\text{end of scale} - \text{start of scale}} \times \frac{\text{FEEDF}}{100.0}$ <p><b>Unit of measurement:</b> %</p> <p><b>Options:</b> -100.0...100.0</p>			

#### 4.12.11 DEAD.B - Deadband

Acronym	Scrolling message	Submenu	Attributes
DEAD.B	PID.1 (or PID.2) DEAD BAND	PID	R W
<p>The parameter shows and sets the deadband. The deadband is symmetrical to the setpoint. If the process value (PV) stays in this band, the control output keeps the required power value constant.</p> <p><b>Unit of measurement:</b> Scale points of main or auxiliary input.</p> <p><b>Options:</b> 0...999</p>			

NOTE: To access the following submenus, you will need to provide a Level 2 Passcode.

## 4.13 Submenu IN.DIG - Configuring digital inputs

Acronym	Scrolling message	Password	Description
IN.DIG	DIGITAL INPUT CONFIG	Level 2	Lets you configure the controller's digital inputs. The menu is present if there are digital inputs.

### 4.13.1 I.DIG.N - Selecting the digital input

Acronym	Scrolling message	Submenu	Attributes
I.DIG.N	DIGITAL INPUT NUMBER	IN.DIG	R W

The parameter shows and sets the identifying number of the digital input to be configured.

**Unit of measurement:** Number

**Options:** 1...5 for AC50 models with 5 digital inputs option

### 4.13.2 STAT - Defining the input state

Acronym	Scrolling message	Submenu	Attributes
StAt	IN.DIG.1 (o IN.DIG.2 ... IN.DIG.5) DIGITAL INPUT STATUS	IN.DIG	R W

The parameter shows and sets the state of the input with identifying number "x".  
The direct digital input is active when there is current in the digital input or the contact is closed.  
The inverse digital input is active when there is no current in the digital input or the contact is open.  
Digital inputs can be forced so that they are always on or off.

**Unit of measurement:** -

**Options:**

- DIREC** = Direct digital input
- INVRs** = Inverse digital input
- OFF** = Digital input forced off
- ON** = Digital input forced on

### 4.13.3 F.IN - Selecting the assigned function

Acronym	Scrolling message	Submenu	Attributes
F.in	IN.DIG.1 (o IN.DIG.2 ... IN.DIG.5) DIGITAL INPUT FUNCTION	IN.DIG	R W

The parameter shows and sets the function assigned to the digital input with identifying number "x".

**Unit of measurement:** -

**Options:**

- NONE** = No assigned function
- AU.MA1** = Automatic-Manual control for PID.1
- LO.RE1** = Local-Remote setpoint mode for PID.1
- HOLD1** = IN.1 Hold value of main input
- AL.ACK** = Reset alarm latches
- S.TUN1** = Activate Self-Tuning for PID.1
- A.TUN1** = Activate Auto-Tuning for PID.1
- ON-OFF** = Software ON-OFF
- FKEY** = Blockkey
- WRI.EN** = Enable writing of configuration parameters
- if the Timer function is enabled in MODE.1:*
  - T.STS1** = START/STOP timer TIMER.1
  - T.RST1** = RESET timer TIMER.1
- if PID2.E function is enabled in EN.FUN:*
  - AU.MA2** = Automatic-Manual control for PID.2
  - LO.RE2** = Local-Remote setpoint mode for PID.2
  - HOLD2** = Hold value of input IN.2
  - S.TUN2** = Activate Self-Tuning for PID.2
  - A.TUN2** = Activate Auto-Tuning for PID.2
- if the Timer function is enabled in MODE.2:*
  - T.STS2** = START/STOP timer TIMER.2
  - T.RST2** = RESET timer TIMER.

*If valve model with auxiliary input present, function FUnC=VALV.P and custom linear type, and with one output configured as V.OPEN and one configured as V.CLOS:*

**VALV.P** = Auxiliary input calibratoin

*if valve model:*

**V.END.O** = Valve opening limit stop

**V.END.C** = Valve closing limit stop

**B.STRT** = BURNOFF Start"/>

**B.ABOR** = BURNOFF Abort"/>

**B.ST.AB** = BURNOFF Start/Abort"/>

**D.STRT** = DIAGNO Start"/>

**D.ABOR** = DIAGNO Abort"/>

**D.ST.AB** = DIAGNO Start/Abort"/>

**B.AUTO** = Automatic Burnoff"/>

**D.AUTO** = Automatic Diagno"/>

**PCO.R** = PCO Local/Remote"/>

**PH2.R** = PH2 Local/Remote"/>

#### 4.13.4 MSG.IN - Selecting the digital input message

Acronym	Scrolling message	Submenu	Attributes
MSG.IN	IN.DIG.1 (o IN.DIG.2 ... IN.DIG.5) NUMBER OF SCROLLING MESSAGE AT INPUT ACT	IN.DIG	R W

The parameter shows and sets the number of the message assigned to activation of the digital input, i.e., the scrolling message shown on the display.  
For more information on scrolling messages, see "Scrolling messages".  
If the parameter is set to "0" no message will be displayed when the digital input is activated.  
The same message number can be assigned to different inputs.

**Unit of measurement:** Message identification number

**Options:** 0...25 (with LAnG=LANG1 or LANG2 or LANG3)  
0...75 (with LAnG=NONE)

## 4.14 Submenu OUTPU - Configuring outputs

Acronym	Scrolling message	Password	Description
OUTPU	OUTPUT CONFIG	Level 2	Lets you configure the controller outputs.

### 4.14.1 OUT.N - Selecting the output

Acronym	Scrolling message	Submenu	Attributes
OUT.N	OUTPUT NUMBER	OUTPU	R W

The parameter shows and sets the identifying number of the output to be configured.

**Unit of measurement:** Number

**Options:** 1...6

### 4.14.2 STAT - Defining the output state

Acronym	Scrolling message	Submenu	Attributes
StAt	OUTPU.1 (o OUTPU.2... OUTPU.6) DIGITAL OUTPUT STATUS	OUTPU	R W

The parameter shows and sets the state of the output with identifying number "x".  
The active direct output corresponds to the relay ON (conducting).  
The active inverse output corresponds to the relay output OFF.  
The outputs can be forced so that they are always on or off.

If the VT1, option is present, the parameter is ON.

**Unit of measurement:** -

**Options:**       **DIREC** = Direct output  
                  **INVRS** = Inverse output  
                  **OFF** = Output forced off  
                  **ON** = Output forced on

### 4.14.3 F.OUT - Selecting the function assigned to relay

Acronym	Scrolling message	Submenu	Attributes
F.out	OUTPU.1 (o OUTPU.2... OUTPU.6) OUTPUT FUNCTION	OUTPU	R W

The parameter shows and sets the function assigned to the output with identifying number "x", if the output is relay

**Unit of measurement:** -

**Options:**       **NONE** = No assigned function  
                  **INCR1** = Incr/Enrichment control output of PID.1  
                  **DECR1** = Decr/impoverishment air control output of PID.1  
                  **ALRM1** = Output for Alarm 1  
                  **ALRM2** = Output for Alarm 2  
                  **ALRM3** = Output for Alarm 3  
                  **ALRM4** = Output for Alarm 4  
                  **OR.12** = Alarm 1 OR Alarm 2  
                  **OR.123** = Alarm 1 OR Alarm 2 OR Alarm 3  
                  **O.1234** = Alarm 1 OR Alarm 2 OR Alarm 3 OR Alarm 4  
                  **AND.12** = Alarm 1 AND Alarm 2  
                  **AN.123** = Alarm 1 AND Alarm 2 AND Alarm 3  
                  **A.1234** = Alarm 1 AND Alarm 2 AND Alarm 3 AND Alarm 4

**LBA1** = Output for LBA alarm of PID.1

**BUT.SR** = Set/Reset from key

*if the Timer function is enabled in MODE.1:*

**TIMR1** = Timer state (end of count)

*if model with valve control:*

**V.OPEN** = Output for the opening of the valve

**V.CLOS** = Output for the closure of the valve

*if model with digital inputs:*

**IN.DIG** = Repetition of a digital input

**POWR1** = Output for PID.1 power alarm

*if PID2.E function is enabled in EN.FUN:*

**INCR2** = PID.2 incr control output

**DECR2** = PID.2 decr control output

**LBA2** = PID.2 LBA alarm output

**POWR2** = Output for PID.2 power alarm

*if the Timer function is enabled in MODE.2:*

**TIMR2** = TIMER.2 timer state (end count)

*if model with Master Modbus serial (except output 1) and at least one Master parameter configured as MASTER:*

**MASTER** = Master value (for type provided to word only) (index no. to be specified in MAST.N)

*Functions associated with Zirconium probe diagnostics*

*if valve model:*

**V.END.O** = End of valve stroke when opening

**V.END.C** = End of valve stroke when closed

**B.STRT** = BURNOFF Start"/>

**B.ABOR** = BURNOFF Abort"/>

**B.ST.AB** = BURNOFF Start/Abort"/>

**D.STRT** = DIAGNO Start"/>

**D.ABOR** = DIAGNO Abort"/>

**D.ST.AB** = DIAGNO Start/Abort"/>

**B.AUTO** = Automatic Burnoff"/>

**D.AUTO** = Automatic Diagno"/>

**PCO.R** = PCO Local/Remote"/>

**PH2.R** = PH2 Local/Remote"/>

#### 4.14.4 SWTCH - Setting the number of switchings for signal

Acronym	Scrolling message	Submenu	Attributes
SWTCH	OUTPU.1 (or OUTPU.2 ... OUTPU.4) NUMBER OF SWITCHING CYCLES	OUTPU	R W

The parameter shows and sets the number of switchings (x1000) of the relay, exceeding which the signal is generated OUTX.SWITCH ALARM where X is the number of output 1 or 2 or 3 or 4  
The function is disabled if the parameter equals "0".  
CAUTION: The minimum counting unit is 1000 ON-OFF switching operations. The alarm is therefore triggered for values strictly greater than the set SWTCH parameter (e.g. if SWTCH is set to 1, the alarm is not triggered at 1000 + 1 switches, but at 1000 + 1000 switches = 2000).

**Unit of measurement:** Number

**Options:** 0...9999

#### 4.14.5 FAULT - State of output with broken input

Acronym	Scrolling message	Submenu	Attributes
FAULT	OUTPU.1 (or OUTPU.2 ... OUTPU.6) FAULT OUTPUT STATE	OUTPU	R W

The parameter shows and sets the state (ON, OFF) that the output assumes in case of sensor fault (Err, Sbr, ...), on main input IN.1 or auxiliary input IN.2, if the output is direct or inverse and automatic operation mode.

**Unit of measurement:** -

**Options:**

- OFF.1** = Output OFF in case of fault on main input IN.1
- On.1** = Output ON in case of fault on main input IN.1
- nOnE** = Output continues to function normally

*if the model with auxiliary input:*

- OFF.2** = Output OFF in case of fault on auxiliary input IN.2
- On.2** = Output ON in case of fault on auxiliary input IN.2
- OF.12** = Output OFF in case of fault on input IN.1 or IN.2
- On.12** = Output ON in case of fault on input IN.1 or IN.2

#### 4.14.6 MSG.OU - Selecting the output message

Acronym	Scrolling message	Submenu	Attributes
MSG.OU	OUTPU.1 (or OUTPU.2 ... OUTPU.6) NUMBER OF SCROLLING MESSAGE AT OUTPUT ACT	OUTPU	R W

The parameter shows and sets the number of the message assigned to activation of the output, i.e., the scrolling message shown on the display.  
For more information on scrolling messages, see "3.1.2.2. Scrolling messages".  
If the parameter is set to "0" no message will be displayed when the output is activated.  
The same message number can be assigned to different outputs.

**Unit of measurement:** Message number

**Options:** 0...25 (with LAnG=LANG1 or LANG2 or LANG3)  
0...75 (with LAnG=NONE)

#### 4.14.7 CY.TIM - Cycle time of output

Acronym	Scrolling message	Submenu	Attributes
CY.TIM	OUTPU.1 (o OUTPU.2 ... OUTPU.6) CYCLE TIME	OUTPU	R W

The parameter shows and sets the slicing period of the output.  
The parameter appears if the parameter F.ou.x = INCR1, INCR2 or F.ou.x = DECR1, DECR2.

The slicing period is the cycle time, i.e., the sum of ON time and OFF time proportional to the value of Heat or Cool power.

Burst Firing (BF) mode has a variable cycle time, optimized to transfer power as quickly as possible.  
The minimum interval for ON or OFF equals the electrical cycle (20 ms at 50 Hz).  
The ON and OFF times are multiples of the minimum time.

**Example**  
If Incr power is 25% and the line frequency is 50 Hz, the cycle time is 80 ms. The output is active for 20 ms and inactive for 60 ms (= 3 × 20 ms, equal to the remaining 75% of the cycle time).

**Unit of measurement:** Seconds

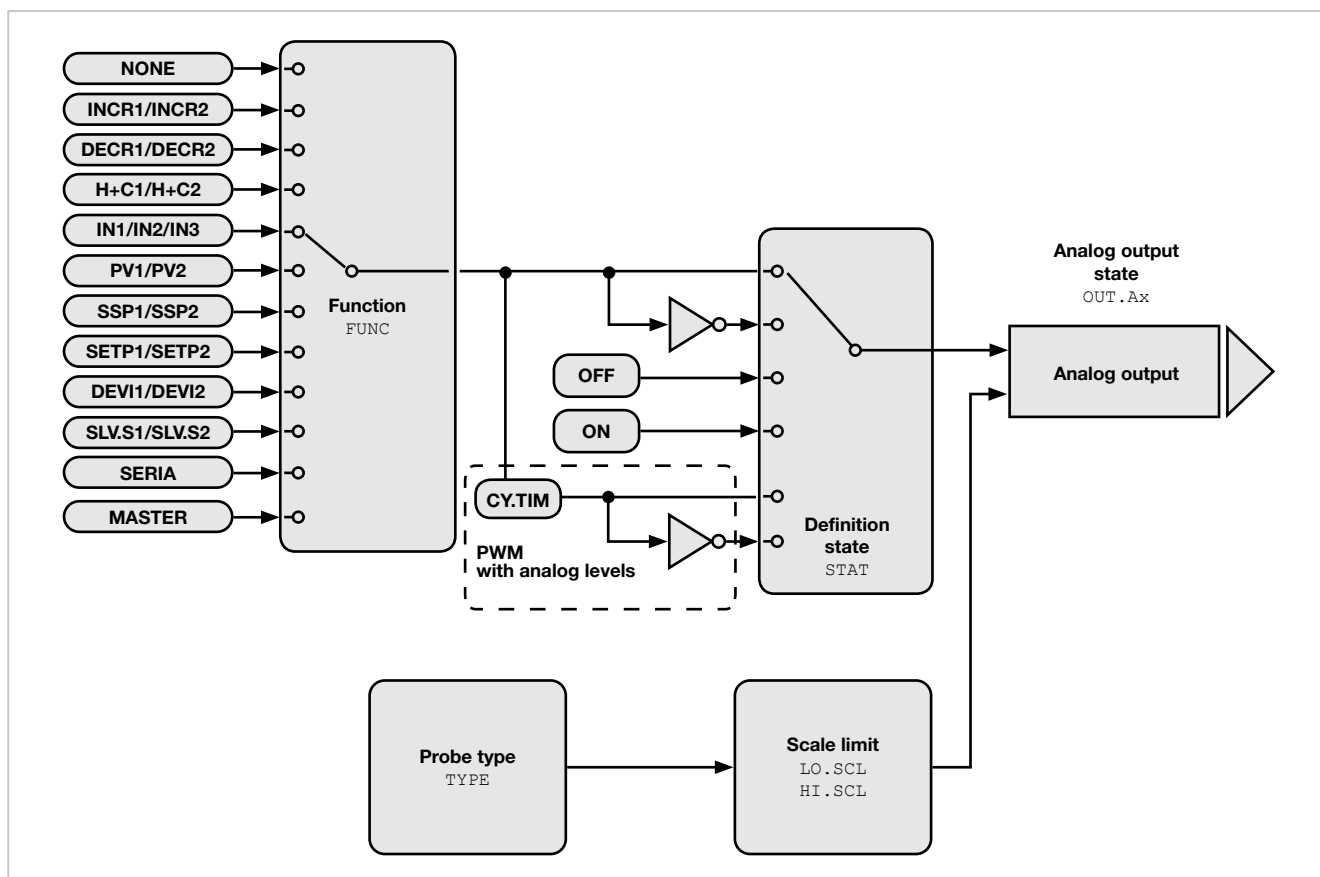
**Options:** 1...200 for relay output



## 4.15 Submenu OUT.AN - Configuring the analog retransmission output

Acronym	Scrolling message	Password	Description
OUT.AN	ANALOG RETRANSMISSION OUTPUT CONFIG	Level 2	Lets you configure the analog output used for retransmission of analog values.  The submenu appears if the analog retransmission output is present on the controller.

### 4.15.1 Functional diagram



### 4.15.2 OU.AN.N - Selecting the output

Acronym	Scrolling message	Submenu	Attributes
OU.AN.N	ANALOG OUTPUT NUMBER	OUT.AN	R W
The parameter shows and sets the identifying number of the output to be configured.			
<b>Unit of measurement:</b> Number			
<b>Options:</b> 1...2			

#### 4.15.3 STAT - Defining the state of the analog output

Acronym	Scrolling message	Submenu	Attributes
StAt	OUT.AN.1 (o OUT.AN.2) ANALOG OUTPUT STATUS	OUT.AN	R W
<p>The parameter shows and sets the state of analog retransmission output A1 or A2.  The active direct output corresponds to minimum with the minimum output value in voltage or current.  The active inverse output corresponds to minimum with the maximum output value in voltage or current.  The outputs can be forced so that they are always on or off.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <ul style="list-style-type: none"> <li><b>DIREC</b> = Direct output</li> <li><b>INVRS</b> = Inverse output</li> <li><b>OFF</b> = Forced output inactive (minimum voltage or current value)</li> <li><b>ON</b> = Forced output active (maximum voltage or current value)</li> <li><b>DI.PWM</b> = Direct output with partialisation of ON/OFF and cycle time CY.TIM</li> <li><b>IN.PWM</b> = Inverse output with partialisation of ON/OFF and cycle time CY.TIM</li> </ul>			

#### 4.15.4 TYPE - Defining the type of analog output

Acronym	Scrolling message	Submenu	Attributes
tYPE	OUT.AN.1 (o OUT.AN.2) ANALOG OUTPUT TYPE	OUT.AN	R W
<p>The parameter shows and sets the definition of analog output A1 or A2.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <ul style="list-style-type: none"> <li><b>20MA</b> = 0...20 mA Output</li> <li><b>4-20M</b> = 4...20 mA Output</li> <li><b>10V</b> = 0...10 V Output</li> <li><b>2-10V</b> = 2...10 V Output</li> <li><b>C.20MA</b> = 0...20 mA Custom output</li> <li><b>C.4-20</b> = 4...20 mA Custom output</li> <li><b>C.10V</b> = 0...10 V Custom output</li> <li><b>C.2-10</b> = 2...10 V Custom output</li> </ul>			

#### 4.15.5 FUNC - Selecting the function assigned to the analog output

Acronym	Scrolling message	Submenu	Attributes
FuNC	OUT.AN.1 (o OUT.AN.2) REFERENCE SIGNAL ANALOG OUTPUT	OUT.AN	R W
<p>The parameter shows and sets the function assigned (retransmission of values) to analog output A1 or A2.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <ul style="list-style-type: none"> <li><b>NONE</b> = No assigned function</li> <li><b>INCR1</b> = Incr control power of PID.1</li> <li><b>DECR1</b> = Decr control power of PID.1</li> <li><b>PV1</b> = Process variable 1</li> <li><b>SSP1</b> = Active setpoint of PID.1</li> </ul> <p><i>if PID2.E function is enabled in EN.FUN:</i></p> <ul style="list-style-type: none"> <li><b>INCR2</b> = PID.2 Incr control output</li> <li><b>DECR2</b> = PID.2 Decr control output</li> <li><b>H+C2</b> = PID.2 heat/cool control output</li> <li><b>PV2</b> = Process variable 2</li> </ul>			

#### 4.15.6 LO.SCL - Scale minimum

Acronym	Scrolling message	Submenu	Attributes
LO.SCL	OUT.AN.1 (o OUT.AN.2) LOW LIMIT ANALOG OUTPUT	OUT.AN	R W
<p>The parameter shows and sets the scale minimum, which corresponds to minimum output value in voltage or current. Each time you set the power control output on parameter FuNC, the parameter value is forced to 0.</p> <p><b>Unit of measurement:</b> Scale points of quantity assigned to analog output.</p> <p><b>Options:</b> -1999...9999</p>			

#### 4.15.7 HI.SCL - Scale maximum

Acronym	Scrolling message	Submenu	Attributes
HI.SCL	OUT.AN.1 (o OUT.AN.2) HIGH LIMIT ANALOG OUTPUT	OUT.AN	R W
<p>The parameter shows and sets the scale maximum, which corresponds to minimum output value in voltage or current. Each time you set the power control output on parameter FuNC, the parameter value is forced to 1000.</p> <p><b>Unit of measurement:</b> Scale points of quantity assigned to analog output.</p> <p><b>Options:</b> -1999...9999</p>			

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## 4.16 Submenu EN.FUN - Configuration of enablings

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Acronym	Scrolling message	Password	Description
EN.FUN	ENABLE FUNCTIONS	Level 2	Lets you configure other controller functions.

### 4.16.1 EN.EDI - Enabling Editor configurator Menu

Acronym	Scrolling message	Submenu	Attributes
EN.EDI	ENABLE EDITOR CONFIGURATOR	EN.FUN	R W

This parameter shows and sets enabling in the set-up of the editor on the tools menu.

**Unit of measurement:** -

**Options:**           **OFF**     = Menu Configurator disabled  
                  **On**        = Menu Configurator enabled

## 4.17 Submenu MODE - Configuring functioning mode

Acronym	Scrolling message	Password	Description
MODE	FUNCTION MODE MANAGER	Level 2	Lets you configure the controller's functioning mode.

### 4.17.1 MODE.N - Selecting function mode

Acronym	Scrolling message	Submenu	Attributes
MODE.N	MODE NUMBER	MODE	R W

The parameter shows and sets the identifying number of the functions to be configured.

**Unit of measurement:** Number

**Options:**           1       = Select modes for PID.1  
                  2       = Select modes for PID.2 (only with auxiliary input option and PID.2 enabled via PID2.  
                                  E=On)

### 4.17.2 PID.G.N - Number of groups of control parameters

Acronym	Scrolling message	Submenu	Attributes
PID.G.N	MODE.1 (o MODE.2) NUM OF CONTROL PARAMETERS GROUP	MODE	R W

The parameter shows and sets the number of the groups of PID parameters.  
The groups of control parameters are disabled if the parameter equals "0".

**Unit of measurement:** Number

**Options:**           0...4

### 4.17.3 MA.AU - Defining transition from Manual to Automatic

Acronym	Scrolling message	Submenu	Attributes
MA.AU	MODE.1 (o MODE.2) MANUAL TO AUTOMATIC TRANSITION TYPE	MODE	R W

The parameter shows and sets controller behavior when switching from manual to automatic mode.

With STAND, the POWER output assumes the value calculated by the PID based on the local or remote SP (bumpless PID with integral action based on actual PV-SP and power values).

With BUMPL, the local setpoint assumes the PV value (bumpless PID with integral action based on actual power value). PV-SP = 0. With PID.1 enabled as controller of the MAN/AUTO switching ratio,  $RATIO = PV1 / IN2$  is calculated.

**Unit of measurement:** -

**Options:**           STAND  
                  BUMPL

### 4.17.4 AU.MA - Defining transition from Automatic to Manual

Acronym	Scrolling message	Submenu	Attributes
AU.MA	MODE.1 (o MODE.2) AUTOMATIC TO MANUAL TRANSITION TYPE	MODE	R W

The parameter shows and sets controller behavior when switching from automatic to manual mode.

With STAND, the control output assumes the local or remote POWER value.

With BUMPL, the value of the control output does not change. In case of remote manual control, the control acts in raise/lower mode.

**Unit of measurement:** -

**Options:**           STAND  
                  BUMPL

#### 4.17.5 LO.RE - Defining transition from remote SP to local SP

Acronym	Scrolling message	Submenu	Attributes
LO.rE	MODE.1 (o MODE.2) REMOTE TO LOCAL TRANSITION TYPE	MODE	R W
<p>The parameter shows and sets controller behavior when switching from remote to local setpoint, and is significant only with Func = SETP or RATIO.</p> <p>With STAND, the setpoint switches to the value of the selected local SP or multiset, possibly with setpoint gradient (if set).</p> <p>With BUMPL, the remote SP value is memorized in the selected local SP or multiset.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>                <b>STAND</b>                               <b>BUMPL</b></p>			

#### 4.17.6 MA.P.L - Enabling manual power latch

Acronym	Scrolling message	Submenu	Attributes
MA.P.L	MODE.1 (o MODE.2) MANUAL POWER LATCH ENABLE	MODE	R W
<p>The parameter shows and sets enabling of memorization (in non-volatile memory) of the manual power value.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>                <b>LATCH</b> = Latch enabled                               <b>NO.LAT</b> = Latch disabled. After Power-on, Manual power value is reset</p>			

#### 4.17.7 MAN.P - Enabling change of manual power value

Acronym	Scrolling message	Submenu	Attributes
MA.n.P	MODE.1 (o MODE.2) MANUAL POWER MODIFY ENABLE	MODE	R W
<p>The parameter shows and sets enabling of change of the manual power value.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>                <b>MODIF</b> = Change allowed                               <b>NO.MOD</b> = Change not allowed</p>			

#### 4.17.8 TMER - Enabling Timer function

Acronym	Scrolling message	Submenu	Attributes
tMEr	MODE.1 (o MODE.2) TIMER ENABLE	MODE	R W
<p>The parameter shows and sets enabling of the Timer function. The Timer function is explained in detail in "Timer"</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>                <b>OFF</b> = Timer disabled                               <b>ON.SEC</b> = Timer enabled with time base Seconds                               <b>ON.MIN</b> = enabled with time base Minutes</p>			

#### 4.17.9 MUL.SP - Enabling Multiset function

Acronym	Scrolling message	Submenu	Attributes
MUL.SP	MODE.1 (o MODE.2) MULTISSET ENABLE	MODE	R W
<p>The parameter shows and sets enabling of the Multiset function. The MULTISSET function is explained in detail in "Multiset, setpoint gradient".</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b>    = Multiset disabled                   <b>On</b>       = Multiset enabled</p>			

#### 4.17.10 SP.REM - Enabling the remote setpoint

Acronym	Scrolling message	Submenu	Attributes
SP.REM	MODE.1 (o MODE.2) REMOTE SP ENABLE	MODE	R W
<p>The parameter shows and sets enabling of the remote setpoint.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b>    = Remote setpoint disabled                   <b>On</b>       = Remote setpoint enabled from analog input                   <b>SEr</b>     = Remote setpoint enabled from serial</p>			

#### 4.17.11 SPR.T - Defining absolute or deviation remote setpoint

Acronym	Scrolling message	Submenu	Attributes
SPr.t	MODE.1 (o MODE.2) REMOTE SP TYPE	MODE	R W
<p>The parameter shows and defines the setpoint as absolute or deviation. The absolute remote setpoint replaces the local setpoint in the control. The deviation remote setpoint is added algebraically to the local setpoint in the control. The parameter appears only if the parameter SP.REM is different from OFF</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>ABSLT</b> = Absolute remote setpoint                   <b>RELAT</b> = Deviation remote setpoint</p>			

#### 4.17.12 ENERG - Enabling the energy counter function

Acronym	Scrolling message	Submenu	Attributes
ENERG	MODE.1 (o MODE.2) ENERGY COUNTER ENABLE	MODE	R W
<p>The parameter shows and sets enabling of the energy counter function. The Energy Counter function is explained in detail in "Energy counter".</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b>    = Energy counter disabled                   <b>On</b>       = Energy counter enabled</p>			

## 4.18 Submenu SERIA - Configuring serial communication

Acronym	Scrolling message	Password	Description
SERIA	SERIAL COMMUNICATION CONFIG	Level 2	Lets you configure serial communication. The submenu appears if the RS485 Modbus RTU option or the Ethernet Modbus TCP option is present.

### 4.18.1 CODE - Identification code (N/A in Ethernet model)

Acronym	Scrolling message	Submenu	Attributes
CODE	INSTRUMENT ID CODE FOR SERIAL COMM	SERIA	R W
<p>The parameter shows and sets the identifying code of the controller in a Modbus serial network. The parameter only appears if the RS485 Modbus TCP option is available.</p> <p><b>Unit of measurement:</b>    Number</p> <p><b>Options:</b>                    1...247</p>			

### 4.18.2 KBAUD - Selecting communication speed

Acronym	Scrolling message		Submenu	Attributes
KBAUD	COMMUNICATION SPEED		SERIA	R W
The parameter shows and sets the communication speed for the serial port.				
<b>Unit of measurement:</b> kbaud                    Slave scan delay <b>145</b>				
<b>Options:</b>				
	<b>1.2</b>	= 1200 baud		
	<b>2.4</b>	= 2400 baud		
	<b>4.8</b>	= 4800 baud		
	<b>9.6</b>	= 9600 baud		
	<b>19.2</b>	= 19200 baud		
	<b>38.4</b>	= 38400 baud		
	<b>57.6</b>	= 57600 baud		
	<b>115.2</b>	= 115200 baud		

### 4.18.3 PAR - Selecting parity

Acronym	Scrolling message	Submenu	Attributes
PAr	PARITY	SERIA	R W
The parameter shows and sets the parity used in serial communication.			
<b>Unit of measurement:</b> -			
<b>Options:</b>			
<b>NONE</b> = No parity			
<b>ODD</b> = Odd parity			
<b>EVEN</b> = Even parity			

### 4.18.4 SCANR - Setting delay between two consecutive Modbus master with Ethernet option

Acronym	Scrolling message	Submenu	Attributes
SCANR	SCAN RATE MODBUS MASTER	SERIA	R W
<p>The parameter shows and sets the delay, in milliseconds, between two consecutive Modbus master communications to slave nodes connected via serial when other instrumentation is connected to the RS485 Modbus RTU via an Ethernet Modbus TCP card.</p> <p>The parameter only appears if the Ethernet Modbus TCP e RS485 “bridge” option is available.</p> <p><b>Unit of measurement:</b>    ms</p> <p><b>Options:</b>                    0...9999</p>			



## 4.19 ETHER Submenu - Ethernet parameter configuration

Acronym	Scrolling message	Password	Description
ETHER	ETHERNET COMMUNICATION CONFIG	Level 2	Permits configuration of Ethernet communication.

### 4.19.1 CODE.E – Ethernet identification code

Acronym	Scrolling message	Submenu	Attributes
CODE.E	INSTRUMENT ID CODE ETHERNET	ETHER	R
This parameter shows the identification code identifying the controller in an Ethernet Modbus network. <b>Unit of measurement:</b> Number <b>Options:</b> 1			

### 4.19.2 TYPE – Network parameter assignment method

Acronym	Scrolling message	Submenu	Attributes
tyP.E	ASSIGNMENT MODE OF NETWORK PARAMETERS	ETHER	R W
This parameter shows the assignment mode of the Ethernet network's IP address, subnet mask and gateway parameters. <b>Unit of measurement:</b> <b>Options:</b> <b>FIXED</b> = Parameters entered manually are used <b>DHCP</b> = Parameters received from the network's DHCP server are used			

### 4.19.3 IP.AD1 – Address IP 1

Acronym	Scrolling message	Submenu	Attributes
IP.AD1	IP ADDRESS	ETHER	R W
This parameter shows the IP 1 address identifying the controller in an Ethernet network. The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx). <b>Unit of measurement:</b> Number <b>Options:</b> 0...255			

### 4.19.4 IP.AD2 – Address IP 2

Acronym	Scrolling message	Submenu	Attributes
IP.AD2	IP ADDRESS	ETHER	R W
This parameter shows the IP 2 address identifying the controller in an Ethernet network. The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx). <b>Unit of measurement:</b> Number <b>Options:</b> 0...255			

### 4.19.5 IP.AD3 – Address IP 3

Acronym	Scrolling message	Submenu	Attributes
IP.AD3	IP ADDRESS	ETHER	R W
This parameter shows the IP 3 address identifying the controller in an Ethernet network. The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx). <b>Unit of measurement:</b> Number <b>Options:</b> 0...255			

#### 4.19.6 IP.AD4 – Address IP 4

Acronym	Scrolling message	Submenu	Attributes
IP.AD4	IP ADDRESS	ETHER	R W
<p>This parameter shows the IP 4 address identifying the controller in an Ethernet network. The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.7 SUB.M1 – Subnet mask 1

Acronym	Scrolling message	Submenu	Attributes
SUB.M1	SUBNET MASK	ETHER	R W
<p>This parameter shows the Subnet mask 1 identifying the controller in an Ethernet network. The parameter is the first field in the complete Subnet mask (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.8 SUB.M2 – Subnet mask 2

Acronym	Scrolling message	Submenu	Attributes
SUB.M2	SUBNET MASK	ETHER	R W
<p>This parameter shows the Subnet mask 2 identifying the controller in an Ethernet network. The parameter is the first field in the complete Subnet mask (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.9 SUB.M3 – Subnet mask 3

Acronym	Scrolling message	Submenu	Attributes
SUB.M3	SUBNET MASK	ETHER	R W
<p>This parameter shows the Subnet mask 3 identifying the controller in an Ethernet network. The parameter is the first field in the complete Subnet mask (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.10 SUB.M4 – Subnet mask 4

Acronym	Scrolling message	Submenu	Attributes
SUB.M4	SUBNET MASK	ETHER	R W
<p>This parameter shows the Subnet mask 4 identifying the controller in an Ethernet network. The parameter is the first field in the complete Subnet mask (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.11 GT.AD1 – Gateway Address 1

Acronym	Scrolling message	Submenu	Attributes
GT.AD1	GATEWAY ADDRESS	ETHER	R W
<p>This parameter shows the Gateway 1 address identifying the controller in an Ethernet network. The parameter is the first field in the complete Gateway address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.12 GT.AD2 – Gateway Address 2

Acronym	Scrolling message	Submenu	Attributes
GT.AD2	GATEWAY ADDRESS	ETHER	R W
<p>This parameter shows the Gateway 2 address identifying the controller in an Ethernet network. The parameter is the first field in the complete Gateway address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.13 GT.AD3 – Gateway Address 3

Acronym	Scrolling message	Submenu	Attributes
GT.AD3	GATEWAY ADDRESS	ETHER	R W
<p>This parameter shows the Gateway 3 address identifying the controller in an Ethernet network. The parameter is the first field in the complete Gateway address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.14 GT.AD4 – Gateway Address 4

Acronym	Scrolling message	Submenu	Attributes
SUB.M4	SUBNET MASK	ETHER	R W
<p>This parameter shows the Gateway 4 address identifying the controller in an Ethernet network. The parameter is the first field in the complete Gateway address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...255</p>			

#### 4.19.15 TIM.NT – Network Time Protocol server update time

Acronym	Scrolling message	Submenu	Attributes
TIM.NT	NETWORK TIME SERVER UPDATE TIME	ETHER	R W
<p>This parameter shows and updates the server update time for time synchronisation of the controller (Network Time Protocol). If the parameter is 0, the automatic updating function will be disabled.</p> <p><b>Unit of measurement:</b> hours</p> <p><b>Options:</b> 0...9999</p>			

#### 4.19.16 IP.NT1 – IP address 1 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT1	NETWORK TIME SERVER IP ADDRESS	ETHER	R W
<p>This parameter shows and updates the IP 1 address server update time for time synchronisation of the controller (Network Time Protocol)..</p> <p>The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b>    Number</p> <p><b>Options:</b>                0...255</p>			

#### 4.19.17 IP.NT2 – IP address 2 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT2	NETWORK TIME SERVER IP ADDRESS	ETHER	R W
<p>This parameter shows and updates the IP 2 address server time for time synchronisation of the controller (Network Time Protocol).</p> <p>The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b>    Number</p> <p><b>Options:</b>                0...255</p>			

#### 4.19.18 IP.NT3 – IP address 3 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT3	NETWORK TIME SERVER IP ADDRESS	ETHER	R W
<p>This parameter shows and updates the IP 3 address server time for time synchronisation of the controller (Network Time Protocol).</p> <p>The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b>    Number</p> <p><b>Options:</b>                0...255</p>			

#### 4.19.19 IP.NT4 – IP address 4 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT4	NETWORK TIME SERVER IP ADDRESS	ETHER	R W
<p>This parameter shows and updates the IP 4 address server time for time synchronisation of the controller (Network Time Protocol).</p> <p>The parameter is the first field in the complete IP address (xxx.xxx.xxx.xxx).</p> <p><b>Unit of measurement:</b>    Number</p> <p><b>Options:</b>                0...255</p>			

#### 4.19.20 BRO.NT – Broadcast definition for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
BRO.NT	NETWORK TIME SERVER BROADCAST	ETHER	R W
<p>This parameter shows and updates the broadcast definition server for time synchronisation of the controller (Network Time Protocol).</p> <p><b>Unit of measurement:</b>    -</p> <p><b>Options:</b>                <b>OFF</b>    = The server is on a local network                               <b>On</b>       = The server is on a public network</p>			

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#### 4.19.21 GMT.OF – Offset in relation to GMT (Greenwich Mean Time)

Acronym	Scrolling message	Submenu	Attributes
GMT.OF	GREENWICH MEAN TIME OFFSET	ETHER	R W
This parameter shows and updates the offset for time synchronisation of the GMT(Greenwich Mean Time).			
<b>Unit of measurement:</b> hh.mm			
<b>Options:</b> -12.00...12.00			

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## 4.20 Submenu HMI - Display configuration

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Acronym	Scrolling message	Password	Description
HMI	DISPLAY CONFIG	Level 2	Lets you configure the controller's display.

### 4.20.1 HOM.S - Selecting Home page

Acronym	Scrolling message	Submenu	Attributes
HoM.S	HOME SELECT	HMI	R W
<p>The parameter shows and sets the Home page at power-on. The parameter appears only if the optional auxiliary input is available and PID2 is enabled.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>HOME1</b> = Display Home1 at power-on and Home2 enabled                          <b>HOME2</b> = Display Home2 at power-on and Home2 enabled                          <b>NO.HO2</b> = Display Home1 at power-on and Home2 disabled</p>			

#### 4.20.2 BAR.E - Enable bargraph display on Home menus

Acronym	Scrolling message	Submenu	Attributes
bAr.E	BARGRAPH ENABLE	HMI	R W

The parameter enables the display of bargraphs.

**Unit of measurement:** -

**Options:** **OFF** = Disables display of three bargraphs bAr.1, bAr.2, bAr.3, of IN/OUT frame and of figures from 1 to 8

**ON.ALL** = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 including frames (default)



**NO.FRA** = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 without frames



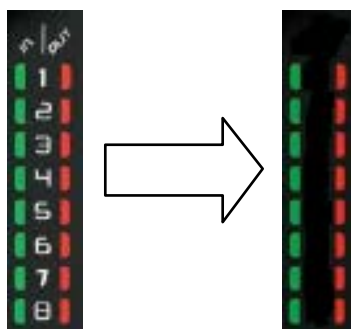
**ON.3LY** = Enables display of bargraph bAr.3 only



**ON.AL1** = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 including frames (default). Disables display of IN/OUT frame and of figures from 1 to 8

**NO.FR1** = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 without frames. Disables display of IN/OUT frame and of figures from 1 to 8.

**ON.3L1** = Enables display of bargraph bAr.3 only. Disables display of IN/OUT frame and of figures from 1 to 8.



#### 4.20.3 LANG - Selecting language for messages

Acronym	Scrolling message	Submenu	Attributes
LAng	MESSAGE LANGUAGE	HMI	R W

The parameter shows and sets the language for the scrolling messages.

**Unit of measurement:** -

**Options:** **LANG1** = Language 1 (English)  
**LANG2** = Language 2 (Italian)  
**LANG3** = Language 3  
**NONE** = No language

#### 4.20.4 SPEED - Message scrolling speed

Acronym	Scrolling message	Submenu	Attributes
SPEED	SCROLLING MESSAGE SPEED	HMI	R W
<p>The parameter shows and sets the message scrolling speed. “1” corresponds to maximum scrolling speed, “10” to minimum speed. With “0” the message does not scroll and the display shows first the first 7 characters.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> 0...10 (default = 3)</p>			

#### 4.20.5 BACKL - Backlighting level

Acronym	Scrolling message	Submenu	Attributes
BACKL	BACKLIGHT LEVEL	HMI	R W
<p>The parameter shows and sets the backlight level on the display (when the controller is on) 10 seconds after the last key has been pressed. With “0,” the backlight does not switch off, but goes to the minimum useful level for reading the display. The backlight goes to maximum level when any key is pressed.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> 0...10 (default = 8)</p>			



## 4.21 Submenu HOME - Configuration of display and keyboard in Home1 and Home2

Acronym	Scrolling message	Password	Description
HOME	HOME DISPLAY AND KEYBOARD	Level 2	Lets you configure the controller's display and keys in Home1 and Home2.

### 4.21.1 HOME.N - Selecting Home

Acronym	Scrolling message	Submenu	Attributes
HOME.N	HOME NUMBER	HOME	R W


The parameter shows and sets the identifying number of Home to configure.

**Unit of measurement:** Number

**Options:** 1...2

### 4.21.2 BUT.1 - Selecting function key 1

Acronym	Scrolling message	Submenu	Attributes
but.1	HOME.1 (o HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 1 (  ) of the controller.

**Unit of measurement:** -

**Options:**

- NONE** = No function assigned
- AU-MA** = Automatic-Manual control
- LO-RE** = Local-remote setpoint mode
- HOLD** = Hold main input value
- AL.ACK** = Reset alarm latches
- S.TUNE** = Activate Self-Tuning
- A.TUNE** = Activate Auto-Tuning
- OUT.S.R** = Set/reset outputs set with BUT.SR function
- INT.RS** = Integral reset

*if the Multiset function is enabled:*


- SP.SEL** = Select setpoint M.SP1.1/M.SP2.1

*In the case of a valve model with auxiliary input, linear custom type FUnC=VALV.P function, and with one output set as V.OPEN and one output set as V.CLOS:*

- VALV.P** = auxiliary input configuration

### 4.21.3 BUT.2 - Selecting function key 2

Acronym	Scrolling message	Submenu	Attributes
but.2	HOME.1 (o HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 2 (  ) of the AC50 controller.


**Unit of measurement:** -

**Options:** As per **but.1**

Note : If the setting is the same as but.1, it has no effect (equals NONE).

### 4.21.4 BUT.3 - Selecting function key 3

Acronym	Scrolling message	Submenu	Attributes
but.3	HOME.1 (o HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 3 (  ) of the AC50 controller.

**Unit of measurement:** -

**Options:** As per **but.1**

Note : If the setting is the same as but.1 or but.2, it has no effect (equals NONE).

#### 4.21.5 DS.SP - Selecting the SV display

Acronym	Scrolling message	Submenu	Attributes
dS.SP	HOME.1 (o HOME.2) SV DISPLAY FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the SV display.

**Unit of measurement:** -

**Options:**

**NONE** = None (display off)

**SETP** = Local setpoint / manual power or active setpoint (read only), in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).

**SSP** = Active setpoint (read only)

*if the model with auxiliary input*

**IN2** = Auxiliary input

**OUT.P** = Power control output (on AC50 LED % on)

**SP-PV** = Deviation |SP-PV|

**INCR** = Incr power output with 0...100% control (on AC50 LED % on)

**DECR** = Decr power output with 0...100% control (on AC50 LED % on)

**HE+CO** = Power control output -100...100% (positive for heating, negative for cooling) (on AC50 LED % on)

*if the ENERG function is enabled*

**OUT.KW** = Power on load (on AC50 LED KW on)

**EN.KWH** = Energy transferred to load ((on AC50 LED KWh on)

*if the Timer function is enabled:*

**TIM.RE** = Remaining timer value

**TIM.EL** = Timer value lapsed

*if controller model with valve control:*

**V.POSI** = Valve position (on AC50 LED % on)

**IN1** = Main input

*if model with auxiliar input 2*

**IN3** = Auxiliar input 2

*if model with Modbus Master serial and Master parameter configured:*

**MAS.01** = Master value 1

**MAS.02** = Master value 2

**MAS.03** = Master value 3

**MAS.04** = Master value 4

**MAS.05** = Master value 5

**MAS.06** = Master value 6

**MAS.07** = Master value 7

**MAS.08** = Master value 8

**MAS.09** = Master value 9

**MAS.10** = Master value 10

**MAS.11** = Master value 11

**MAS.12** = Master value 12

**MAS.13** = Master value 13

**MAS.14** = Master value 14

**MAS.15** = Master value 15

**MAS.16** = Master value 16

**MAS.17** = Master value 17

**MAS.18** = Master value 18

**MAS.19** = Master value 19

**MAS.20** = Master value 20

**CP.VAL** = Percent Carbon

**DEW.P** = Dew point value

#### 4.21.6 DS.F - Selecting the MEN display

Acronym	Scrolling message	Submenu	Attributes
dS.F	HOME.1 (o HOME.2) MEN DISPLAY FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the MEN display.

**Unit of measurement:** -

**Options:**

- NONE** = None (display off)
- SETP** = Local setpoint / manual power or active setpoint (read only), in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).
- SSP** = Active setpoint (read only)

*if the model with auxiliary input*

- IN2** = Auxiliary input
- OUT.P** = Power control output (on AC50 LED % on)
- SP-PV** = Deviation |SP-PV|
- INCR** = Incr power output with 0...100% control (on AC50 LED % on)
- DECR** = Decr power output with 0...100% control (on AC50 LED % on)
- HE+CO** = Power control output -100...100% (positive for heating, negative for cooling) (on AC50 LED % on)

*if the ENERG function is enabled*

- OUT.KW** = Power on load (on AC50 LED KW on)
- EN.KWH** = Energy transferred to load ((on AC50 LED KWh on)

*if the Timer function is enabled:*

- TIM.RE** = Remaining timer value
- TIM.EL** = Timer value lapsed

*if controller model with valve control:*

- V.POSI** = Valve position (on AC50 LED % on)

- IN1** = Main input

*if model with auxiliar input 2*

- IN3** = Auxiliar input 2

*if model with Modbus Master serial and Master parameter configured:*

- MAS.01** = Master value 1
- MAS.02** = Master value 2
- MAS.03** = Master value 3
- MAS.04** = Master value 4
- MAS.05** = Master value 5
- MAS.06** = Master value 6
- MAS.07** = Master value 7
- MAS.08** = Master value 8
- MAS.09** = Master value 9
- MAS.10** = Master value 10
- MAS.11** = Master value 11
- MAS.12** = Master value 12
- MAS.13** = Master value 13
- MAS.14** = Master value 14
- MAS.15** = Master value 15
- MAS.16** = Master value 16
- MAS.17** = Master value 17
- MAS.18** = Master value 18
- MAS.19** = Master value 19
- MAS.20** = Master value 20

- CP.VAL** = Percent Carbon
- DEW.P** = Dew point value

#### 4.21.7 BAR.1 - Selecting bargraph 1 display

Acronym	Scrolling message	Submenu	Attributes
bAr.1	HOME.1 (o HOME.2) BARGRAPH FUNCTION	HOME	R W
<p>The parameter shows and sets the display assigned to the bargraph 2.  The parameter appears only if parameter bAr.E is at  - ON.ALL, ON.AL1, NO.FRA and NO.FR1</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <p><b>PV</b> = Process variable (the PV LED will light up only if this item is selected)  <b>SETP</b> = Local setpoint / manual power or active setpoint (read only), in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).  <b>SSP</b> = Active setpoint (read only)</p> <p><i>if the model with auxiliary input</i>  <b>IN2</b> = Auxiliary input  <b>OUT.P</b> = Power control output (on AC50 LED % on)  <b>SP-PV</b> = Deviation  SP-PV   <b>INCR</b> = Incr power output with 0...100% control (on AC50 LED % on)  <b>DECR</b> = Decr power output with 0...100% control (on AC50 LED % on)  <b>HE+CO</b> = Power control output -100...100% (positive for heating, negative for cooling) (on AC50 LED % on)</p> <p><i>if the ENERG function is enabled:</i>  <b>OUT.KW</b> = Power on load</p> <p><i>if the Timer function is enabled:</i>  <b>TIM.RE</b> = Remaining timer value  <b>TIM.EL</b> = Timer value elapsed</p> <p><i>if controller model with valve control:</i>  <b>V.POSI</b> = Valve position</p> <p><b>IN1</b> = Main input</p> <p><i>if model with auxiliar input 2</i>  <b>IN3</b> = Auxiliar input 2</p> <p><i>if model with Modbus Master serial and Master parameter configured:</i>  <b>MAS.01</b> = Master value 1  <b>MAS.02</b> = Master value 2  <b>MAS.03</b> = Master value 3  <b>MAS.04</b> = Master value 4  <b>MAS.05</b> = Master value 5  <b>MAS.06</b> = Master value 6  <b>MAS.07</b> = Master value 7  <b>MAS.08</b> = Master value 8  <b>MAS.09</b> = Master value 9  <b>MAS.10</b> = Master value 10  <b>MAS.11</b> = Master value 11  <b>MAS.12</b> = Master value 12  <b>MAS.13</b> = Master value 13  <b>MAS.14</b> = Master value 14  <b>MAS.15</b> = Master value 15  <b>MAS.16</b> = Master value 16  <b>MAS.17</b> = Master value 17  <b>MAS.18</b> = Master value 18  <b>MAS.19</b> = Master value 19  <b>MAS.20</b> = Master value 20</p> <p><b>CP.VAL</b> = Percent Carbon  <b>DEW.P</b> = Dew point value</p>			

#### 4.21.8 BAR.2 - Selecting bargraph 2 display

Acronym	Scrolling message	Submenu	Attributes
bAr.2	HOME.1 (o HOME.2) BARGRAPH FUNCTION	HOME	R W
<p>The parameter shows and sets the display assigned to the bargraph 2.  The parameter appears only if parameter bAr.E is at  - ON.ALL, ON.AL1, NO.FRA and NO.FR1</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b></p> <p><b>PV</b> = Process variable  <b>SETP</b> = Local setpoint / manual power or active setpoint, in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled) (LED SP on)  <b>SSP</b> = Active setpoint ( LED SP on)</p> <p><i>f the model with auxiliary input</i>  <b>IN2</b> = Auxiliary input  <b>OUT.P</b> = Power control output  <b>SP-PV</b> = Deviation  SP-PV   <b>INCR</b> = Incr power output with 0...100% control  <b>DECR</b> = Decr power output with 0...100% control  <b>HE+CO</b> = Power control output -100...100% (positive for heating, negative for cooling)</p> <p><i>if the ENERG function is enabled:</i>  <b>OUT.KW</b> = Power on load</p> <p><i>if the Timer function is enabled:</i>  <b>TIM.RE</b> = Remaining timer value  <b>TIM.EL</b> = Timer value elapsed</p> <p><i>if controller model with valve control:</i>  <b>V.POSI</b> = Valve position</p> <p><b>IN1</b> = Main input</p> <p><i>if model with auxiliar input 2</i>  <b>IN3</b> = Auxiliar input 2</p> <p><i>if model with Modbus Master serial and Master parameter configured:</i>  <b>MAS.01</b> = Master value 1  <b>MAS.02</b> = Master value 2  <b>MAS.03</b> = Master value 3  <b>MAS.04</b> = Master value 4  <b>MAS.05</b> = Master value 5  <b>MAS.06</b> = Master value 6  <b>MAS.07</b> = Master value 7  <b>MAS.08</b> = Master value 8  <b>MAS.09</b> = Master value 9  <b>MAS.10</b> = Master value 10  <b>MAS.11</b> = Master value 11  <b>MAS.12</b> = Master value 12  <b>MAS.13</b> = Master value 13  <b>MAS.14</b> = Master value 14  <b>MAS.15</b> = Master value 15  <b>MAS.16</b> = Master value 16  <b>MAS.17</b> = Master value 17  <b>MAS.18</b> = Master value 18  <b>MAS.19</b> = Master value 19  <b>MAS.20</b> = Master value 20</p> <p><b>CP.VAL</b> = Percent Carbon  <b>DEW.P</b> = Dew point value</p>			

#### 4.21.9 BAR.3 - Selecting bargraph 3 display

Acronym	Scrolling message	Submenu	Attributes
bAr.3	HOME.1 (o HOME.2) BARGRAPH FUNCTION	HOME	R W

e parameter shows and sets the display assigned to the bargraph 3.  
The parameter appears only if parameter bAr.E is at  
- ON.ALL, ON.AL1, NO.FRA, NO.FR1, ON.3LY and ON.3L1

**Unit of measurement:** -

**Options:**

**PV** = Process variable  
**SETP** = Local setpoint / manual power or active setpoint, in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled) (LED SP on)  
**SSP** = Active setpoint ( LED SP on)

*if the model with auxiliary input*  
**IN2** = Auxiliary input  
**OUT.P** = Power control output  
**SP-PV** = Deviation |SP-PV|  
**INCR** = Incr power output with 0...100% control  
**DECR** = Decr power output with 0...100% control  
**HE+CO** = Power control output -100...100% (positive for heating, negative for cooling)

*if the ENERG function is enabled:*  
**OUT.KW** = Power on load

*if the Timer function is enabled:*  
**TIM.RE** = Remaining timer value  
**TIM.EL** = Timer value elapsed

*if controller model with valve control:*  
**V.POSI** = Valve position

**IN1** = Main input

*if model with auxiliar input 2*  
**IN3** = Auxiliar input 2

*if model with Modbus Master serial and Master parameter configured:*  
**MAS.01** = Master value 1  
**MAS.02** = Master value 2  
**MAS.03** = Master value 3  
**MAS.04** = Master value 4  
**MAS.05** = Master value 5  
**MAS.06** = Master value 6  
**MAS.07** = Master value 7  
**MAS.08** = Master value 8  
**MAS.09** = Master value 9  
**MAS.10** = Master value 10  
**MAS.11** = Master value 11  
**MAS.12** = Master value 12  
**MAS.13** = Master value 13  
**MAS.14** = Master value 14  
**MAS.15** = Master value 15  
**MAS.16** = Master value 16  
**MAS.17** = Master value 17  
**MAS.18** = Master value 18  
**MAS.19** = Master value 19  
**MAS.20** = Master value 20

**CP.VAL** = Percent Carbon  
**DEW.P** = Dew point value

#### 4.21.10 LED.1 - Enable RUN led flashing

Acronym	Scrolling message	Submenu	Attributes
LED.1	ENABLE OF RUN LED BLINKING	HOME	R W
The parameter enables and disabled RUN led flashing			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>OFF</b> = Disables RUN led flashing			
<b>On</b> = Enables RUN led flashing			

#### 4.21.11 LED.2 – Enabling MANUAL led

Acronym	Scrolling message	Submenu	Attributes
LED.2	ENABLE OF MANUAL LED	HOME	R W
The parameter enables and disables the MANUAL led			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>OFF</b> = Disables the MANUAL led			
<b>On</b> = Enables the MANUAL led			

#### 4.21.12 LED.3 – Enabling TUNE led

Acronym	Scrolling message	Submenu	Attributes
LED.3	ENABLE OF TUNE LED	HOME	R W
The parameter enables and disables the TUNE led			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>OFF</b> = Disables the TUNE led			
<b>On</b> = Enables the TUNE led			

#### 4.21.13 LED.4 – Enabling RAMP led

Acronym	Scrolling message	Submenu	Attributes
LED.4	ENABLE OF RAMP LED	HOME	R W
The parameter enables and disables the RAMP led			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>OFF</b> = Disables the RAMP led			
<b>On</b> = Enables the RAMP led			

#### 4.21.14 LED.5 – Enabling REMOTE led

Acronym	Scrolling message	Submenu	Attributes
LED.5	ENABLE OF REMOTE LED	HOME	R W
The parameter enables and disables the REMOTE led			
<b>Unit of measurement:</b> -			
<b>Options:</b> <b>OFF</b> = Disables the REMOT led			
<b>On</b> = Enables the REMOT led			

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#### 4.21.15 LED.6 – Enabling SP1/2 led

Acronym	Scrolling message	Submenu	Attributes
LED.6	ENABLE OF SP12 LED	HOME	R W
<p>The parameter enables and disables the SP1/2 led</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>           <b>OFF</b>     = Disables the SP1/2 led                       <b>On</b>        = Enables the SP1/2 led</p>			



## 4.22 Submenu US.CAL - User Custom Input Calibration

Acronym	Scrolling message	Password	Description
US.CAL	USER CALIBRATION MANAGER	Level 2	Lets the user calibrate the controller with regard to Custom main input, HB alarm setpoints, energy reset, and partial day count.

### 4.22.1 U.CAL - Selecting the user custom input calibration

Acronym	Scrolling message	Submenu	Attributes
U.CAL	USER CALIBRATION TYPE	US.CAL	R W

The parameter shows and sets the parameter, input or output to which calibration will be applied.

**Unit of measurement:** -

**Options:** **NONE** = No calibration

**RTC** = Real Time Clock setting

*if the model has no buffer battery, the data in the RTC at each power-on are initialized to:*

**HOURL** = 0                      **MIN** = 0                      **SEC** = 0

**dAY** = MONDA              **DATE** = 1              **Mont** = JANUA

**YEAR** = 00

*if energy counting mode is enabled in MODE.1:*

**ENRG1** = Reset energy count 1 (totalizer EN.KWH1 and time EN.TIM1)

**P.DAYS** = Reset partial day count

*if the main input is custom:*

**I.MAIN** = Calibration of custom main input (selected with parameter TYPE on INPUT.1 menu)\*

*if the model with auxiliary input is custom:*

**I.AUX** = Calibration of custom auxiliar input (selected with parameter TYPE on INPUT.2 menu)\*

*if the model with analogue output OUT.A1 is custom:*

**OUT.A1** = Calibration of custom retransmission output (selected with parameter t.o.A1 on OUT.AN menu)

*if the model with analogue output OUT.A2 is custom:*

**OUT.A2** = Calibration of custom retransmission output (selected with parameter t.o.A2 on OUT.AN menu)

*if the model with continuous output (OUT.C) is custom:*

**OUT.C** = Calibration of custom continuous output

*if energy counting mode is enabled in MODE.2:*

**ENRG2** = Reset energy count 2 (E.KWH2 totalizer and E.TIM2 time)

**CY.RES** = Reset switching cycle count shown in INDG.S

*in the case of a valve model with auxiliary input, linear custom type FUnC=VALV.P function, and with one output set as V.OPEN and one output set as V.CLOS input configuration:*

**VALV.P** = Auxiliary input calibration with valve position function.

It is made up of 6 progressive phases:

Phase 1: START CALIBRATION message, switch to phase 2 after approximately 4 sec.

Phase 2: VALVE OPEN message and indication of increasing percent progress, output V.OPEN is on for the time set in parameter TRAVL in sub-menu VALVE increased by 10% and switch to phase 3.

Phase 3: SAVE MAX message, the maximum auxiliary input calibration value is saved and switch to phase 4.

Phase 4: VALVE CLOSE message and indication of decreasing percent progress, output V.CLOS is on for the time set in parameter TRAVL in sub-menu VALVE increased by 10% and switch to phase 5.

Phase 5: SAVE MIN message, the minimum auxiliary input calibration value is saved and switch to phase 6.

Phase 6: END CALIBRATION message, calibration ends after approximately 4 sec.

Calibration only occurs for the valve model with auxiliary input, linear custom type FUnC=VALV.P function, and with an output set as V.OPEN and output set as V.CLOS.

Calibration can be aborted at any time by pressing the regulator key **A/M**

*if model has custom auxiliary input 2:*

**I.AUX2** = Calibration of custom auxiliary input 2 (selected with TYPE parameter in INPUT.3 menu).

\* in the case of C.RTD, linearisation with 32 broken LIN=32STP must be enabled

#### 4.22.2 FI.CAL - Resetting the factory calibration

Acronym	Scrolling message	Submenu	Attributes
FI.CAL	FACTORY CALIBRATION	US.CAL	R W
<p>The parameter shows and sets resetting of the factory calibration. This operation can be done only for inputs and outputs, if U.CAL corresponds to I.MAIN, I.AUX, I.AUX2, OUT.A1, OUT.A2 or OUT.C.</p> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b>            <b>no</b>        = Keep user calibration                       <b>YES</b>        = Reset factory calibration</p>			

#### 4.22.3 C.LOW - Calibrating minimum current / voltage

Acronym	Scrolling message	Submenu	Attributes
C.LOW		US.CAL	R W
<p>The parameter appears if you are calibrating a main input or custom auxiliary input in current or voltage. To calibrate:</p> <ul style="list-style-type: none"><li>• apply the current or voltage value corresponding to minimum scale value to the selected input;</li><li>• press the <b>MEN</b> key to acquire the calibration value.</li></ul> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.22.4 C.HIGH - Calibrating maximum current / voltage

Acronym	Scrolling message	Submenu	Attributes
C.HIGH		US.CAL	R W
<p>The parameter appears if you are calibrating a main input or custom auxiliary input in current or voltage. To calibrate:</p> <ul style="list-style-type: none"><li>• apply the current or voltage value corresponding to maximum scale value to the selected input;</li><li>• press the <b>MEN</b> key to acquire the calibration value.</li></ul> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.22.5 RTD.LO - Calibrating minimum resistance value

Acronym	Scrolling message	Submenu	Attributes
RTD.LO		US.CAL	R W
<p>The parameter appears if you are calibrating a main input or custom RTD auxiliary input. To calibrate:</p> <ul style="list-style-type: none"><li>• apply a resistance corresponding to minimum scale value to the main input (for example, 18.52 <math>\Omega</math> for Pt100) ;</li><li>• press the <b>MEN</b> key to acquire the calibration value.</li></ul> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.22.6 RTD.HI - Calibrating maximum resistance value

Acronym	Scrolling message	Submenu	Attributes
RTD.HI		US.CAL	R W
<p>The parameter appears if you are calibrating a main input or custom RTD auxiliary input. To calibrate:</p> <ul style="list-style-type: none"><li>• apply a resistance corresponding to maximum scale value to the main input (for example, 390.48 <math>\Omega</math> for Pt100);</li><li>• press the <b>MEN</b> key to acquire the calibration value.</li></ul> <p><b>Unit of measurement:</b> -</p> <p><b>Options:</b> -</p>			

#### 4.22.7 HOUR - Setting hours

Acronym	Scrolling message	Submenu	Attributes
HOUR		US.CAL	R W
<p>The parameter shows and sets the hours on the Real Time Clock, if U.CAL = RTC.</p> <p><b>Unit of measurement:</b> Ore</p> <p><b>Options:</b> 0...23</p>			

#### 4.22.8 MIN - Setting minutes

Acronym	Scrolling message	Submenu	Attributes
MIN		US.CAL	R W
<p>The parameter shows and sets the minutes on the Real Time Clock, if U.CAL = RTC.</p> <p><b>Unit of measurement:</b> Minutes</p> <p><b>Options:</b> 0...59</p>			

#### 4.22.9 SEC - Setting seconds

Acronym	Scrolling message	Submenu	Attributes
SEC		US.CAL	R W
<p>The parameter shows and sets the seconds on the Real Time Clock, if U.CAL = RTC.</p> <p><b>Unit of measurement:</b> Seconds</p> <p><b>Options:</b> 0...59</p>			

#### 4.22.10 DAY - Setting day of week

Acronym	Scrolling message	Submenu	Attributes
dAY		US.CAL	R W
<p>The parameter shows and sets the day of the week on the Real Time Clock, if U.CAL = RTC.</p> <p><b>Unit of measurement:</b> Day of week</p> <p><b>Options:</b> MONDA...SUNDA</p>			

#### 4.22.11 DATE - Setting day

Acronym	Scrolling message	Submenu	Attributes
DATE		US.CAL	R W
The parameter shows and sets the day on the Real Time Clock, if U.CAL = RTC <b>Unit of measurement:</b> Number of day <b>Options:</b> 1...31			



#### 4.22.12 MONT - Setting month

Acronym	Scrolling message	Submenu	Attributes
Mont		US.CAL	R W
The parameter shows and sets the month on the Real Time Clock, if U.CAL = RTC. <b>Unit of measurement:</b> Month <b>Options:</b> JANUA...DECEM			



#### 4.22.13 YEAR - Setting year

Acronym	Scrolling message	Submenu	Attributes
YEAR		US.CAL	R W
The parameter shows and sets the year on the Real Time Clock, if U.CAL = RTC. <b>Unit of measurement:</b> Year <b>Options:</b> 0...99			

#### 4.22.14 C.LO - Setting analog output minimum

Acronym	Scrolling message	Submenu	Attributes
C.LO		US.CAL	R W
The parameter shows and sets the minimum analog output value. You can change the displayed value with the  and  keys. To check the real voltage/current value on the output during calibration, measure it with a voltmeter/ammeter <b>Unit of measurement:</b> steps <b>Options:</b> 0...65535			

#### 4.22.15 C.HIG - Setting analog output maximum

Acronym	Scrolling message	Submenu	Attributes
C.HIG		US.CAL	R W
The parameter shows and sets the maximum analog output value. You can change the displayed value with the  and  keys. To check the real voltage/current value on the output during calibration, measure it with a voltmeter/ammeter. <b>Unit of measurement:</b> steps <b>Options:</b> 0...65535			

## 4.23 PASC0 - Setting level password 0

Acronym	Scrolling message	Submenu	Attributes
PASC0	SET PASS0	Level 2	R W
<p>This parameter may be used to set the password to access User Menu parameters. Default code: 5.</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...9999</p>			

## 4.24 PASCQ - Setting level password Q

Acronym	Scrolling message	Submenu	Attributes
PASCQ	SET PASSQ	Level 2	R W
<p>This parameter may be used to set the password to access the Quickstart Menu. Default code: 5.</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...9999</p>			


## 4.25 PASC1 - Setting level 1 password

Acronym	Scrolling message	Submenu	Attributes
PASC1	SET PASS1	Level 2	R W
<p>This parameter may be used to set the password to access the level 1 configuration submenu and User Menu parameters. Default code: 5.</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...9999</p>			

## 4.26 PASC2 - Setting level 2 password

Acronym	Scrolling message	Submenu	Attributes
PASC2	SET PASS2	Level 2	R W
<p>The parameter lets you set the password for accessing level 2 configuration submenus. Default code: 5.</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...9999</p>			

## 4.27 FI.CFG - Entering the reset code

Acronym	Scrolling message	Password	Attributes
FI.CFG	ENTER DEFAULT CONFIGURATION PASS	Level 2	R W
<p>The parameter lets you set the code for resetting the controller to factory configuration, which will delete all changes made. Default code: 99.</p> <p>ATTENTION! After you have set code 99, when you press the  key the controller runs the Power-on procedure, as described in "Sequence at power-on".</p> <p><b>Unit of measurement:</b> Number</p> <p><b>Options:</b> 0...9999</p>			

## 4.28 Status parameters associated with the Carbon Controller function

The parameters listed below relate to the status of the carbon potential adjustment and the diagnostics of the zirconium probe.

They are not shown in a specific menu navigable from the tool but can be entered in the User Menu configurable via SuperSET according to application requirements.

### 4.28.1 C.PERC - Percent calculated carbon

Acronym	Scrolling message	Submenu	Attributes
C.PERC	CALCULATED CARBON PERCENTAGE	UserMenu	R
The parameter indicates the percent of carbon calculated in runtime			
<b>Unit of measurement:</b> %			
<b>Options:</b>			

### 4.28.2 DEW.P - Calculated DEWPOINT

Acronym	Scrolling message	Submenu	Attributes
DEW.P	CALCULATED DEWPOINT	UserMenu	R
The parameter indicates the value of DEWPOINT calculated in runtime			
<b>Unit of measurement:</b> degrees F			
<b>Options:</b>			

### 4.28.3 P.OXY - Oxygen percentage

Acronym	Scrolling message	Submenu	Attributes
P.OXY	OXYGEN PERCENTAGE	UserMenu	R
The parameter indicates the value of OXYGEN calculated in runtime			
<b>Unit of measurement:</b> %			
<b>Options:</b>			

### 4.28.4 B.STAT - BURNOFF STATUS

Acronym	Scrolling message	Submenu	Attributes
B.STAT	BURNOFF STATE	UserMenu	R
This parameter shows the current status of the BURNOFF procedure			
<b>Unit of measurement:</b>			
<b>Options:</b>			
	<b>IDLE</b> = idle state		
	<b>CHECK</b> = check of conditions for Burnoff start-up		
	<b>P.BURN</b> = Air blowing start preparation		
	<b>R.BURN</b> = Air blowing run		
	<b>DELTA</b> = delta mV test after air blowing		
	<b>P.R.MIN</b> = preparation of recovery phase before minimum time		
	<b>RE.MIN</b> = Recovery up to the minimum time		
	<b>W.RECO</b> = Recovery		
	<b>DEFRZ</b> = Carbon defreezing parameters - end Burnoff		

#### 4.28.5 B.COUN - Burnoff Countdown

Acronym	Scrolling message	Submenu	Attributes
B.COUN	BURNOFF COUNTDOWN	UserMenu	R
The parameter indicates the time remaining in burnoff			
<b>Unit of measurement:</b> s			
<b>Options:</b>			

#### 4.28.6 B.AUT.C - Time remaining before the next Burnoff procedure

Acronym	Scrolling message	Submenu	Attributes
B.AUT.C	TIME TO NEXT BURNOFF IN HH.MM	UserMenu	R
The parameter indicates the time remaining before the next scheduled burnoff procedure (only if Automatic Burnoff procedure is set).			
<b>Unit of measurement:</b> HH.MM			
<b>Options:</b>			

#### 4.28.7 B.COMM – BURNOFF command

Acronym	Scrolling message	Submenu	Attributes
B.COMM		UserMenu	W
The parameter sets BURNOFF procedure start or abort. After setting the desired control, the parameter automatically returns to NONE.			
<b>Unit of measurement:</b>			
<b>Options:</b> NONE = no control			
START = Start BURNOFF procedure			
ABORT = Abort BURNOFF procedure			

#### 4.28.8 D.STAT - PROBE DIAGNOSIS STATUS

Acronym	Scrolling message	Submenu	Attributes
D.STAT	DIAGNO STATE	UserMenu	R
The parameter indicates the status of the Zirconium Oxide PROBE DIAGNOSIS procedure.			
<b>Unit of measurement:</b>			
<b>Options:</b> IDLE = idle state			
CHECK = check of conditions for probe diagnosis start-up			
P.IMPE = Zirconium oxide probe impedance measurement start preparation			
IMP.CA = Zirconium oxide probe impedance measurement			
P.SHOR = probe short-circuit test preparation			
SHORT = Probe short circuit test			
RECO = Recovery after short circuit test			

#### 4.28.9 D.COUN - Probe Diagnostics Countdown

Acronym	Scrolling message	Submenu	Attributes
D.COUN	DIAGNO COUNTDOWN	UserMenu	R
The parameter indicates the probe diagnostics countdown			
<b>Unit of measurement:</b> s			
<b>Options:</b>			

#### 4.28.10 D.AUT.C - Time remaining before next Probe Diagnostics procedure

Acronym	Scrolling message	Submenu	Attributes
D.AUT.C	TIME TO NEXT DIAGNO IN HH.MM	UserMenu	R
<p>The parameter indicates the time remaining before the next scheduled Zirconium oxide probe diagnosis procedure (only if the Automatic Diagnosis procedure is set).</p> <p><b>Unit of measurement:</b> HH.MM</p> <p><b>Options:</b></p>			

#### 4.28.11 D.COMM - Zirconium oxide probe diagnostic controls

Acronym	Scrolling message	Submenu	Attributes
D.COMM		UserMenu	W
<p>The parameter sets the zirconium oxide probe diagnostics start or abort. After setting the desired control, the parameter automatically returns to NONE.</p> <p><b>Unit of measurement:</b></p> <p><b>Options:</b>                <b>NONE</b>    = no control                               <b>START</b>   = Start probe diagnostics procedure                               <b>ABORT</b> = Abort probe diagnostics procedure</p>			

#### 4.28.12 CARB.STATUS - CARBON POTENTIAL STATUS

Acronym	Scrolling message	Submenu	Attributes
CARB.STATUS		UserMenu	R
<p>The parameter indicates the status of the CARBON CONTROLLER. The parameter is incorporated in the CARBON STATUS screen.</p> <p><b>Unit of measurement:</b></p> <p><b>Options:</b>                <b>GOOD</b>                = OK status                               <b>BUNROFF</b>            = Burnoff in progress                               <b>DIAGNO</b>             = Probe diagnostics in progress                               <b>WARN</b>                = Warnings triggered                               <b>ERROR</b>              = Errors triggered                               <b>OUT OF RANGE</b> = calculation outside the limits</p>			

#### 4.28.13 OXYG - Oxygen partial pressure reading

Acronym	Scrolling message	Submenu	Attributes
OXYG		UserMenu	R
<p>The parameter indicates the concentration of oxygen in the atmosphere</p> <p><b>Unit of measurement: partial pressure, where 1.00 = 100% O<sub>2</sub></b></p>			



## 5. EXAMPLES AND APPLICATION NOTES

### 5.1. Carbon Potential Control

This instrument is intended for use controlling the furnace atmosphere in thermochemical treatment processes, such as cementation, also known as case hardening.

The instrument takes a reading of the Zirconium oxide oxygen probe, as well as a temperature measurement of the probe itself, and uses this data to calculate:

- **Carbon Potential:** a measure of the ability of a given atmospheric composition to diffuse carbon within a heated steel workload, expressed as a percentage (by weight) of carbon in the steel (typically 0 to 2.5%).
- **Dew Point:** referring to a gas mixture, the temperature at which the condensed phase and the vapour phase of its water content are in equilibrium (at constant pressure).

The instrument is capable of running an algorithm for cleaning the zirconium oxide probe, referred to as the **BURNOFF** phase or procedure.

In the Burnoff phase, the zirconium oxide probe is struck by a flow of air to remove soot residues. Following this cleaning, the Burnoff Recovery phase is carried out, in which the instrument waits and monitors the condition of the probe until it reaches its pre-blowing behaviour.

The Burnoff phase can be triggered by the automatic start of probe cleaning after a set interval (in continuous processes) or manually started by the operator. If necessary, the instrument detects conditions in which probe cleaning has not been effective, e.g. due to the presence of a lot of soot or poor flow rate of cleaning air, and reports this to the operator.

A probe control algorithm is included to monitor probe impedance and condition, as well as the response to a short circuit in the probe. The operator is warned if the condition of the probe is not optimal, either in terms of impedance or in terms of recovering the probe signal after a short circuit.

The zirconium oxide probe generates a millivolt signal that depends on the ratio of the oxygen concentration on the reference side of the probe (outside the furnace) to the oxygen concentration in the furnace.

The zirconium probe is also equipped with a thermocouple for temperature measurement in the immediate vicinity of the sensitive element.

The mV output of the probe must be connected to input 3 (IN\_AUX2) of the controller, while the thermocouple of the probe must be connected to input 1 (I.MAIN) of the controller. The controller uses the temperature and oxygen concentration signals to calculate the carbon potential of the atmosphere in the furnace (PV1 on the controller's PID1).

The second temperature LOOP (PV2 on PID2) may be used to control oven temperature.

Generally speaking, sensor cleaning should be carried out at the beginning and end of a processing batch, with intermediate cleaning in longer processing cycles, following the recommendations of the manufacturers of the probes

used.

Programming a sensor impedance check for each batch can be a good way of detecting a faulty probe at an early stage.

An alarm can be configured to warn operators if the carbon potential exceeds the saturation limit, greatly reducing the risk of soot build-up on parts and surfaces inside the furnace.

#### 5.1.1. Normal instrument functioning

Using the "C.SET" parameter in the "CP.SET" menu, the operator selects which type of adjustment to be performed:

- **%C:** the controller calculates the percentage of Carbon in the furnace starting from the voltage read by the Zirconium oxide probe and the temperature read by the thermocouple of the probe itself; the calculated Carbon percentage is shown on the PV display of HOME1, where the settable Setpoint and the temperature read by the probe are also displayed. In parallel, the regulator also calculates the Dewpoint, also on the basis of probe readings (the parameter can be entered in HOME1 through the parameters DS.F or DS.SP or as a parameter of the USERMENU).
- **Dewpoint:** the controller continuously calculates and regulates the dewpoint value based on the desired setpoint.
- **mV:** the controller continuously measures and regulates the millivolts value based on the desired setpoint.
- **Oxygen:** the controller continuously calculates and regulates the oxygen value based on the desired setpoint.
- **Normal adjustment:** by selecting the NONE parameter, the user can choose to adjust a loop which is not based on the zirconium oxide probe.

Holding down the "FUN" key on the instrument, from HOME1 we go to HOME2, if present, and then to the USERMENU, where the "CARBON STATE" screen is shown as the first entry, displaying the following information:

- **PV DISPLAY:** shows the temperature read by the probe in real time or, during the Burnoff and Probe Diagnostics procedures, shows the last temperature measured before the start of the procedure (see section on Burnoff and Probe Diagnostics)
- **SP DISPLAY:** shows the voltage read in real time by the Zirconium probe on IN\_AUX2 or, during Burnoff and Probe Diagnosis procedures, shows the last voltage measured before the start of the procedure (see Burnoff and Probe Diagnosis section)
- **DISPLAY F:** text messages are shown to indicate controller status ("GOOD" if the entire algorithm is working within the established parameters, or scrolling strings of messages with the faults detected - see section on "Error conditions").

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Please refer to the “CP.SET” MENU for an understanding of all the parameters that can be set for zirconium oxide oxygen probe-based control.

## 5.2. Burnoff procedure - probe cleaning

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The instrument allows automatic (parameter AUT.B with a repetition frequency of B.FREQ) or manual cycles for cleaning the Zirconium oxide oxygen probe. The cycles can be activated using the TST + A/M key in the “CARBON STATE” screen, by digital input, by serial via the “B.COMM” parameter.

The BURNOFF start command is ignored if:

- A diagnosis procedure is in progress
- The temperature measured by the probe does not reach the value M.TEMP
- Burnoff inhibit timer is active (default 10 minutes)
- auto tune is in progress
- burnoff error not cleared

The various phases in the Burnoff procedure are displayed by means of parameter B.STAT, while the “CARBON STATE” screen displays scrolling messages indicating the execution of the individual phases and a countdown of the various phases according to the set times.

The cleaning phase is a period during which air is injected through the probe via a control signal (a “digital” output) raised for a programmable period, **B.TIME[s]**. The voltage value read by the probe is unreliable during cleaning, due to air passing through the probe. Even immediately after cleaning, the signal from the probe will not be reliable, so a subsequent signal recovery phase is planned. During the recovery phase, we wait until the air injected into and around the probe vanishes and the signal returns to normal.

Immediately after the Burnoff phase, the instrument performs a test: it checks that the air passing through the probe is of good quality, i.e. clean air with a sufficient rate of flow. If these conditions are met, the voltage at the ends of the probe should drop rapidly. This means that after a Burnoff, before starting recovery, the voltage value of the probe must have fallen by at least M.VAR (**Minimum Burnoff Variation**).

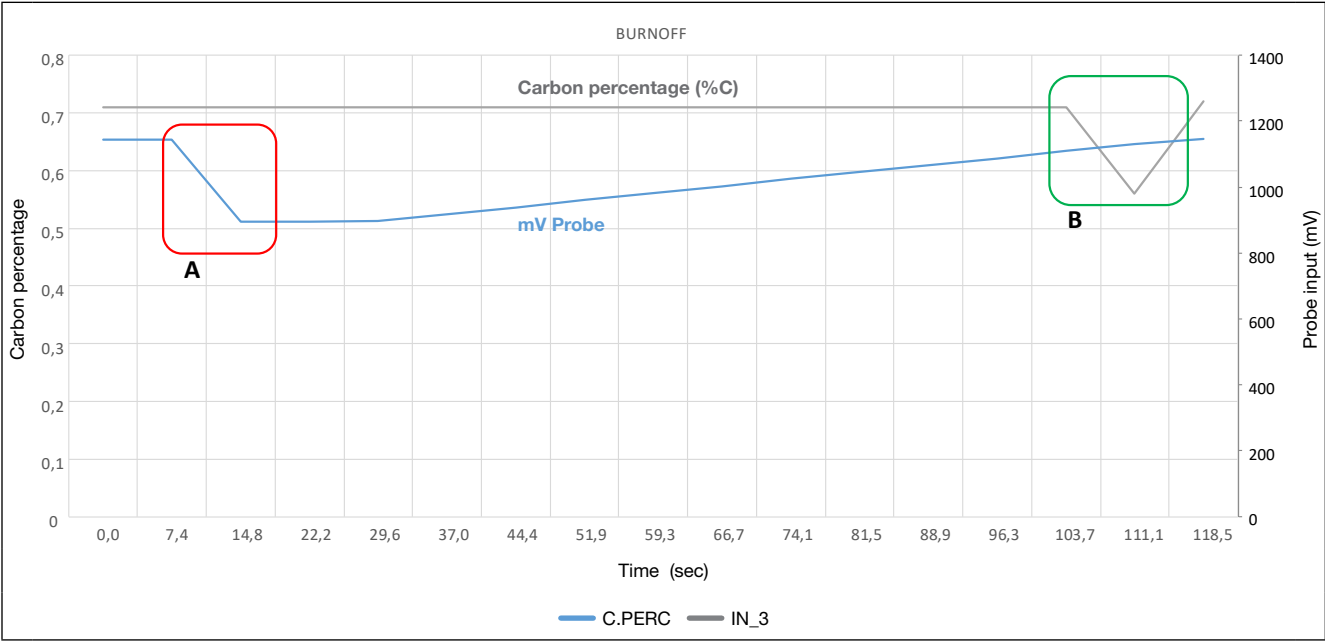
Control will not be suspended during these phases. A reliable %C value will be guaranteed using the last reliable voltage and temperature value stored before the cleaning phase (parameters FRZ.TE and FRZ.MV). These values will be used for calculation, leaving the q (Alloy Factor), pCO (percentage of Carbon Monoxide) and pH<sub>2</sub> (percentage of diatomic Hydrogen) values to be set by the user. When the Burnoff phase begins, the integral component of the PID remains frozen throughout the Burnoff and Recovery phases in order to prevent unwanted integration of errors detected at the start of the phase.

After cleaning, wait until the voltage value returns to a value similar to the one it had before injecting air. After an amount of time **B.MIN.T**, if the value in mV has reached at least 98% of the last useful value recorded, then the recovery is considered terminated, the signal is unfrozen and control begins again, with a jump of the signal in mV up to a maximum permitted value of 2% (which **does not** correspond to a 2% jump of the calculated %C).

Observation of a bump in the setting, with significant power intervention, at the end of the Burnoff, could be:

- Symptomatic of degradation of the probe’s working conditions (the previously set recovery time is no longer sufficient to ensure complete recovery of the previous conditions). A probe diagnosis procedure is recommended.
- Symptomatic of incorrectly set recovery times

# GRAPH 1

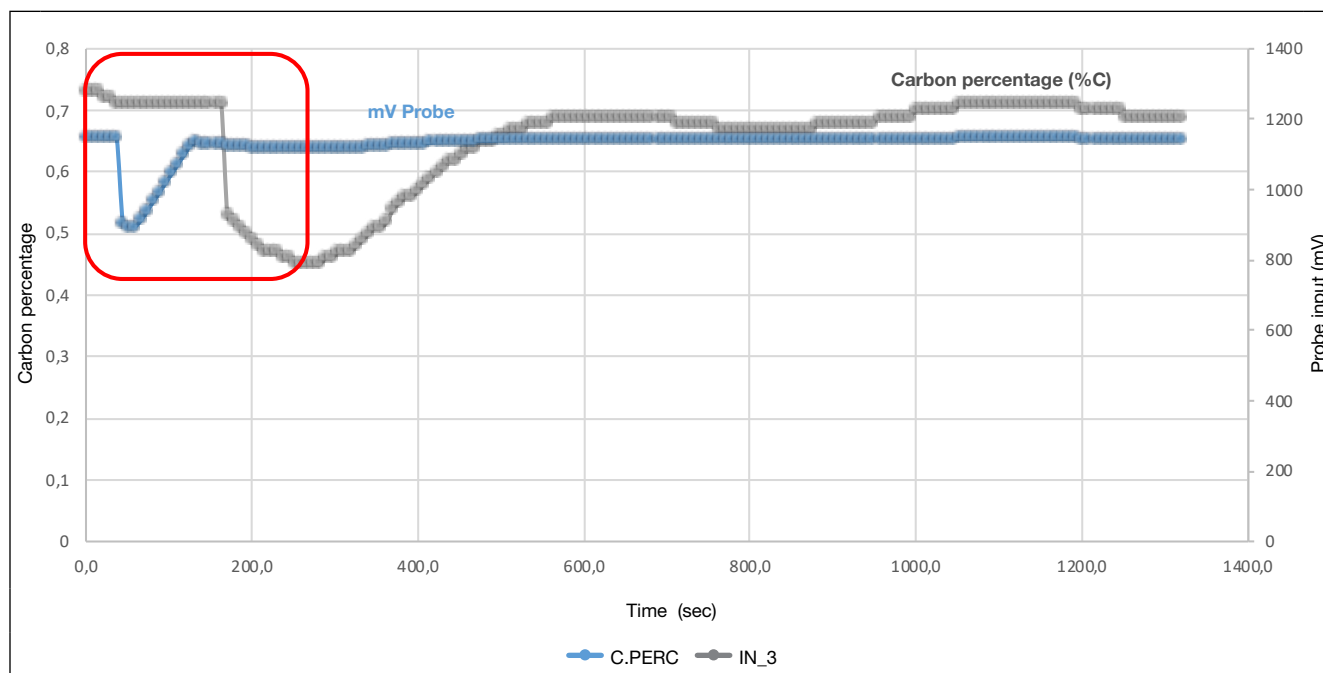


Test configuration referring to GRAPH 1		
Meaning	Parameter	Value
Set point (%C)	SSP_1	0,7
Time to next diagnostics (h)	B.AUT.C	1
Start procedure control, returns to 0 during runtime	B.COMM	0
Burnoff duration (s)	B.TIME	15
Burnoff start-up mode	AUT.B	AUTO
Period between two Burnoffs (min)	B.FREQ	120
Recovery time lower limit (s)	B.MIN.T	75
Recovery time upper limit (s)	B.MAX.T	300
Minimum temperature for Burnoff execution (°C or °F)	M.TEMP	650
Maximum limit for Burnoff execution (°C or °F)	LIM.TE	1200
Minimum mV probe variation during Burnoff (Pti)	M.VAR	200

Graph 1 shows the calculated carbon potential in grey and the mV of the Zirconia probe during the Burnoff procedure with a blowing time of 15 s and a recovery time of 90 s in blue. At point A, shown in red, the air-blowing phase is taking place and the mV is decreasing, while the carbon percentage remains stationary, frozen at the value calculated before the start of the procedure. Then the recovery phase begins, and

the mVs return to normal values. At point B the recovery ends and the carbon percentage returns to the true values. In this specific case, a noticeable drop in the percentage of carbon may be observed, since the mV probe has reached 98% of its pre-Burnoff value within the recovery time (a symptom of probe degradation or a recovery time setting that is too stringent for the type of probe used).

## GRAPH 2



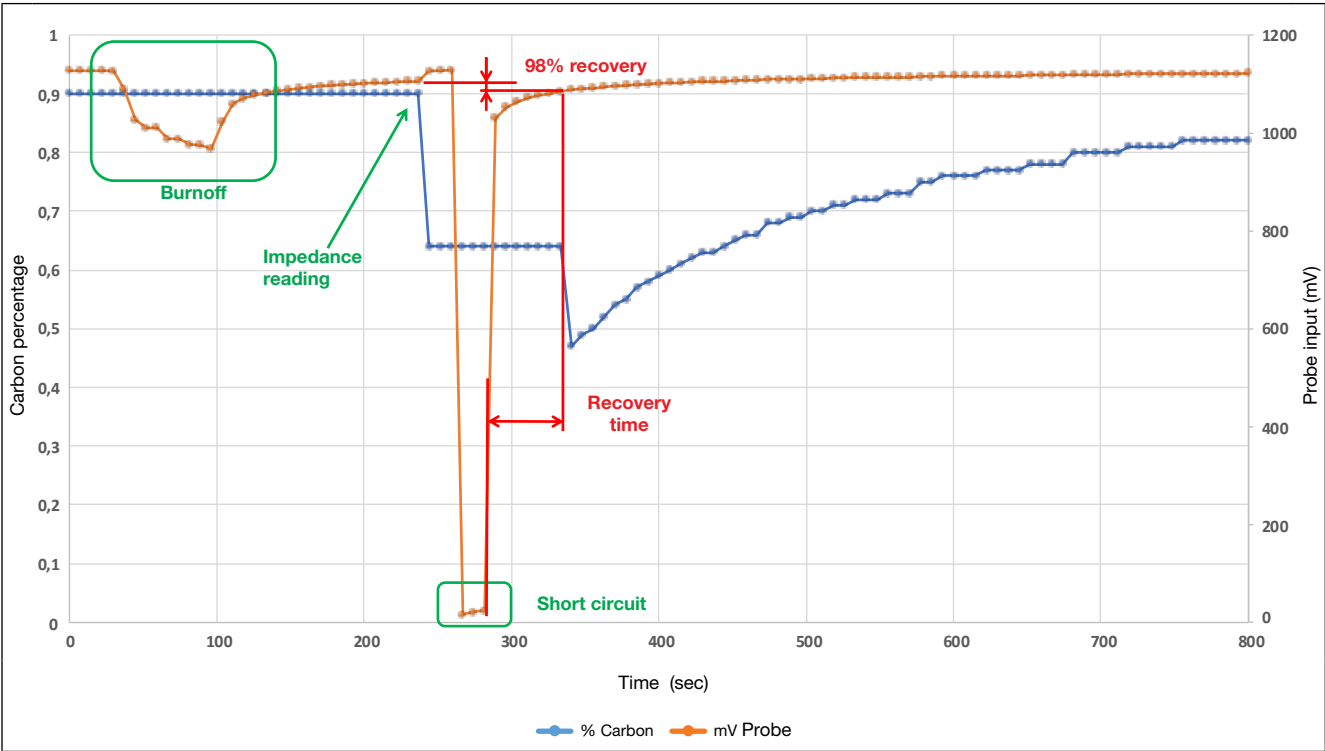
Test configuration referring to GRAPH 2

Meaning	Parameter	Value
Set point (%C)	SSP_1	0,7
Time to next diagnostics (h)	B.AUT.C	0
Start procedure control, returns to 0 during runtime	B.COMM	0
Burnoff duration (s)	B.TIME	15
Burnoff start-up mode	AUT.B	Manual
Period between two Burnoffs (min)	B.FREQ	120
Recovery time lower limit (s)	B.MIN.T	90
Recovery time upper limit (s)	B.MAX.T	300
Minimum temperature for Burnoff execution (°C or °F)	M.TEMP	650
Maximum limit for Burnoff execution (°C or °F)	LIM.TE	1200
Minimum mV probe variation during Burnoff (Pti)	M.VAR	200

In graph 2, the Burnoff procedure is highlighted in red, in which the recovery ends at the time B.MIN.T = 90s, even though the mV probe (IN3) has already become fully operational before the set minimum time: it is clear that the

calculated carbon percentage continues to be the frozen one until the time B.MIN.T, after which the Burnoff procedure ends.

**GRAPH 3: burnoff and diagnostics on a real probe**



Graph 3 shows the diagnostic steps in a real application where burnoff is performed followed by probe diagnostics. There is an initial Burnoff phase in which, following air blowing, there is a descent of the points during which the %C is frozen.

At the end of Burnoff recovery, the %C calculation is resumed before starting the diagnostic phase which includes reading the probe impedance and applying the short-circuit.

---

If the signal has not yet reached 98% after the Burnoff Min Recovery Time, the Recovery situation continues, waiting until the 98% threshold is exceeded. If the signal has still not reached at least 98% after B.MAX, an alarm will be triggered in the cleaning phase (BURNOFF Failure).

Probe temperature cannot rise above **LIM.TE** during the BurnOff phase. Above this temperature, cleaning stops and Recovery is completed. This could be a sign of a potentially harmful exothermal reaction. An error is reported (see section "Error and alarm conditions").

The start of the BurnOff is always conditional on the **M.TEMP** being exceeded.

The mode of starting the Burnoff procedure can be selected using parameter **AUTO.B**:

- Manual = a call will never be made automatically. Wait for a command from serial or keyboard or digital input.
- Automatic = cyclical repetition of the Burnoff procedure

#### Automatic operation

After M.TEMP has been exceeded, the BurnOff will be repeated cyclically with frequency of **B.FREQ** (if the parameter **Burnoff frequency** = 0, only one BurnOff procedure will be performed).

The falling edge of **Automatic BurnOff** resets the time counters. If a manual command is given while an automatic procedure is in progress, the current procedure is terminated before effectively reverting to manual control.

The Diagnostic and Burnoff procedures are mutually exclusive (they cannot start at the same time): if automatic mode is enabled, it will wait for the current procedure to be completed.

#### Abort burnoff

It is possible to interrupt the Burnoff command with the ABORT Burnoff command (available from the keyboard in the CARBON STATE screen (first parameter of the USERMENU) by pressing the UP and DOWN keys simultaneously for at least 2 s, from the digital input, from the serial via the B.COMM paramete.

In all cases, the Abort command leads to execution of the recovery procedure for ensuring that the probe returns to pre-Burnoff operating conditions..

#### Burnoff REPORT

At the end of the procedure, the recovery time taken by the probe to return to operation (R.TIME), any anomalies, and the voltage and temperature values of the probe detected before the burnoff procedure (**FRZ.TE** and **FRZ.MV**) are saved in specific parameters in the INFO.C menu.

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## 5.4. Zirconium probe diagnosis procedure

Probe diagnostics measure the impedance value and the response of the probe to a short circuit of the voltage input to check the signal recovery time. First the impedance reading is taken and then the short circuit is performed (if parameter D.TIME is different from 0, otherwise only the impedance measurement is performed).

The instrument allows automatic cycles (**AUT.D** parameter with **D.FREQ** repetition frequency) or manual diagnosis of the Zirconium oxide oxygen probe. The cycles can be activated using the TST+FUN key in the **CARBON STATE** screen (first parameter in the USER MENU), by digital input, or by serial via the **D.COMM** parameter.

The start command DIAGNO is ignored if:

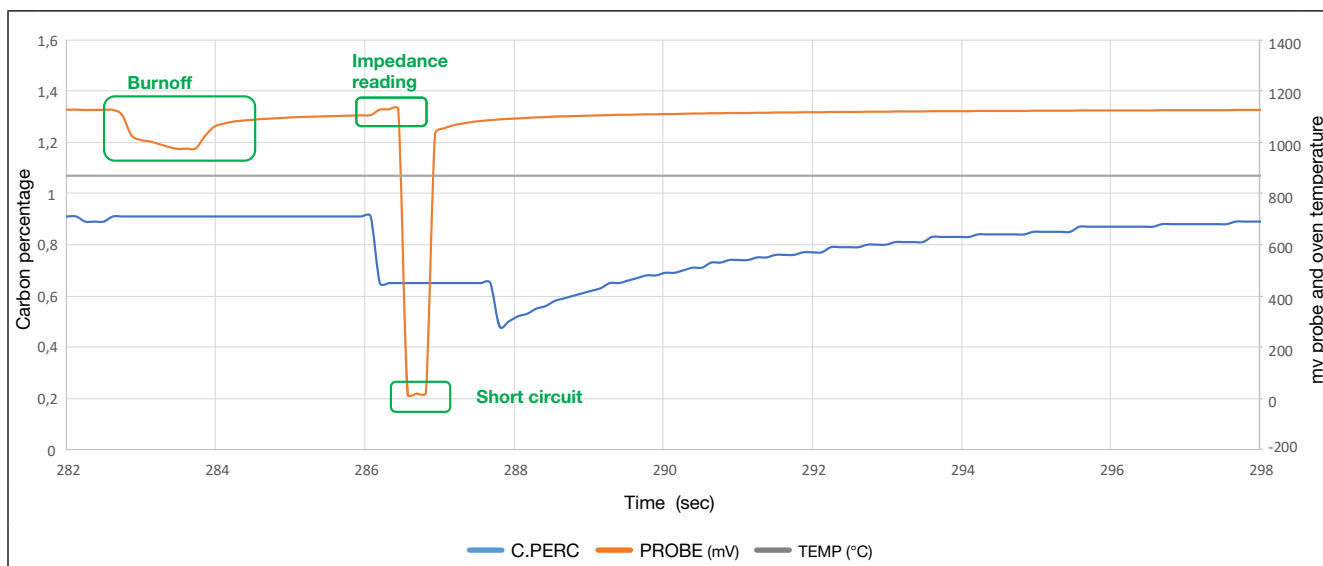
- A Burnoff procedure is underway
- The temperature measured by the probe does not reach the value **D.MIN.T**

The various phases of the Burnoff procedure are displayed by means of the **D.STAT** parameter, while the CARBON STATE screen (the first parameter in the USERMENU) displays scrolling messages indicating execution of the individual sub-phases and a countdown of the various phases according to the set times.

Short-circuiting the probe causes it to work as an oxygen pump, thus creating a higher concentration of oxygen around the probe. The signal recovery time is an indication of how quickly the oxygen barrier around the probe is cleared.

The probe is short-circuited for a certain time **D.TIME** [s] and the time taken to return to steady state **D.RECO** [s] is evaluated. If it does NOT return to the initial value  $\pm 2\%$  within the set **D.MAX.T** [s], a fault is signalled on the diagnostics performed (**Diagno Failure**).

## GRAPH 4



Graph 4 shows the Diagnostic procedure.

During the first 20s a measurement of probe impedance is taken, after which the short-circuit is triggered (in the graph

the mV IN3 signal of the probe is set to 0 for a time equal to D.TIME = 15s. Next, note the rise of the IN3 signal during recovery from the short circuit until the mV value is fully recovered.

The mode of starting the Probe Diagnostics procedure can be selected using parameter AUTO.D:

- Manual= a call will never be made automatically. Wait for a command from serial or keyboard or digital input.

Automatic = cyclical repetition of the probe diagnosis procedure

- After Burnoff = queuing of the diagnosis procedure to a manual or automatic Burnoff procedure.

#### Automatic operation

After passing D.MIN.T, the diagnosis will be repeated cyclically with a frequency of D.FREQ (if parameter **D.FREQ** = 0 only one diagnosis step will be performed).

If a manual command is given while an automatic procedure is in progress, the current procedure is terminated before effectively reverting to manual control.

The Diagnostic and Burnoff procedures are mutually exclusive (they cannot start at the same time): if automatic mode is enabled, it will wait for the current procedure to be completed.

The **AUT.D** parameter can be used to link the Diagnosis phase to an automatic or manual Burnoff phase. In the event of an error in the Burnoff procedure, the diagnosis procedure is still carried out at the end of the procedure (useful for understanding the actual state of the probe).

#### Abort diagnosis

It is possible to interrupt the diagnosis command with the Diagno ABORT command (available from the keyboard in the "CARBON STATE" screen by pressing the UP and DOWN keys simultaneously for at least 2 s, from the digital input, from the serial port via the D.COMM parameter (**ABORT** option) and from the LFB.

#### REPORT

At the end of the procedure, the recovery time taken by the probe to become operational again (D.RECO), any anomalies, and the voltage and temperature values of the probe detected before the diagnosis procedure (D.FR.MV and D.FR.TE) are saved in special parameters in the INFO.C menu.

## 5.5. FAULT AND/OR ALARM CONDITIONS

There are several cases of errors or faults that are handled differently by the controller. The HOME1 screen shows the general error message in the event of a fault, while the "CARBON STATE" screen in the USERMENU shows the detailed scrolling message of the type of error or warning detected.

In the first instance, there is an error priority:

1. Highest priority: ERRORS on the I.MAIN, I.AUX and I.AUX2 inputs (Sensor breakage, Out-of-limit reading, Calibration error). In this case, the PV display in HOME1

shows the type of error that has occurred with a scrolling message; control is interrupted and the control outputs are inhibited.

2. Medium priority: ERRORS concerning the algorithm for control via Zirconia probe. In this case too, the control outputs are inhibited, but only if the parameter "LOC.O" is set to ENABLE. Below is a table summarising all alarm conditions
3. Low priority: warnings concerning Burnoff and Probe Diagnostics procedures that have ended with fault signals; these errors do not inhibit the control outputs.

Name	Description	Outputs locked by default (Loop1). See NOTE4	Error message retention / Continuous monitoring	HOME message	CARBON STATE screen message
<b>Alarm Too Low Temp for Calc</b>	Indicates if you are below the minimum temperature for calculating %C or DewPoint (C.MIN.T parameter)	YES (if LOC.O = ENABLE)	Continuous control	"CARBON CALC OUT RANGE"	"TOO LOW TEMP TO CALC"
<b>Alarm Too High Temp for Calc</b>	Signalling if you are above the maximum calculable temperature of %C or Dewpoint (C.MAX.T parameter)	YES (if LOC.O = ENABLE)	Continuous control	"CARBON CALC OUT RANGE"	"TOO HIGH TEMP TO CALC"
<b>Min Probe Calc</b>	Signalling if you are below the calculable voltage limit of %C or DewPoint (P.MIN.V parameter)	YES (if LOC.O = ENABLE)	Continuous control	"CARBON CALC OUT RANGE"	"TOO LOW MV TO CALC"
<b>Max Probe Calc</b>	Signalling if you are above the calculable voltage limit of %C or DewPoint (P.MAX.V parameter)	YES (if LOC.O = ENABLE)	Continuous control	"CARBON CALC OUT RANGE"	"TOO HIGH MV TO CALC"



<b>Out of Saturation limit</b>	If the <b>Saturation Limit</b> %C beyond which <b>soot</b> is generated is exceeded (C.SAT.L parameter)	YES (if LOC.O = ENABLE)	Continuous control	"HIGH SATURATION"	"TOO HIGH SATURATION"
<b>Air blow error during Burnoff</b>	Signal drop in mV not large enough during air blowing. This may indicate an insufficient air flow or a damaged cleaning system. (M.VAR parameter)	NO	Alarm held	"BURNOFF FAILURE"	"MIN BURNOFF VARIATION NOT REACH"
<b>Probe Recovery Failure</b>	The mV signal of the probe does not reach 98% of the initial value within <b>B.MAX.T</b>	NO	Alarm held	"BURNOFF FAILURE"	"BURNOFF RECOVERY TIMEOUT"
<b>BurnOff outside temperature limit</b>	A temperature higher than the <b>LIM.TE</b> set limit is reached during the Burnoff phase. Reaching this temperature during the Burnoff phase immediately terminates the procedure, moving on to the recovery phase.	NO	Alarm held	"BURNOFF FAILURE"	"OVER TEMPERATURE BURNOFF"
<b>Probe Test Fail DIAGNO</b>	Signal in mV unrecovered after probe short-circuit within a tolerance of +2% of initial signal within <b>D.MAX.T</b>	NO	Alarm held	"DIAGNO FAILURE"	"SC RECOVERY OUT OF RANGE"
<b>DIAGNO Limit Probe Impedance Alarm</b>	If the measured impedance of the probe exceeds <b>IMPE.L</b> or exceeds the maximum measurement limits of the instrument (99.99 Kohm)	NO	Alarm held	"DIAGNO FAILURE"	"IMPEDANCE OUT OF RANGE"
<b>Temperature and probe voltage input error</b>	If the inputs show any kind of reading error (e.g. Sbr detach probe error detected), the values of the Zirconium oxide probe cannot be read and the Carbon percentage cannot be calculated.	YES (if LOC.O = ENABLE)	Continuous control	Sbr, Hi, Lo, Err errors	"CARBON INPUT ERROR"
<b>SPARE PROBE ACTIVE</b>	Use of the spare probe on IN.AUX	NO			

**NOT"1:** The acknowledged alarms reappear as a signal in the CARBON STATE when the instrument is restarted; with the "CLEA" parameter in the "CP.SET" menu , it is possible to reset both the alarm condition and the signal.

**NOTE2:** The alarm conditions indicated as continuous monitoring are constantly checked during machine operation; if the condition persists, use of the "CLEA" parameter will have no effect.

**NOTE3:** the scrolling messages in the "CARBON STATE" screen of the USERMENU can be customised according to

your needs using the SuperSET tool in the "MESSAGES" section.

**NOTE4:** control and the outputs associated with enrichment and depletion are also inhibited in the case of input errors "Sbr" (Sensor broken), "Err" (Calibration error), "-HI" and "-Lo" (Calibration limit exceeded). For the latter two errors, control will be interrupted only if the C.SET parameter in the CP.SET menu is different from NONE.

---

## 5.6. The COF and H2F parameters can be set remotely

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The Carbon Monoxide and Hydrogen factor parameters can be set remotely using the instrument's AUX auxiliary input.

To do this, follow the steps below:

1. Connect the instrument, providing the COF or H2F values to the instrument's AUX input (refer to electrical connections section).
2. In the INPUT menu, select input 2 and set the appropriate parameters for the instrument being used.
3. In the INPUT menu, select input 2 and set the FUNC parameter to "CARB.R". This will enable COF.R and H2F.R in the CP.SET menu.
4. In the CP.SET menu, set the parameter COF.R and/or H2F.R to ENABLED.
5. NB: The instrument expects to receive a value (1 - 1000) with no decimal points, set input 2 appropriately.

---

## 5.7. Auxillary input

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The value of the auxiliary analog input is shown in parameter IN2.

The function can be:

- display only (with settable alarms if required);
- process variable for PID.2;
- reference for the PID.1 ratio controller if in REMOTE mode;
- process variable (PV) setpoint for PID.1 if the controller is in REMOTE mode;
- POWER setpoint for PID.1 if the controller is in MANUAL and REMOTE mode;
- reset power for PID.1
- valve position

The scale limit values of the input are settable on the configuration menu with parameters LO.SCL and HI.SCL (INPUT.2 menu).

The parameter IN2 is shown in read-only on the user configuration menu.

## 5.8. 4-point input correction

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The 4-point input correction lets you adjust/align the reading of the probe t/c, mV inputs, and/or of the auxiliary input by setting four values: X1, X2, Y1 & Y2.

To enable the function, proceed to level PASS 1 menu option; then to the INPUT menu. Under selected input # cycle through the Submenu to set parameter Lin to display 4.POIN and press MEN. (INPUT.1 menu for probe T/C or INPUT.2 for auxiliary input or INPUT.3 for probe mV).

The limitations are:

- X2 must always be larger than X1;
- X2-X1 must be 10% larger than the full scale of the selected sensor.

The setting is limited within the defined scale LO.SCL... HI.SCL (INPUT.1 menu for probe T/C, INPUT.2 for auxiliary input, or INPUT.3 for probe mV).

When using this function on linear scales (60mV, 1V, 5V, 10V, 20 mA), you may invert the scale. You should always use copper wire when sourcing your DC values.

When using this function on inputs set up for thermocouple types (B, K, N, R, S), you should always use corresponding thermocouple wire when sourcing your values.

Proceed to PASS 2 menu option. Then under LNR.4.P menu select input # using parameter LNR.4.N (INPUT.1 menu for probe T/C or INPUT.2 for auxiliary input or INPUT.3 for probe mV).

The four values may be set within the LIN.4.P menu, as indicated by the Md.4P parameter:

- RD.ADJ: the user manually selects the parameters in order (X1, Y1, X2, and Y2) and edits the value appearing on the display
- CALIB: for values X1 and X2, no value is shown that can be increased or decreased, but the input is directly shown (which can be modified with a calibrator)

If you select the second option (Md.4P="CALIB") and press MEN,

- 1) The display will show X1. Source into your selected input from calibrated device the base value. (Ex: 0.0 F). Then press MEN

1.1) The calibrator's reading will be assigned to the first of the four parameters X1 (=value of the abscissa of the first linearization point)

2) When the second parameter Y1 (=value of the ordinate of the first linearization point) appears on the screen, use the UP\DOWN buttons to adjust the value to be assigned to this parameter (Ex: X1 was sourced 0.0 F - enter 0.0). Once you have the value adjusted, press MEN to assign value to the parameter and proceed on to the next parameter.

3) The display will show X2. Source into your selected input from calibrated device the 2nd linearization point. Ex. 2000 F Now press MEN

3.1) The calibrator's reading will be assigned to X2 the third of the four parameters X2 (=value of the abscissa of the second linearization point)

4) When the fourth parameter Y2 (=value of the ordinate of the second linearization point) appears on the screen, use the UP\DOWN buttons to adjust the value to be assigned to this parameter (Ex: X2 was sourced 2000 F - enter 20.00). Once you have the value adjusted, press MEN to assign value to the fourth parameter Y2. Then exit the menu by pressing and holding A/M to return to main display.

Use the FUN button to select specified display modes on the display so the effective input can be shown on the instrument's respective input display, net of the OFFSET parameter and correction of the 4 points (in the LIN.4.P menu, you need not disable 4-point linearization or reset the OF.SCLx parameter, if it has been entered).

### Example of typical use

A customer's weights and measures division periodically checks linearization, which has been set to represent a straight line passing through two points (200, 210),(600, 700)

In this case, proceed as follows:

- a) Set the calibrator to 200°C
- b) Go into the new LIN.4.P menu and set parameter Md.4P to "CALIB"
- c) Read the Inx parameter at 200°C and confirm the first parameter by pressing "MEN"
- d) In the second parameter, set 210°C and press "MEN"
- e) Set the calibrator to 600°C

- 
- f) Press "MEN" to confirm the reading of 600°C on the INx parameter shown
  - g) Set the fourth parameter to 700°C and press "MEN"
  - h) Exit the menu, and the PV will appear with 4-point correction set

Note1: you do NOT need to remember to disable linearization during the procedure

Note2: you do NOT need to remember to reset the offset

**WARNING:** if the FILT.D parameter is not 0, when you return to the home page, you may find a PV value different from the one set (as the INx parameter is displayed during the procedure, and not PVx ).

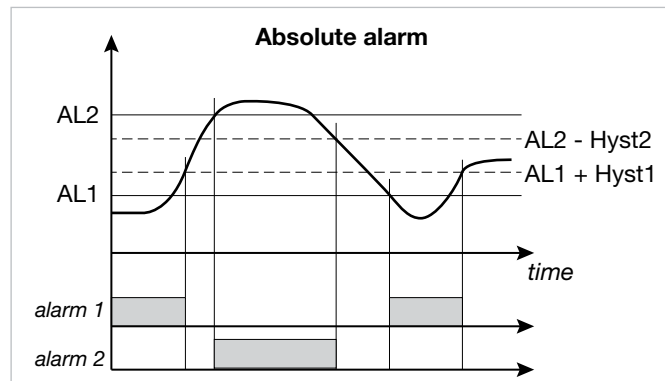
## 5.9 Alarms

### 5.9.1 AL1...AL4 Generic alarms

Generic alarms AL1...AL4 can be mainly 4 types, as described below:

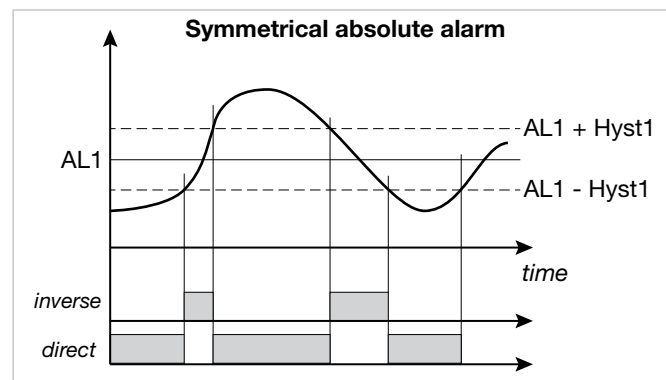
#### Absolute alarm

AL1 inverse and absolute, AL2 direct and absolute. Two alarm setpoints, AL1 (lower setpoint) and AL2 (upper setpoint) are set, corresponding to two specific hysteresis values, Hyst1 (positive) and Hyst2 (negative). The alarm trips when the measured value remains less than AL1 or greater than AL2 for the set delays. The alarm condition ends when the measured value is greater than AL1 + Hyst1, or less than AL2 - Hyst2. This prevents repeated alarms caused by slight changes in the measured value. Any alarm message at power-on, when the equipment is not at full speed, can be avoided by setting disable at power-on.



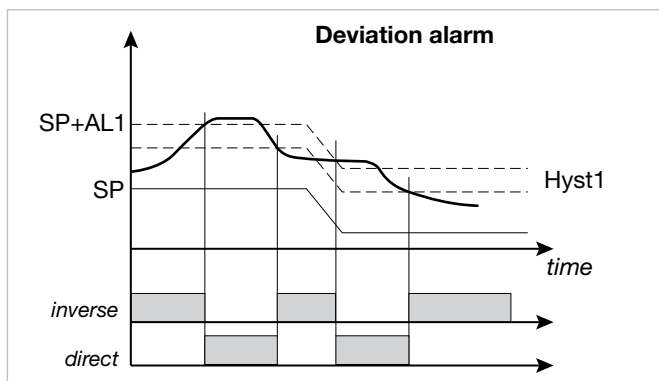
#### Symmetrical absolute alarm

A single alarm setpoint AL1 and a single hysteresis value Hyst1 are set. When a direct alarm is set, the alarm trips when the measured value is less than AL1 - Hyst1 or greater than AL1 + Hyst1 for the set delay. When an inverse alarm is set, the alarm trips when the measured value is greater than AL1 - Hyst1 or less than AL1 + Hyst1 for the set delay.



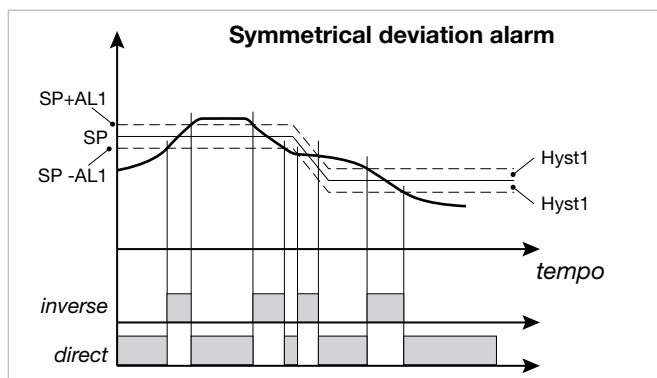
#### Deviation alarm

A single alarm setpoint AL1 and a single hysteresis value Hyst1 (negative) are set. When a direct alarm is set, the alarm trips when the measured value is greater than SP + AL1 for the set delay. The alarm condition ends when the measured value is less than SP + AL1 - Hyst1. When an inverse alarm is set, the alarm trips when the measured value is less than SP + AL1 - Hyst1 for the set delay. The alarm condition ends when the measured value exceeds SP + AL1. The deviation alarm lets you implement dynamic setpoints that automatically follow the trend.



#### Symmetrical deviation alarm

A single alarm setpoint AL1 and a single hysteresis value Hyst1 are set. When a direct alarm is set, the alarm trips when the measured value is less than SP - AL1 or greater than SP + AL1. When an inverse alarm is set, the alarm trips when the measured value is between SP - AL1 and SP + AL2.



## 5.9.2 LBA alarm

This alarm signals an interrupt in the control loop as a possible consequence of a sensor in short circuit, an inverted sensor, or a load break.

It trips an alarm if the variable does not increase its value in heating (or does not decrease it in cooling) when maximum power is supplied for settable time LBA.TM.

Setting the parameter LBA.TM = 0 disables the LBA function. The value of the variable is enabled only outside the proportional band.

When the alarm is active, power is limited to the value LBA.PW and the PV display flashes.

The alarm condition is reset if the temperature increases in heating mode (if it decreases in cooling mode), by setting AL.ACK = On in the user configuration menu, or by switching to Manual mode.

The LBA alarm is disabled in the presence of ON-OFF control (of incr, decr, and incr/decr).

In the presence of PID control with ON-OFF incr or decr, LBA.PW can only be set for the PID part.

## 5.9.3 Power alarm

The power alarm can be linked to each PID, PID1 and PID2 control LOOP. The alarm is inactive if the control is ON/OFF during Self-Tuning and in Manual.

The alarm signals possible power changes (OUT.P1 or OUT.P2) after the process variable (PV) has stabilized on the setpoint (SSP active).

The process variable is considered stable after 300 seconds. The reference power is refreshed only at power-on or after a setpoint change.

If the process variable exits the stabilization band after an initial stabilization, this has no effect on the alarm.

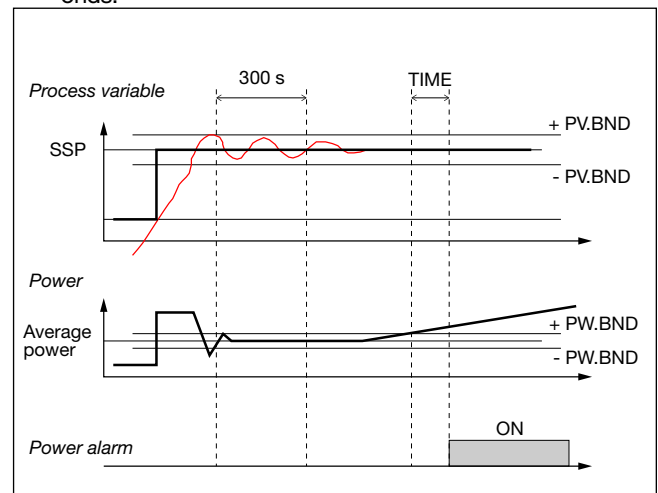
In case of PV in SBR or Err error:

- if the PV has not yet stabilized, FAULT power is supplied;
- if the PV has stabilized, the average power for the last 5 minutes is supplied.

Set a power alarm as follows:

- If necessary, assign an output (OUTPU.1 ...OUTPU.4) for the power alarm (POWR1 for PID1 or POWR2 for PID2).
- Set the band (PV.BND) within which the process variable is considered stable after 300 seconds have elapsed.
- Set the band (PW.BND) outside of which the alarm is activated after TIME has elapsed.

The reference power is the active power after 300 seconds.



The alarm is reset and the reference power is refreshed only at power-on or after a change of the SSP setpoint.

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## 5.10 Retransmission output

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The retransmission output is used mainly to retransmit the OUT.PW control power.

The percentage of actuation value is shown by read-only parameter OUT. AN on the user configuration menu.

## 5.11 Switching the software on/off

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### 5.11.1. How to switch it off


Keep the  and  keys pressed for 5 seconds to deactivate the controller.

The device goes to an “OFF” state and assumes the behavior of a controller switched off.

The voltage is not switched off: the process variable (PV) display stays on, but the SV display is off.

All outputs (control and alarms) are OFF (logic level 0, relays de-energized) and all controller functions are inhibited except “POWER-UP”, and serial communication.

### 5.11.2 How to switch it on

Keep the  key pressed for 5 seconds: the controller goes from “OFF” to “ON” state.

If voltage is switched off during the “OFF” state, at the next Power-up the controller returns to “OFF” state (the controller latches the “ON/OFF”).

Functioning is normally enabled. To disable it, set the parameter On.OF = disab. on the MODE configuration menu. This function can be assigned to a digital input (F.in.x, parameter ON-OFF), excluding deactivation from the keypad.

## 5.12 Soft-Start

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If enabled (by setting SOFT.S = ON on the PID configuration menu), the Soft-Start function slices power based on the percentage of time lapsed since controller power-on compared to the time set in the parameter SOFT.T

Soft-Start is an alternative to Self-Tuning and is activated after every controller power-on.

The Soft-Start action is reset in Automatic-Manual switching.

## 5.13 Tuning

### 5.13.1 Tuning actions

Tuning actions are divided into 3 categories:

- **Proportional:** action in which the contribution of the output is proportional to the deviation in input.
- **Integral:** action in which the contribution on the output is proportional to the integral in time of the deviation in input.
- **Derivative:** action in which the contribution on the output is proportional to the speed of change of the deviation in input.

The deviation is the offset between the measured value of the controlled variable and the setpoint.

Tuning actions let you achieve optimum tuning of the controlled process in every phase.

#### 5.13.1.1 Influence of Proportional, Integral and Derivative actions on response of controlled process

The response of the controlled process depends on the type of control action set. Specifically:

- Increasing the Proportional Band reduces oscillations but increases the deviation.
- Decreasing the Proportional Band reduces the deviation but causes oscillations of the controlled variable (excessively low Proportional Band values make the system unstable).
- Increasing the Derivative Action, corresponding to an increase in Derivative Time, reduces the deviation and prevents oscillations up to a critical value of Derivative Time, beyond which it increases the deviation and causes prolonged oscillations.
- Increasing the Integral Action, corresponding to a decrease in Integral Time, tends to cancel the deviation at full speed between the controlled variable and the setpoint.
- If the Integral Time value is too long (weak Integral action), there may be persistence of the deviation between the controlled variable and the setpoint.

For more information on tuning actions, contact SSI Customer Care.

### 5.13.2 Manual tuning

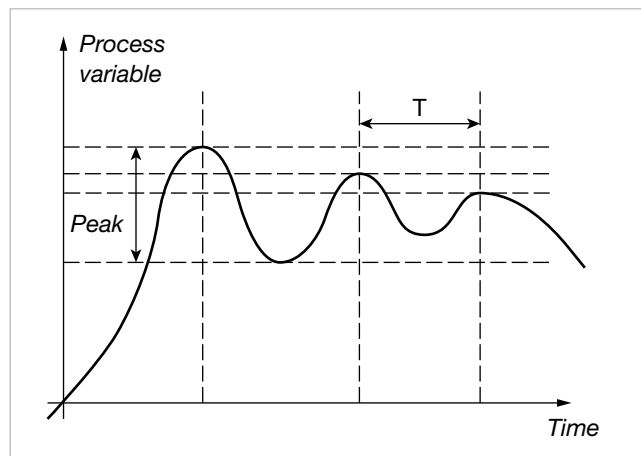
Manual tuning is done as follows:

1. Set the setpoint to the working value.
2. Set the Proportional Band to 0.1% (with ON-OFF control).
3. Switch to automatic and watch the behavior of the variable.  
There will be behavior similar to that shown in the following figure.
4. Calculate the PID parameters:
  - Proportional Band P.B. value

$$P.B. = \frac{\text{Peak}}{V_{\max} - V_{\min}} \times 100$$

where  $V_{\max} - V_{\min}$  is the scale interval.

- Integral Time value  $It = 1.5 \times T$
- Derivative Time value  $dt = It / 4$



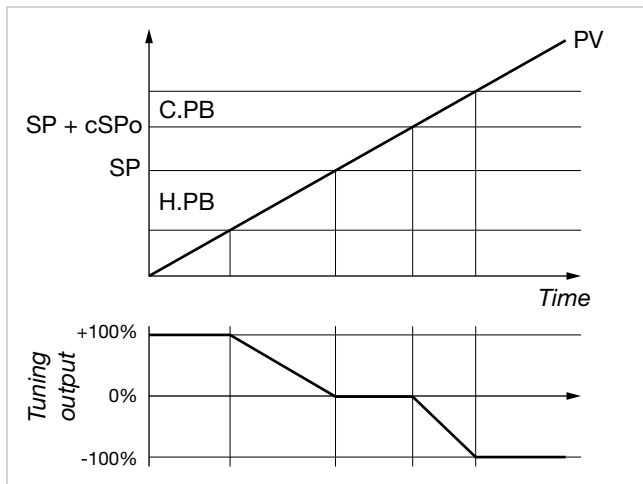
1. Switch the controller to manual.
2. Set the calculated parameters (re-enable PID control by setting a cycle time for relay output if necessary).
3. Switch to automatic.
4. To check optimization of the parameters, change the setpoint value if possible and check transitory behavior: if oscillation persists, increase the Proportional Band value; on the other hand, if the response is too slow, decrease the value.

### 5.13.3 Examples of tuning

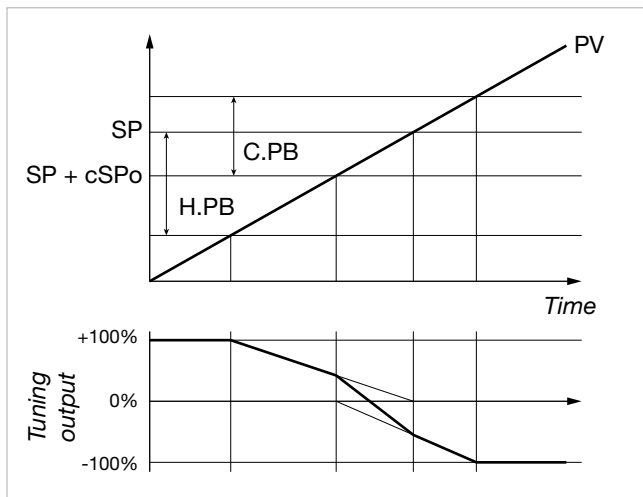
The two diagrams below show the time change in the monitored value and the change in the controlled tuning output.

- PV = Process variable
- SP + cSPo = decr setpoint
- cSPo = C.SP (HI.SCL - LO.SCL) / 100
- C.PB = Proportional decr band
- SP = incr setpoint
- H.PB = Proportional incr band





Tuning output only with proportional action in case of proportional incr band separate from decr band.



Tuning output only with proportional action in case of proportional incr band superimposed on decr band.

### 5.13.4 Incr/Decr tuning with relative gain

For this tuning mode (enabled on the PID menu with parameter Cntr = PID.RG) you have to specify the cooling type (INCR parameter).

The PID cooling parameters are calculated starting from heating parameters in the specified ratios:

- **Air** relative gain  $H.PB / C.PB = 1$
- **Water** relative gain  $H.PB / C.PB = 0.8$
- **Oil** relative gain  $H.PB / C.PB = 0.4$

#### Example

Starting with the following heat data:

- DECR = oil
- H.PB = 10.0
- H.IT = 4.00
- H.DT = 1.00

there will be the following cool data:

- C.PB = 12.5
- C.IT = 4.00
- C.DT = 1.00

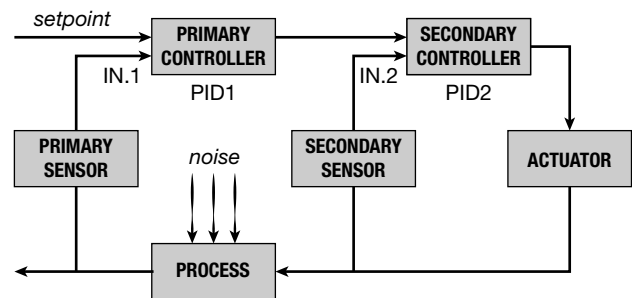
For slicing cycle times for outputs, the following values should be set:

- **Air** CY.TIM Cycle T Cool = 10 seconds
- **Water** CY.TIM Cycle T Cool = 2 seconds
- **Oil** CY.TIM Cycle T Cool = 4 seconds



**Attention!** Cool parameters cannot be changed in this mode.

### 5.13.5 Cascade controls



Two controllers are arranged in cascade when the output signal from the first becomes the input signal to the second, which in turn sends a signal to the control unit.

The primary controller compares the controlled variable to the setpoint, while the secondary controller compares the value of the controlled variable to the signal from the primary controller.

Cascade control provides faster control of the primary variable value.

In addition, the primary variable is less subject to deviations. The secondary controller keeps the flow constant, changing it only when instructed by the primary controller.

The cascade controller is used especially in very slow processes. In these processes, the error is recovered over a long time, and when noise enters the process, you have to wait a long time before the error is revealed and before corrective action begins; therefore, the corrective action does not start immediately. After the action has started, you have to wait a long time for the result.

A cascade control is built by finding intermediate controlled variables that can perform rapid corrective actions in case of noise.

The primary and secondary controllers are arranged in cascade: each has its own process variable but only the secondary one has an output that commands the process.

The main advantages of cascade control are:

- noise in the secondary loop is corrected by the secondary controller before it can affect the primary variable;
- delays in the secondary part of the process are significantly reduced by the secondary loop, and this increases primary loop response speed;
- gain changes in the secondary part are compensated in its chain;
- the secondary loop lets the primary controller act precisely on the flow of material or energy.

Cascade control is very useful when you require highly efficient control in the event of noise or when the secondary part of the process involves a long delay.

Cascade control has two controllers (a primary and a secondary); normally, the choice of control actions, based on process speed, is made as follows:

- **Generally fast processes:** for precise control, integral action in the primary and only proportional in the secondary is sufficient (primary controller PI, secondary controller P).
- **Generally, very slow processes:** for best system readiness, precision, and stability, configure the primary controller PID and the secondary controller PI.

The simplest example of a cascade control is a controller on a valve positioner: in this application the positioner is used to overcome hystereses and to reduce valve time constants. Cascade control is normally not required in fast control loops (flow rates, pressures, etc.) and is more useful in temperature controls.

The PID.1 control output is the setpoint for PID.2.

#### 5.13.5.1 Tuning two PID's configured for cascade control

If you need to tune two PID's configured for cascade control (parameter APP.t=CAS.HE\CAS.CO\CAS.HC on EN.FUN menu), do as follows:

1. Set the primary PID to Manual (for example with the Automatic\Manual button on home page Home.1), and keep the secondary PID in Automatic
2. Set the value of power delivered by the primary PID (secondary PID setpoint).
3. Start the Self-Tuning procedure for the secondary PID (see "5.15.3. Self-Tuning.")
4. When the Self-Tuning procedure for the secondary PID is done, return the primary PID to Automatic (for example with the Automatic\Manual button on home page Home.1)
5. Start the Self-Tuning procedure for the primary PID (see "Self-Tuning.")

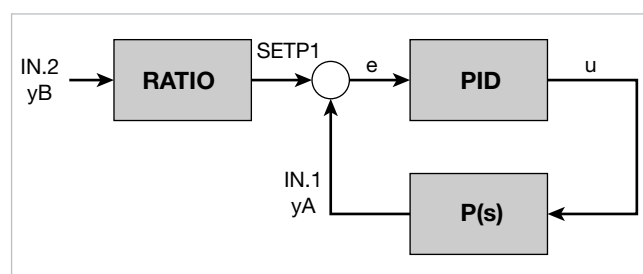
### 5.13.6 Ratio control

In ratio control, the variable to be controlled is not a physical quantity but instead its ratio with another quantity, whose value must obviously be available.

This type of control is commonly used, for example, in processes where a reactor has to be fed with two reagents in a fixed ratio.

In practical applications, the primary variable is not controlled or externally controlled, as in the case of mixing two fluids (Fluid1/Fluid2).

The control is obtained by simply calculating the setpoint of substance A (Fluid1), which can be controlled, as a product of substance B (Fluid2) multiplied by an appropriate coefficient (RAT.CO), which expresses the ratio to be maintained between the two substances.



RATIO is the ratio required between IN1 (PV1) and IN2 (or IN3) (range from 0.01 to 99.99), i.e.

$$\text{RATIO} = \text{IN1} / \text{IN2 (or IN3)}$$

This ratio is automatically calculated in the transition from manual -> automatic and can be changed on the User menu.

The PID control controls IN1 so that it is always:

$$\text{IN1} = \text{SETP1} = \text{IN2 (or IN3)} \times \text{RAT.CO.}$$

#### 5.13.6.1 Activating the ratio controller

Activate ratio controller work mode as follows:

- Enable the remote setpoint (parameter SP.REM on MODE menu = On).
- Configure the auxiliary input function (FUNC in INPUT.2) or the auxiliary input 2 function (FUNC in INPUT.3) as the reference for the ratio controller for PID.1.

## 5.14 Multiset, setpoint gradient

The Multiset function is enabled on the MODE configuration submenu by selecting MUL.SP = On.

This function allows to set:

- 2 setpoints (M.SP1 and M.SP2) by using a digital input with function F.in.x = SEL1.0 (for PID1) or SEL2.0 (for PID2) or SE12.0 (for PID1 and PID2) or a configurable faceplate key (but.1 or but.2 or but.3) setting the option but.x = SP.SEL on the HMI submenu.
- 4 setpoints (M.SP1, M.SP2, M.SP3 and M.SP4) by using two digital inputs, one with function F.in.x = SEL1.0 (for PID1) or SEL2.0 (for PID2) or SE12.0 (for PID1 and PID2) and the other with function F.in.x = SEL1.1 (for PID1) or SEL2.1 (for PID2) or SE12.1 (for PID1 and PID2).

The selection of M.SP1 and M.SP2 is shown on the display via LED.

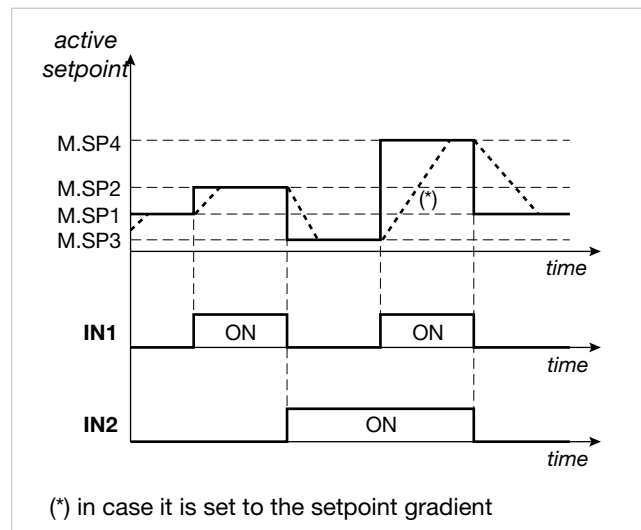
The setpoint gradient function is enabled on the PID submenu by setting the GRAD.I (up gradient setpoint) and/or GRAD.D (down gradient setpoint) parameters with a value other than 0.

At start and at Automatic/Manual switching, the setpoint is assumed equal to PV. With set gradient it reaches the Local/Remote setpoint or the setpoint selected in case of Multiset function.

Each change of setpoint is subject to a gradient: GRAD.I. for

change from lower to higher setpoint, GRAD.D. for change from higher to lower setpoint.

The setpoint gradient is inhibited at start when Self-Tuning is enabled. The control setpoint reaches the set value with a speed defined by the gradient.



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## 5.15 Slave Communication in Modbus TCP

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The Ethernet Modbus TCP option may be used to access the device using the Modbus TCP protocol.

Access may take place via any client (including the SuperSET set-up), implementing the following Modbus commands :

- 01 : Read Coils
- 02 : Read Discrete Inputs
- 03 : Read Holding Registers
- 04 : Read Input Registers
- 05 : Write Single Coil
- 06 : Write Single Register
- 15 : Write Multiple Coils
- 16 : Write Multiple registers

In order to connect with the device using the Modbus TCP protocol via a client, you must assign network parameters, and specifically:

- IP address (default 192.168.1.50)
- Subnet Mask (default 255.255.255.0)
- Gateway (default 192.168.1.1)

### 5.15.1 Modbus TCP communication diagnostics

If the Modbus TCP communication option is installed but there are errors exchanging data with the device where the network interface card is assembled :

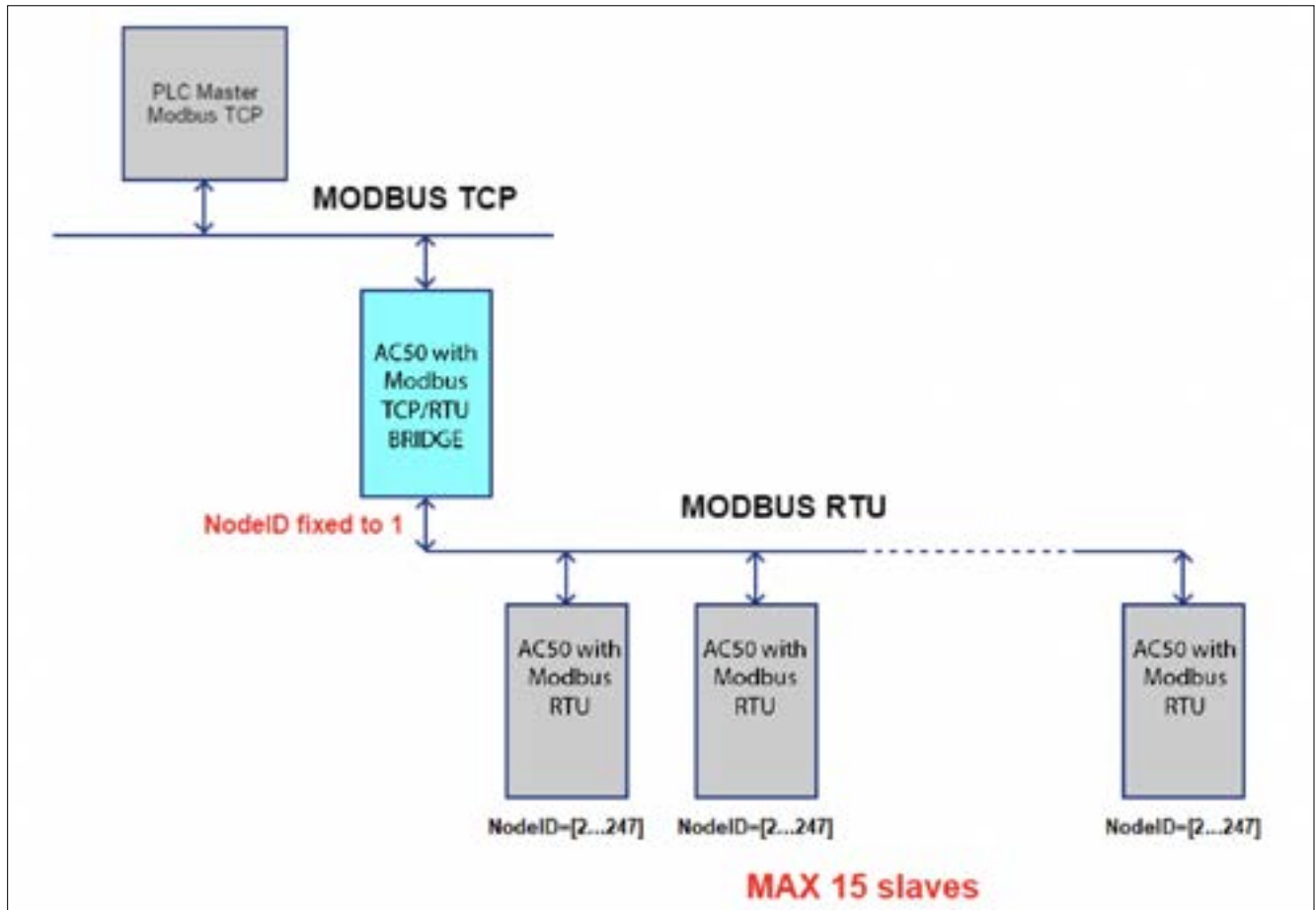
- the MAC.E parameter in the INFO submenu will display the value 0x:00:00:00:00:00:00.
- The INFO.E submenu and the ETHER submenu will not appear.

If there are no errors, you will be able to obtain network connection status by accessing the parameters in the INFO.E submenu.

### 5.15.2 Operation as a device

#### Bridge with other devices

With the “ME = Ethernet Modbus TCP\RTU Bridge” option, the device can operate as a Modbus TCP\RTU bridge, permitting connection of other devices using the serial number appearing on the terminals on the bottom of the box obtaining the following architecture:



As shown in the figure above, the maximum number of nodes that may be connected is 15.

The value of the node number on the various devices connected may vary within the range of [2...247], in that the value 1 is reserved for the device with the Modbus TCP card mounted on it. The value of the serial parameters

- BaudRate
- Parity
- Stopbit

must be the same for all Slaves.

The SCANR parameter in the SERIA submenu may be used to introduce a delay between two consecutive Modbus requests in order to permit exchange of data with other devices with higher response times.

This delay will affect all communications, data scan time via Modbus.

### 5.15.3 Synchronising the internal clock via NTP server

The “E0 = Ethernet Modbus TCP” and “ME = Ethernet Modbus TCP\RTU Bridge” options may be used to permit use of the device’s internal clock synchronization service (RTC) with an NTP (Network Time Protocol) server in the same sub-network as the controller or in an external network. The service is activated by setting the value of the parameter TIM.NT to a value other than zero. Once started, the controller will periodically ask the server identified by the network address specified in the IP.NTX parameters for the new date and time value to be used and copy it into its internal clock. This service ensures that events programmed with the Calendar on different devices, each of which is connected with the same NTP server, all refer to the same basic time.

## 5.16 Instrument menu set-up

The instrument set-up menu may be customised, selecting the menus and parameters in each menu that must be visible or invisible while browsing. For selecting the menus and menu parameters to be displayed in the instrument's editor, there is a new button on the WIZARD of the SuperSET page (which may be activated using the "EN.EDI" parameter in the EN.FUN menu):



This button opens a new window containing all the menus that may be displayed on the instrument



Select one of the menus and another window will open permitting selection of individual menu parameters:



You may select / deselect all parameters at the same time with the “SELECT ALL” and “UNSELECT ALL” buttons. The “ROOT” and “NUMBER” checkboxes (the second only in the case of a menu with multiple instances, such as INPUT1, INPUT2, etc.) above these buttons cannot be selected by the user, but indicate the two editor views which are obligatory if there is at least one menu parameter selected. The corresponding variables may be viewed in the EXPERT menu under the “Enable Menu” group.





## 5.17 Protection of controller configuration via SuperSET by password

It is possible to protect access via the SuperSET configurator to certain controller parameters by means of a password that can be set freely by the user.

This password can only be configured **only** via SuperSET (parameter "PASCW\_SSICONFIG" in the "Password" menu).



The default value of this parameter, equal to "SSIPASS", renders the protection inactive, thus guaranteeing full operation of the SuperSET configurator.



**Caution!** The value assigned to the password that protects configuration of parameters on the controller is in no way visible on the instrument, but only via SuperSET. The user must store the specific password set on the individual controller independently. If the user forgets the password set on the target, it will not be possible to recover it, so the user must perform a factory reset of the controller to be able to access all configuration parameters again via SuperSET.

If the user sets a password on the controller that differs from the default password, it will be necessary to know this password in order to have full read and write access to all parameters and wizards via the SuperSET configurator. If the user who connects to the device via the SuperSET configurator does not know the password set on the controller (to a value other than the default), the user's access will be limited to a subset of parameters and he or she will be able to view/edit them only via the grid (all wizards will be disabled).

Functions whose configuration via SuperSET can be protected by a password are:

- Linearization of inputs
- Auxiliary Digital Inputs and Outputs
- Internal recipes
- Programmers in Synchronous and Asynchronous Mode
- Logical Blocks
- Mathematical blocks
- Configurable Messages
- Master Communication
- User menu
- Events calendar
- Configuration of parameters displayed in the on-board configuration menu

Access to the controller's parameters via a generic Modbus client (either RTU or TCP) will not be affected in any way by setting a password other than the default.

### 5.17.1 Password Setting

To give the password parameter a different value from the default value, select the appropriate button in the grid



When you press this button, a dialogue box will appear with:

- the **“Current Password”** field displaying the current value of the password as plain text
- the **“New Password”** field in which you can set the new password value in encrypted form.
- a **“Confirm new password”** field where you will be asked to confirm the new password in encrypted form
- a **“Clear”** button for resetting the password to the default value
- OK/Cancel buttons to confirm and/or cancel the setting



**Caution!** Passwords are case-sensitive and must be at least four characters long.

The admissible characters are:

- 'A'... 'Z' e 'a'...'z'
- '0'...'9'
- '!', '\$', '%', '&', '>', '<', ',', ':', ';', '#', '@', '\_', '-'

Use of a character other than those listed above, or a sequence of permitted characters shorter than the minimum length, will make the password unacceptable and cause an error message to appear in the password setting dialogue box when you press “OK”.

### 5.17.2 Access to a device with password-protected configuration via SuperSET

The first time you use the SuperSET configurator to access a device on which a password other than the default was previously set (see paragraph “5.25.1. Password Setup”), you will be prompted to enter the password, whether you are opening a configuration file (.gfe file) or creating a new configuration file.



Once the correct value has been set, the SuperSET configurator will be fully operational.

If

- the password entered is different from the one set on the controller
- the user does not enter a password

from now on the configurator will work in reduced mode. To exit this mode it will be necessary to close the current session of the SuperSET configurator and start a new one.





**Caution!** All configuration parameters that are not accessible in SuperSET in protected mode will be forced to their default value in the configuration file (.gfe file).

### 5.17.3 Opening a password-protected configuration file with SuperSET

If the user tries to open a password-protected configuration file in SuperSET and there is no way to establish communication with any target, it will be necessary to know the value of the password saved in the configuration file in order to obtain full access to the parameters.

If

- the password entered is different from the password saved in the configuration file
- the user does not enter a password

the user will be informed that from now on the configurator will work in reduced mode.

This condition will persist even if the user connects to a controller at a later date.

To exit this mode it will be necessary to close the current session of the SuperSET configurator and start a new one.

## 6. PROGRAMMING WITH PC

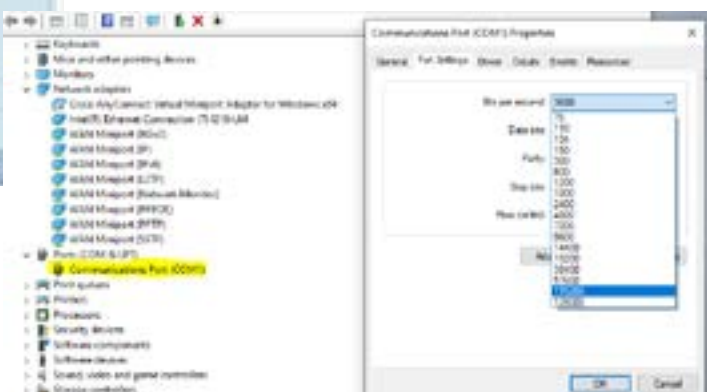
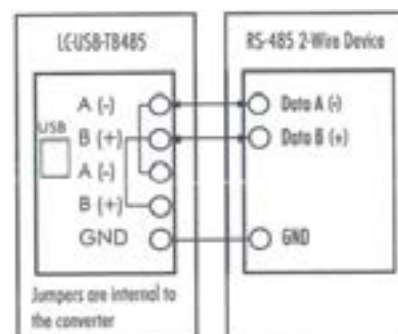
### 6.1. Controller-PC connection

The controller has a port to connect the device to a PC.

The connection requires a special accessory cable (SSi P/N 33372), which acts as a USB-serial interface/converter and communicates as a Virtual COM Port with a USB port on the computer.

After connecting (see images at right), ensure that comm speed is set to 115200 in 3 locations:

- 1) on controller under PASS2 > SERIA > KBAUD (see Section 4.18.2),
- 2) in SuperSET software (see below)
- 3) in PC Device Manager > Ports > Communications Port > Properties > Port Settings (see below).



### 6.2 Programming Tool

#### 6.2.1 SuperSET

The SuperSET software lets you:

- read and write the configuration of controller (set of parameters);
- save recipes on the PC (recipe archive);
- set structure of parameters recipes;
- set sequence and parameters of user configuration menu;
- set message strings (3 selectable languages);
- transfer any firmware updates

The program can be updated automatically from [www.Supersystems.com](http://www.Supersystems.com).

#### 6.2.1.1 System requirements

	Minimum	Recommended
<b>Operating system</b>	Windows XP SP2 or Windows Vista or Windows 7 (32 bit)	Windows 7 (64 bit)
<b>Processor</b>	Intel Pentium 1 GHz	Intel Core i5 2,5 Ghz or higher
<b>RAM</b>	2 GB	4 GB or higher
<b>Free space on Hard Disk</b>	2 GB	4 GB or higher
<b>Resolution</b>	XGA (1024 x 768 pixel)	SXGA (1280 x 1024 pixel) or higher
<b>Browser</b>	Microsoft Internet Explorer 8.0	Microsoft Internet Explorer 9.0 or higher
<b>Ethernet port</b>	1 RJ45	1 RJ45
<b>USB port</b>	1 USB 2.0	1 USB 2.0

## 7. OPERATOR GUIDE

### 7.1. Displays and keys

The display and keys are described in “Display and keys”

#### 7.1.1. Navigating the menus

Keys are used for navigating menus and submenus, changing parameters, and confirming choices.

Their function depends on the context and on how long they are pressed.



The LEDs above the keys not only give confirmation that each key has been pressed (by flashing), but also show which keys can be used in each situation.

The following navigation functions are assigned to the keys:



Scroll User Configuration menu (Setpoint, Alarm setpoints, Control output, etc.).

Each time the key is pressed, it confirms the value of the displayed parameter and goes to the next item on the menu.

Keep the key pressed for more than 2 seconds to enter the Programming/Configuration Menu.



Each time the key is pressed, you go back to the previous menu item or to the higher menu level, according to the context.

Keep the key pressed for more than 2 seconds to return to the Home page.



Press the key to enter a submenu or to lower the displayed parameter value, according to the context.

Keep the key pressed to progressively increase the speed of lowering the displayed parameter.



Press the key to raise the value of the displayed parameter.

Keep the key pressed to progressively increase the speed of raising the displayed parameter.

When the process variable is displayed, in standard configuration the key switches the controller function mode (manual/automatic).

### 7.2 Power-on

The controller runs a self-diagnostics test immediately after power-on.

During the test all segments of the display flash and a checksum is run.

The hardware resources present are also acquired.

If the self-diagnostics test detects no errors, the controller enters normal functioning state (display shows Home page).

If any system errors are detected, the controller displays the related information.

If the error is caused by a damaged program, update the firmware.

If the error is caused by incorrect configuration, reconfigure the controller with PC and SuperSET software.

Errors are saved in a register and can be displayed with the Error function on the INFO menu.

### 7.3 Operation as controller

The device's normal operating mode is controller-only.

The display shows the following information:

- PV displays the process variable value;
- SV displays the setpoint value (if dS.Sp = setp);
- AC50 will also display the control output value (if dS.F = OUT.P);
- by pressing the key the PV display shows, in sequence the significant values that condition controller function: setpoint, alarm setpoints, control output, etc., which can be changed if necessary (parameters in the user menu).

Keep the key pressed for more than 2 seconds to enter the Programming/Configuration menu.

Use the and keys to raise and lower the setpoint to the value required.

Press the key to save the SP value; otherwise, the set value is saved about 3 seconds after the last change

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## 7.4 Errors during operation

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If errors occur during normal operation, the HOME.x pages will show:

- the name of the error on the PV display
- the value of the setpoint or control output on the SV display.
- a scrolling message with errors detected, on display F.

The most common error messages are:

**Lou** Process variable is below minimum scale limit  
(parameter LO.SCL on I.MAIN).

**High** Process variable is above maximum scale limit

(parameter HI.SCL on I.MAIN).

**Err** PT100 in short circuit or input values below minimum limits (for example, thermocouple with incorrect connection) or 4...20 mA transmitter broken or not powered.

**Sbr** Sensor broken or input values above maximum limit.

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## 7.5 Configuration (User menu)

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Every operator has a freely accessible menu (no password required) on which he can configure some controller parameters.


The User Configuration menu can be built according to need with the SuperSET software, grouping up to 100 parameters from those available for controller configuration (see "CONFIGURATION.")

The parameters that may be selected to build the user set-up menu include PASS0 and PASS1; it may be useful to submit a password to the parameters of the user menu.

The controller leaves the factory with a preconfigured user

configuration menu.

This menu can subsequently be modified. The related parameters are shown for models with options; the complete list of parameters is shown on the SuperSET user menu page.


Press the  key to access the User Configuration menu.

SuperSET can be used to set the generic user menu parameter to set automatic back to PV\Home when positioned on the parameter and no key is pressed within 15 seconds.

You can enter the following on the user menu:

- simple parameters (for example, software version SW.Ver or password 1 PASS1);
- single instances of indexed parameters (for example, configuration of main channel type tYPE.1 and of auxiliary channel type tYPE.2) ;



You can run a check of correct configuration of the Recipes template by clicking the  icon in SuperSET (or the "Check user recipes template coherence" command on the SuperSET Service menu).

If:

- the value 0, or
- a wrong Modbus address

is entered in the Value column of the SuperSET User Menu, navigation on the User Menu interrupts and you return to the Home.1 page.

During navigation on an indexed menu, when you return to the menu with index, the number of the indexed submenu is always 1.

If the user changes the User Menu configuration while the controller is working in this menu (i.e., the display is showing one of the User Menu parameters), the switch to Home.1 is automatically forced.

## 8. MAINTENANCE



### Attention!

The controller must be repaired only by technicians trained and authorized by SSi. Any attempt by unauthorized personnel to repair or change the hardware characteristics of the controller will void the warranty.

### 8.1. Replacing the controller

The instrument (display + electronic circuits) can be replaced without having to remove the entire controller from the panel and disconnect its cables.

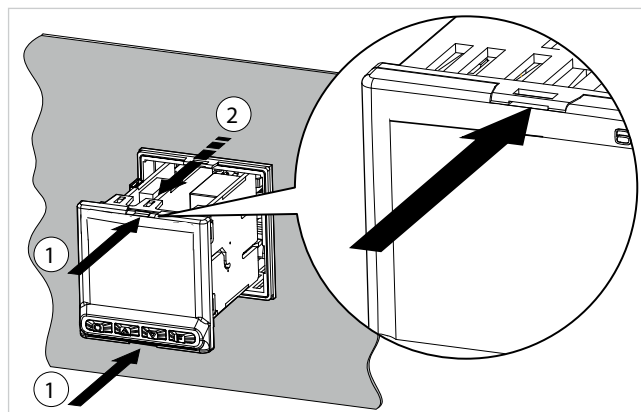
First switch off the power supply to the controller and to the other devices connected to it.

Then release the top and bottom of the faceplate and remove the instrument (see figure).

Insert the new instrument and switch on the power supply.



**Attention!** Replace the entire controller if the blade contacts inside the instrument or the protective case show traces of burns or are not in perfect condition.



### 8.2 Replacing the gasket

The gasket may lose efficiency over time and due to environmental conditions.

To maintain IP65 faceplate protection, replace the gasket (between faceplate and case and between case and panel) at regular intervals.

To replace the gasket between the case and the panel you have to disassemble the controller from the panel and then reassemble it; to replace the gasket between the faceplate and the case, follow the instructions for replacing the controller).

### 8.3 Cloning the configuration

The configuration of one controller can be cloned to another controller by means of a PC.

With a PC (and SuperSET software):

1. With the appropriate cable, connect the controller (with the configuration to be cloned) to the PC.
2. Read all of the controller configuration parameters and save them in a file (recipe).
3. Disconnect the controller.
4. Connect the controller to be configured to the PC.
5. Download the saved configuration to the controller.
6. Disconnect the configured controller

### 8.4 Cleaning

To clean the faceplate and the case, use only a soft cloth dampened with water or alcohol. DO NOT use hydrocarbon solvents (trichloroethylene, gasoline, etc.).

Do not use compressed air to remove dust from the electronic cards. If necessary, use a clean brush with soft bristles.

You can also clean the inside of the controller if necessary. To do this, first switch off the power supply to the controller and to the other devices connected to it.

Then slide out the controller as explained in "Replacing the controller" to access and clean the inside of the case.

## 9. TECHNICAL DATA

### 9.1 AC50

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	83 × 68 mm
	Lighting	Backlit with LEDs, life > 40,000 hours @ 25°C (with brightness level backl = 0.8)
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 23 mm Color: white
	SV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 11 mm Color: green
	F display	Number of digits: 7 to 14 segments, with decimal point Digit height: 9 mm Color: amber
	Unit of measurement	Selectable, °C, °F or custom <sup>1</sup> Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: amber
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
	Bargraph indicator, configurable	Type: graphic bargraph, 11 segments Power indication: 0...100% or -100...100% Current indication: 0...100% f.s.
	Bargraph indicator	Type: double bar, 11 segments Indication of process variable and setpoint: 0...100% f.s.
	Inputs/outputs state signal (only with option)	Number: 8 inputs, 8 outputs Color: green for inputs, red for outputs Control via FB outputs
KEYPAD		Keys number: 6, silicone (A/M, FUN, TST, INC, DEC, MEN) Type: mechanical

<b>INPUTS</b>		
<b>Main and auxiliary inputs (Main, Aux1, Aux2)</b>	Zirconium probe input (AUX2)	<ul style="list-style-type: none"> <li>• 0...2.4V high impedance</li> <li>• Input impedance: &gt; 100 MΩ</li> <li>• Linearization: linear or custom</li> <li>• Calibration accuracy: &lt; 0.1% full scale</li> <li>• Thermal shift: &lt; ±0.003% full scale/°C starting from 25°C room temperature</li> <li>• impedance reading (0..100kΩ)</li> </ul>
	Sensor type	<ul style="list-style-type: none"> <li>• Thermocouples, RTD (PT100, JPT100), IR pyrometers with type K output, 4...20mA, 0...20mA, 10V, 5V, 1V, 60mV, potentiometer</li> <li>• Reading accuracy: ±0.1% of value read</li> </ul> <p>This SSI controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750 series.</p>
	Thermocouple (only Main and Aux1)	<ul style="list-style-type: none"> <li>• Types: J, K, R, S, T, C, D, B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Custom linearization available</li> <li>• Linearization accuracy: according to standard ITS90 polynomes; refer to user manual for details</li> <li>• Cold joint accuracy: &lt; ± 1°C at 25°C ambient temperature</li> <li>• Cold joint compensation: greater than 40:1, rejection at changes in room temperature exceeding 25°C</li> <li>• Diagnostics: Indication of faulty probe and out of scale</li> </ul>
	RTD input (Pt100 and JPt100)	<ul style="list-style-type: none"> <li>• Types: Pt100, JPt100. Custom linearization available</li> <li>• Calibration accuracy: &lt; ±0,1% of the value read in °C ± 0,4°C</li> <li>• Linearization accuracy: &lt;±0,062°C</li> <li>• Thermal shift: &lt; (±0.002% of read value/°C, starting from 25°C room temperature) ± 0.1°C</li> <li>• Diagnostics: Indication of faulty probe and out of scale</li> </ul>
	Linear DC input	<ul style="list-style-type: none"> <li>• Tipi : 0...60 mV, 0...20mA, 4...20mA, 0...1V, 0...5V, 0...10V, 0...2.4V high impedance, 0...1.2V high impedance</li> <li>• Input impedance : <ul style="list-style-type: none"> <li>0...60mV, 0...1V, 0...1.2V, 0...2.4V : &gt; 100 MΩ</li> <li>0...5V, 0...10V : &gt; 400 kΩ</li> <li>0...20mA, 4...20mA : 50 Ω</li> </ul> </li> <li>• Linearization: linear or custom</li> <li>• Calibration accuracy: &lt; 0,1% out of scale</li> <li>• Thermal shift: &lt;±0.003% full scale/°C, starting from 25°C room temperature</li> </ul>
	Sampling time	60 ms or 120 ms, selectable
	Digital filter	0,0...20,0 s configurable
	Rejection to network disturbance (48-62Hz)	Rejection to differential mode: >80 dB Rejection to common mode: >150 dB
	Temperature unit of measure	degree °C/°F, selectable on the keypad
	Reading interval	Type: linear Scale: -1999...9999, settable decimal point
	Insulation	Functional insulation between main and auxiliary inputs
	Type	isolated by external transformer
		Number: 2 max Maximum load: x / 50 mA AC Network frequency: 50/60 Hz Input impedance (Ri): 10 Ω
<b>DIGITAL INPUTS</b>	number	5 max
	Type	voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA <i>For detail see electrical connections</i>
	Isolation	250 V



<b>OUTPUTS</b>		
	Relay (R)	Number: 4 max Type of relay contact: NO Max. current: 5A (2A at ambient temperature up to 45 ° C for certification UL), 250VAC /30 VDC, $\cos\phi = 1$ Minimum load: 5 V, 10 mA Number of operations: > 600,000 @ 2A load current Double isolation Installation of an external R-C suppressor ("snubber") is recommended
	Analog retransmission (A1) (A2)	Number: 2 max 0...10 V, max 20 mA, $R_{out} > 500 \Omega$ 0...20 mA, 4...20 mA, $R_{out} < 500 \Omega$ Resolution: 12 bit Isolated from main input
<b>ALARMS</b>	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB.
<b>POWER SUPPLY</b>	For sensor VT1, VT2	Voltage: 24 VDC $\pm 10\%$ Current max: 30 mA VT1 option of Out3
	For potentiometer VP	Voltage: 1 VDC $\pm 1\%$ Current max: 30 mA
<b>INPUTS / OUTPUTS</b>		
	Digital Inputs/Outputs	Number: 8, in two groups (5 + 3 with separate power supply) Input: PNP 24 VDC, 5 mA Output: PNP with 24 VDC external power supply, $\pm 25\%$ , max 100 mA, short circuit protection with PTC Isolation: 250 V
	Relay	Number: 8, in two groups (5 + 3 relays with common contact) Type of relay contact: NO Max. current: 5A (at ambient temperature up to 45 ° C for certification UL), 250VAC / 30VDC, $\cos\phi = 1$ Max. current for each common: 5 A Number of operations: > 600,000 @ 2A load current Double isolation Installation of an external R-C suppressor ("snubber") is recommended

<b>CONTROL FUNCTIONS</b>		
<b>CONTROL</b>	Type	Single/Double loop
	Control	PID, ON/OFF, single action incr or decr, double action incr/ decr
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
<b>MULTIPLE SETPOINTS</b>	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
<b>TIMER FUNCTION</b>	Modes	START / STOP (2 timer if double loop) STABILIZATION (timer is on when PV enters a band set around setpoint; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
<b>ENERGY COUNTER</b>		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
<b>DIAGNOSTIC</b>		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
<b>RETENTIVE MEMORY</b>	Type	FRAM
	Writes	Number max: > 10 <sup>10</sup> cycles Retention: > 10 years

GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC $\pm 10\%$ , 50/60 Hz
	Power dissipation	12 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section 1 mm <sup>2</sup>
CONNECTIONS	Serial configuration port	Connector: microUSB
	RS485	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Insulation compared to main entrance Screw terminals and crimp connector, max. wire section 2.5 mm <sup>2</sup>
	Master Modbus	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Connettore RJ10
	RTU Bridge	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Screw terminals and crimp connector, max. wire section 2.5 mm <sup>2</sup>
	Ethernet Modbus TCP and Webserver	Baudrate : 10/100BaseTX, 10/100Mbit/s Protocol : Modbus TCP slave, integrated Webserver Isolation from other peripherals Standard RJ45 connector
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2.5 mm <sup>2</sup>
AMBIENT CONDITIONS	Use	Internal
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non condensante (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
DIMENSIONS		96 X 96 mm (1/4 DIN) Depth: 80 mm
WEIGHT		0,24 kg
CE STANDARDS	EMC (electromagnetic compatibility)	Conforms to Directive 2014/30/EU norme EN 61326-1 Emissions in industrial environment classe A
	LVD safety	Conforms to Directive 2014/35/EU norme EN 61010-1
CERTIFICATIONS	Generals	This SSi controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750 series.
	Europe	CE, RoHS, REACH
	USA, Canada	UL, cUL
	Russia	EAC

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## 10. WARRANTY

### Warranty

#### Limited Warranty for Super Systems Products:

The Limited Warranty applies to new Super Systems Inc. (SSI) products purchased direct from SSI or from an authorized SSI dealer by the original purchaser for normal use. SSI warrants that a covered product is free from defects in materials and workmanship, with the exceptions stated below.

The limited warranty does not cover damage resulting from commercial use, misuse, accident, modification or alteration to hardware or software, tampering, unsuitable physical or operating environment beyond product specifications, improper maintenance, or failure caused by a product for which SSI is not responsible. There is no warranty of uninterrupted or error-free operation. There is no warranty for loss of data—you must regularly back up the data stored on your product to a separate storage product. There is no warranty for product with removed or altered identification labels. SSI DOES NOT PROVIDE ANY OTHER WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU. SSI is not responsible for returning to you product which is not covered by this limited warranty.

If you are having trouble with a product, before seeking limited warranty service, first follow the troubleshooting procedures that SSI or your authorized SSI dealer provides.

SSI will replace the PRODUCT with a functionally equivalent replacement product, transportation prepaid after PRODUCT has been returned to SSI for testing and evaluation. SSI may replace your product with a product that was previously used, repaired and tested to meet SSI specifications. You receive title to the replaced product at delivery to carrier at SSI shipping point. You are responsible for importation of the replaced product, if applicable. SSI will not return the original product to you; therefore, you are responsible for moving data to another media before returning to SSI, if applicable. Data Recovery is not covered under this warranty and is not part of the warranty returns process. SSI warrants that the replaced products are covered for the remainder of the original product warranty or 90 days, whichever is greater.

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## 11. REVISION HISTORY

Rev	Description	Date	MCO #
New	New Manual		2339
A	Corrected High Impedance Linear Input terminal info		2347
B	Adjusted Atmosphere/Carbon terminology	8/7/24	2353
C	Multiple corrections to parameter text; removed auto-tune and self-tune; added parameter index	8/13/24	2357
D	Corrections to Section 6	2/12/25	2366
E	Replaced heat/cool terminology with increase/decrease	6/19/25	2370

