COMPARA plus+

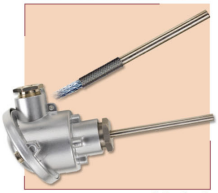
CONVERTIDOR multifunción para PROCESO y TEMPERATURA

Remberg®

RS485

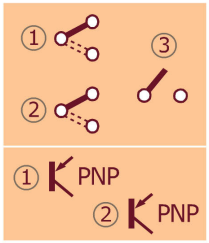
DIGITAL SERIE RS485 MODBUS

RTD´s: Pt100, NTC, ..

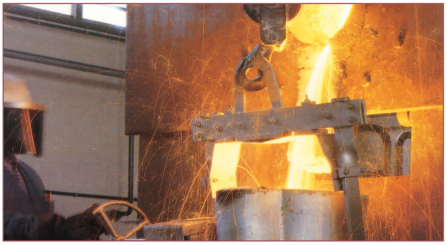


termopares: K, S, J

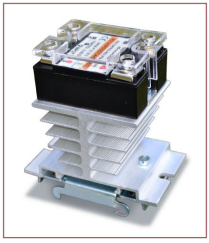
controlador



3 + 2 ALARMAS

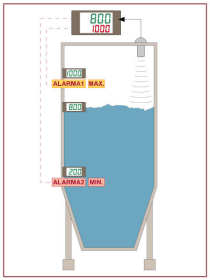


potenciómetros



mA
0-4/20mA
V
0/10V

SALIDA ANALÓGICA



proceso 0-4/20mA, 0/10V

24.. 230VAC-VDC
ALIMENTACIÓN UNIVERSAL

2 x REGULACIÓN SSR

SALIDA SSR RELÉS ESTÁTICOS

c UL us

- MÁXIMO / SOBRECARGA
- MÍNIMO / BAJACARGA
- REGULACIÓN ON / OFF PID
- RETRANSMISIÓN / REGULACIÓN ANALÓGICA
- COMUNICACIÓN REGISTRO / SCADA / MONITORIZACIÓN

PROGRAMACIÓN POR NF

ALARMAS
CONTROLES
REGULACIONES
VALORES LÍMITE

2 CARACTERÍSTICAS TÉCNICAS

ENTRADA

i	Intensidad:	4/20mA, 0/20mA
	Impedancia	51Ω
	Excitación auxiliar	12V/20mA
V mV	Tensión DC:	0/10V
		0/40mV
		Opcional: 0/100V
	Impedancia	1MΩ 100K
Pot	Potenciómetro	..6K, ..150K
Pt	Pt100, Pt500, Pt1000	
Ni	Ni100	
PTC	PTC 1K	
NTC	NTC 10K (B3435K)	
Termopar	J, K, S, R	
	compensación temperatura unión fría 0/50ºC	

ENTRADA DIGITAL

Actuación configurable	HOLD, START/STOP
contacto libre potencial (CLP)	16 17

AISLAMIENTO ENTRADA / SALIDA / ALIMENTACIÓN

- Clase de protección contra descargas eléctricas
- Frontal de clase II
- Aislamiento reforzado: Alimentación, salida relé y frontal.
- Aislamiento reforzado: Salida relé y entrada.
- Aislamiento galvánico: Entrada / Salida / Alimentación **1,5KV**

ALIMENTACIÓN AISLADA

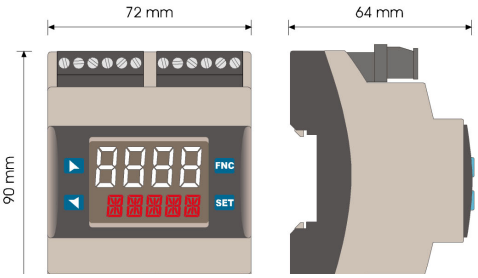
AC ALTERNA / DC CONTINUA Universal	24.. 230VAC / VDC (50/60Hz)
Margen	±15%
Consumo máximo	3VA

PRECISIÓN

Máximo error global	0,3%
Error de linealidad	0,1%
Deriva térmica	0,8µA/ºC 0,3mV/ºC
Resolución salida analógica	4.000ptos. (12bits)

NORMATIVA

- EMC 2014/30/EU (compatibilidad electromagnética)
- DBT 2014/35/EU (directiva de bajo voltaje) para ambientes industriales.
- Inmunidad a interferencias de acuerdo con EN 61000-6-2.
- Emisión de perturbaciones de acuerdo con EN 61000-6-3.
- Categoría de instalación II. Grado de polución 2 EN 61010-1.



AMBIENTALES

Temperatura de trabajo	- 10/+60ºC
Temperatura de almacenamiento	- 40/+80ºC
Tiempo de calentamiento	5 minutos
Coeficiente de temperatura	50ppm/ºC

AISLADA

SALIDA 1 — *1 Relé*

Contacto conmutado	SPST-NO
Intensidad máxima	5A
Tensión máxima	250VAC
Vida eléctrica del relé	100.000 operaciones

SALIDA 2 — *1 Relé*

Contacto conmutado	SPST-NO
Intensidad máxima	5A
Tensión máxima	250VAC
Vida eléctrica del relé	100.000 operaciones

SALIDA 3 — *1 Relé*

Contacto conmutado	SPST-NO
Intensidad máxima	2A
Tensión máxima	250VAC
Vida eléctrica del relé	100.000 operaciones

SALIDA 4 — *Analógica*

0-4/20mA	Repetición, Regulación
Capacidad de carga máxima	500Ω
0/10V	Repetición, Regulación
Intensidad máxima	5mA
Carga máxima	20K

SALIDA 5

SSR PNP - Control relés estáticos	
Tensión máxima	12V/24V
Intensidad máxima	25mA

SALIDA 6

SSR PNP - Control relés estáticos	
Tensión máxima	12V/24V
Intensidad máxima	25mA

SALIDA 7 — *Salida / Entrada*

SERIE RS485	
Protocolo	MOD BUS RTU
Formato	8bit, no paridad, 1 stop
Velocidad	4.800.. 57.600 baudios

DISPLAYS 2

- PROCESO. 4 dígitos blancos. Altura 13,2mm.
- CONSIGNA. 4 dígitos rojos. Altura 7,7mm.

LEDS 8

- ALARMAS. 5 leds rojos estado alarmas.
- MODO. 3 leds rojos modo funcionamiento.

FORMATO

Dimensiones	64x72x90mm
Protección frontal	IP65
Protección caja	IP20
Plástico autoextinguible	PCABS UL94V0
Cable conexión <2,5mm²	12AWG 250V/12A

Table of contents

Introduction

The process controller COMPARA Plus+ is specifically conceived for application on control panels with DIN rail mounting. It stands out for the bright display which ensures optimal visibility and increased level of information for the operator beside a scrolling help function.
COMPARA Plus+ relies on flagship programming mode by NFC/RFID technology with dedicated App for Android devices (same already used for Blue Line controllers, signal converters and STR indicators) not requiring wirings and power supply, allowing quick set-up/updates on site.
The outputs can be selected as command/multiple alarm modes/analogue retransmission. Serial communication RS485 is avaiable with Modbus RTU/Slave protocol. Useful power supply with extended range 24 to 220VAC / VDC with galvanic insulation.

1 Safety guidelines

Read carefully the safety guidelines and programming instructions contained in this manual before connecting/ using the device.
Disconnect power supply before proceeding to hardware settings or electrical wirings to avoid risk of electric shock, fire, malfunction.
Do not install/operate the device in environments with flammable/explosive gases.
This device has been designed and conceived for industrial environments and applications that rely on proper safety conditions in accordance with national and international regulations on labour and personal safety. Any application that might lead to serious physical dama ge/ life risk or involve medical life support devices should be avoided. Device is not conceived for applications related to nuclear power plants, weapon systems, flight control, mass transportation systems.
Only qualified personnel should be allowed to use device and/or service it and only in accordance to technical data listed in this manual.
Do not dismantle/modify/repair any internal component.
Device must be installed and can operate only within the allowed environmental conditions. Overheating may lead to risk of fire and can shorten the lifecycle of electronic components.

1.1 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding these safety guidelines and notices can be life-threatening.
Warning!	Disregarding these safety guidelines and notices can result in severe injury or substantial damage to property.
Information!	This information is important for preventing errors.

1.2 Safety Precautions

CAUTION - Risk of Fire and Electric Shock This product is UL listed as DIN-rail mounting process control equipment. It must be mounted in an enclosure that does not allow fire to escape externally.	**Danger!**
If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.	**Danger!**
Loose screws may occasionally result in fire. For screw terminals of relays and of power supply, tighten screws to tightening torque of 0,51 Nm. For other terminals, tightening torque is 0,19 Nm	**Warning!**
A malfunction in the Digital Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Digital Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.	**Warning!**

1.3 Precautions for safe use

Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events. Do not handle the Digital Controller in ways that exceed the ratings.

- The product is designed for indoor use only. Do not use or store the product outdoors or in any of the following places.
  - Places directly subject to heat radiated from heating equipment.
  - Places subject to splashing liquid or oil atmosphere.
  - Places subject to direct sunlight.
  - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
  - Places subject to intense temperature change.
  - Places subject to icing and condensation.
  - Places subject to vibration and large shocks.
- Installing two or more controllers in close proximity might lead to increased internal temperature and this might shorten the life cycle of electronic components. It is strongly recommended to install cooling fans or other air-conditioning devices inside the control cabinet.
- Always check the terminal names and polarity and be sure to wire properly. Do not wire the terminals that are not used.
- To avoid inductive noise, keep the controller wiring away from power cables that carry high voltages or large currents. Also, do not wire power lines together with or parallel to Digital Controller wiring. Using shielded cables and using separate conduits or ducts is recommended. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component). When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the Digital Controller. Allow as much space as possible between the Digital Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
- A switch or circuit breaker must be provided close to device. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for the controller.
- The device must be protected by a fuse T1A, 250 VAC, time lag, low shut-off capacity.
- Wipe off any dirt from the Digital Controller with a soft dry cloth. Never use thinners, benzine, alcohol, or any cleaners that contain these or other organic solvents. Deformation or discoloration may occur.
- The number of non-volatile memory write operations is limited. Therefore, use EEprom write mode when frequently overwriting data, e.g.: through communications.
- Chemicals/solvents, cleaning agents and other liquids must not be used.
- Non-respect of these instructions may reduce performances and safety of the devices and cause danger for people and property.

For CT (Current Transformer) input:

- **Warning**: To reduce risk of electric shock, always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current transformers
- For use with Listed Energy-Monitoring Current Transformers
- The current transformers may not be installed in equipment where they exceed 75 percent of the wiring space of any cross-sectional area within the equipment
- Restrict installation of current transformer in an area where it would block ventilation openings
- Restrict installation of current transformer in an area of breaker arc venting
- Not suitable for Class 2 wiring methods
- Not intended for connection to Class 2 equipment
- Secure current transformer and route conductors so that the conductors do not directly contact live terminals or bus.

1.4 Environmental policy / WEEE

Do not dispose electric tools together with household waste material.
According to European Directive 2012/19/EU on waste electrical and electronic equipment and its implementation in accordance with national law, electric tools that have reached the end of their life must be collected separately and returned to an environmentally compatible recycling facility.

2 Model Identification

Power supply 24..220 VAC/VDC ±10% 50/60 Hz – 3 Watt	
COMPARA Plus +	1 A.I. + 1 relays 5 A + 1 relays 3 A + 1 relay 2 A + 2 SSR + 2 D.I. + 1 A.O. V/mA + RS485 + CT

3 Technical Data

3.1 General Features

Displays	4 digits 0,52'', 5 digits 0,30''
Operating temperature	Temperature: 0-45° C -Humidity 35..95 uR%. Max. altitude: 2000m
Sealing	Open type, IP20 (not UL evaluated)
Material	Box and front panel PC UL94V0
Weight	Approx. 210 g

3.2 Hardware Features

Analogue inputs	**AI1**: configurable via software. **Input**: Thermocouple type K, S, R, J,T,E,N,B. Automatic compensation of cold junction from -25..85° C. **Thermoresistances**: PT100, PT500, PT1000, Ni100, PTC 1K, NTC 10K (β 3435K) **Input V/mA**: 0-1 V, 0-5 V, 0-10 V, 0-20 o 4-20 mA, 0-60 mV. **Pot. Input**: 1...150 KΩ. **CT**: 50 mA.	Tolerance (25° C) ± 0.2% ±1 digit (on F.s.) for thermocouple, thermoresistance and V/mA. Cold junction accuracy 0.1° C/°C. **Impedence**: **0-10 V**: Ri>110 KΩ **0-20 mA**: Ri<5 Ω **0-40 mV**: Ri>1 MΩ
Relay outputs	Config. as command and alarm output	Contacts: Q1: 5 A - 250 VAC for resistive load. Q2: 3 A - 250 VAC for resistive load. Q3: 2 A - 250 VAC for resistive load.
SSR outputs	Config. as command and alarm output	12/24 V, 25 mA.
Analogue output	Configurable as command and alarm output or as retransmission of process / setpoints.	Configurable: **0-10 V** with 40000 points +/-0.2% (on F.s.) @25 °C; load >= 1 KΩ **4-20 mA** with 40000 points +/-0.2% (on F.s.) @25 °C; load <= 250Ω
Power-supply	Extended power-supply 24..220 VAC/VDC ±10% 50/60 Hz	**Consumption:** 3 Watt

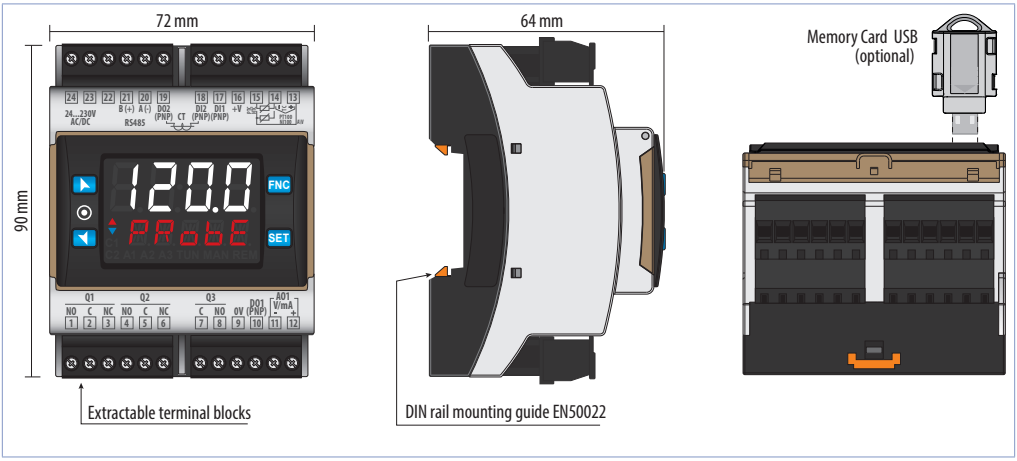
3.3 Software Features

Regulation algorithms	ON-OFF with hysteresis. P, PI, PID, PD with proportional time
Proportional band	0..9999°C o °F
Integral time	0,0..999,9 sec (0 excludes)
Derivative time	0,0..999,9 sec (0 excludes)
Controller functions	Manual or automatic Tuning, selectable alarm, protection of command and alarm setpoints.

3.4 Programming mode

by keyboard	..see paragraph *11*
software LabSoftview	..on *"Download section"* of official site
App	..through download the App on Google Play Store®, see paragraph *9* When activated by a reader/interrogator supporting NFC-V protocol, controller COMPARA Plus+ is to be considered a VICC (Vicinity Inductively Coupled Card) according to ISO/IEC 15693 and it operates at a frequency of 13.56 MHz. **The device does not intentionally emit radio waves**.

4 Dimensions and Installation



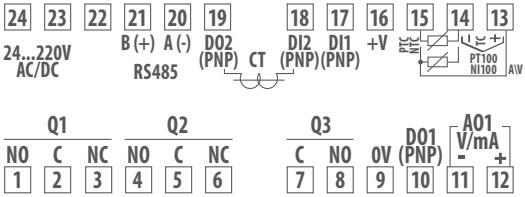
5 Electrical wirings

This controller has been designed and manufactured in conformity to Low Voltage Directive 2006/95/EC, 2014/35/EU (LVD) and EMC Directive 2004/108/EC, 2014/30/EU (EMC). For installation in industrial environments please observe following safety guidelines:

- Separate control line from power wires.
- Avoid proximity of remote control switches, electromagnetic contactors, powerful engines.
- Avoid proximity of power groups, especially those with phase control.
- It is strongly recommended to install adequate mains filter on power supply of the machine where the controller is installed, particularly if supplied 220VAC.
  The controller is designed and conceived to be incorporated into other machines, therefore CE marking on the controller does not exempt the manufacturer of machines from safety and conformity requirements applying to the machine itself.
- Wiring of pins: use crimped tube terminals or flexible/rigid copper wire with diameter 0.2 to 2.5 mm² (min. AWG30, max. AWG14, Minimum temperature rating of the cable to be connected to the field wiring terminals, 75°C). Cable stripping lenght 7 to 8 mm. Tighten screws to tightening torque of 0,51 Nm.
- Use Copper or Copper-Clad Aluminum Conductors Only or AL-CU or CU-AL.

5.1 Wiring diagram

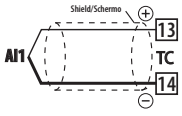
COMPARA Plus +



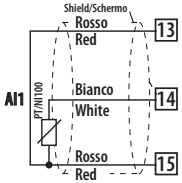
5.1.a Power Supply

	Switching power supply 24..220 VAC/VDC ±10% 50/60 Hz - 3 Watt Galvanic insulation (2500V).

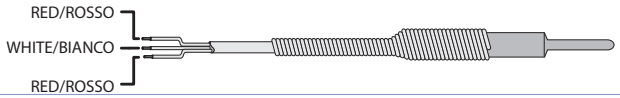
5.1.b Analogue Input AI1

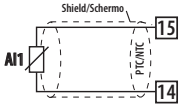


For thermocouples K, S, R, J, T, E, N, B.
- Comply with polarity
- For possible extensions, use compensated cable and terminals suitable for the thermocouples used (compensated).
- When shielded cable is used, it should be grounded at one side only.

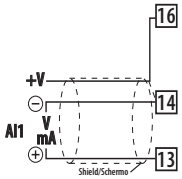


For thermoresistances PT100, Ni100.
- For the three-wire connection use wires with the same section.
- For the two-wire connection short-circuit terminals 13 and 15
- When shielded cable is used, it should be grounded at one side only.



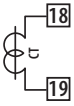


For thermoresistances NTC, PTC, PT500, PT1000 and linear potentiometers.
When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.



For linear signals in Volt and mA
- Comply with polarity
- When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.
- It's possible to select +V at 12Vdc or 24Vdc, by configuring parameter 282 u.out (GROUP R - diSP. - Display and interface).

5.1.c CT input



To enable CT input, modify parameter 287 Ct F.
- Input for 50 mA amperometric transformer.
- Sampling time 100 ms.
- Configurable by parameters.

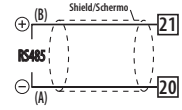
5.1.d Digital inputs

Digital inputs can be enabled by parameters.

Close pin *"DIx"* on pin *"+V"* to enable digital input.

It is possible to put in parallel the digital inputs of different devices joining together the 0V pins (9).

5.1.e Serial input



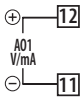
Modbus RS485 communication.
RTU Slave with galvanic insulation.

It is recommended to use the twisted and shielded cable for communications.

5.1.f Digital output

Digital PNP (including SSR) for command or alarm.
Range 12 VDC/25 mA or 24 VDC/15mA selectable by parameter 282 u.out.

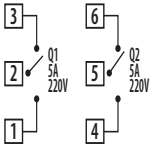
5.1.g Analogue output AO1



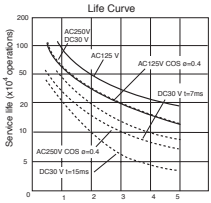
Linear output in **mA** or **V** (galvanically isolated) configurable as command, alarm or retransmission of process-setpoint.

The selection mA or Volt for the linear output depends on the parameters configuration.

5.1.h Relays output Q1 - Q2



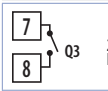
Capacity 5 A (3 A for Q2) / 250 VAC for resistive loads.
See chart below.



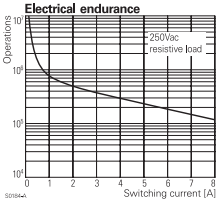
Electrical endurance Q1, Q2:

- 5 A (3 A for Q2), 250 VAC, resistive loads, 10^5 operations.
- 20/2 A, 250 VAC, cosφ = 0.3, $1.2x10^5$ operations.

5.1.i Relay output Q3



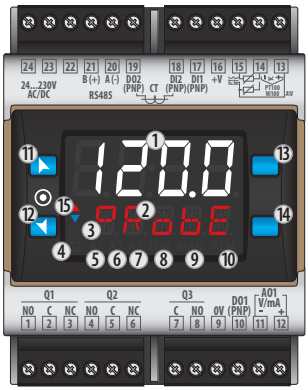
Capacity 2 A / 250 VAC for resistive loads.
See chart below.



Electrical endurance Q3:

- 2A, 250 VAC, resistive loads, 10^5 operations.
- 20/2A, 250 VAC, cosφ = 0.3, 10^5 operations.

6 Display and Key Functions



1	1234	Normally displays the process. During the configuration phase, it displays the parameter being inserted.
2	ProbE	Normally displays the setpoint. During the configuration phase, it displays the parameter value being inserted.

6.1 Meaning of Status Lights (Led)

3	C1	ON when the command output 1 is active. In versions with single analog input, it is ON when the valve is opening. In the versions with two analog inputs, in case of command 1 on the motorized valve, it is permanently ON when the valve is opening and flashing during the closing phase.
4	C2	ON when the command output 2 is active. In versions with single analog input, it is ON when the valve is opening. In the versions with two analog inputs, in case of command 2 on the motorized valve, it is permanently ON when the valve is opening and flashing during the closing phase.
5	A1	ON when alarm 1 is active.
6	A2	ON when alarm 2 is active.
7	A3	ON when alarm 3 is active.
8	TUN	ON when the controller is executing an auto-tuning cycle.
9	MAN	ON when *"Manual"* function is active.
10	REM	ON when the controller communicates through serial. Flashes when the remote setpoint is enabled.

6.2 Keys

11	▲	• Increases the main setpoint. • During configuration allows to scroll the parameters or the groups of parameters. • Increases the setpoints.
12	▼	• Decreases the main setpoint. • During configuration allows to scroll the parameters or the groups of parameters. • Decreases the setpoints.
13	SET	• Allows to visualize command and alarm setpoints. • During configuration allows to enter the parameter to be modified and confirms the variation.
14	FNC	• Allows to enter the Tuning launch function, automatic/manual selection. • During configuration works as exit key (ESCAPE).
15	▲	• ON during the rising phase of the pre-programmed cycle;
	▼	• ON during the falling phase of the pre-programmed cycle;
	▲▼	• Both ON during parameter modification, when this is not a default value.

7 Controller Functions

7.1 Modification of main and alarm setpoint value

Setpoint value can be modified from keyboard as follows:

	Press	Display	Do
1	▲▼	Value on display 2 changes.	Increases or decreases the main setpoint value.
2	SET	Visualizes the other setpoints on display 1. Display 2 shows the setpoint type.	
3	▲▼	Value on display 1 changes.	Increases or decreases the alarm setpoint value.

7.2 Automatic Tune

Automatic tuning procedure allows a precise regulation without delving into the PID regulation algorithm. Selecting Auto on par. 73 tun.1 (for the regulation loop 1), or on par. 98 tun.2 (for the regulation loop 2), the controller analyzes the proces oscillations and optimizes the PID parameters.
Led TUN flashes.
If the PID parameters are not yet selected, at the device switch-on, it is automatically launched the manual Tuning procedure described into the next paragraph.

7.3 Manual Tune

Manual procedure allows the user greater flexibility to decide when to update
PID algorithm parameters. During the manual tuning, the device generates a step to analyze the system inertia to be regulated and, according to the collected data, modifies PID parameters.

After selecting MAnu. on par. 73 tun.1, or on par. 98 tun.2, the procedure can be activated in three ways:

- **Running Tuning by keyboard:**
  Press FNC until display 2 shows tunE with display 1 on dis. and then press SET: display 1 shows Enab. Led TUN switches ON and the procedure starts.
- **Running Tuning by digital input:**
  Select tunE on par. 231 d.i.1F. (or on par. 239 d.i.2F.). At first activation of digital input (commutation on front panel) led TUN led switches on and at second activation switches off.
- **Running Tuning by serial input:**
  Write 1 on word modbus 1216 (command 1) or 1217 (command 2): led TUN switches ON and the procedure starts. Write 0 to stop the tuning.

To avoid an overshoot, the treshold where the controller calculates new PID parameters is determined by this operation:
Tune threshold = Setpoint - *"Set Deviation Tune"* (par. 74 S.d.t.1 or par. 99 S.d.t.2)
Ex.: if the sepoint is 100.0 °C and the Par.32 S.d.t.1 is 20.0 °C the threshold to calculate PID parameters is (100.0 - 20.0) = 80.0 °C.
For a greater precision on PID parameters calculation it is suggested to start the manual tuning procedure when the process deviates from the setpoint.

7.4 Tuning once

Set once on parameter 73 tun.1, or on parameter 98 tun.2.
Autotuning procedure is executed only once at next COMPARA Plus + restart. If the procedure doesn't work, will be executed at next restart.

7.5 Synchronized tuning

Set Synch. on parameter 73 tun.1 or on parameter 98 tun.2.
This procedure has been conceived to calculate correct PID values on multi-zone systems, where each temperature is influenced by the adjacent zones.
Writing on word modbus 1216 (for regulation loop 1) or 1217 (for regulation loop 2) the controller works as follows:

Word value	Action
0	Tune off
1	Command output OFF
2	Command output ON
3	Tune active
4	Tune completed: command output OFF (read only)
5	Tune not available: softstart function enabled (only reading)

Here below the functioning for regulation loop 1: the master switches-off or turns-on all zones (value 1 or 2 on word 1216) for a time long enough to create inertia on the system.
At this point the autotuning is launched (value 3 on word 1216). The controller executes the procedure for the calculation of the new PID values. When the procedure ends, the controller switches off the command output and selects the value 4 on word 1216. The master, who will always read the word 1216, will control the various zones and when all will have finished, will bring to 0 the value of word 1216: the various devices will regulate the temperature independently, with the new calculated values
N.B. The master must read the word 1216 at least every 10 seconds or the controller will automatically exit the autotuning procedure.

7.6 Digital input functions

The COMPARA Plus+ functions related to digital inputs, can be enabled by parameters 231 d.i.1F. e 239 d.i.2F..

- 2t.SW.: Two threshold setpoint modification: with digital input active the COMPARA Plus+ regulates on SET2, otherwise reulates on SET1;
- 2t.SW.i.: Modification of 2 setpoints by digital input with impulse command;
- 3t.SW.i.: Modification of 3 setpoints by digital input with impulse command,
- 4t.SW.i.: Modification of 4 setpoints by digital input with impulse command,
- St./St.: Start / Stop of the controller by digital input with impulse command,
- RUN.: The regulation is enabled only with digital input active,
- HoLd: With digital input active the conversion is locked (visualization maintenance function);
- tUNE: Enables/disables the Tuning if par. 73 tun.1 is selected as MAnu.;

- Au.MA.1.: If par. 48 A.MA.1. is selected as EnAb. or En.Sto., with impulse command on digital input, the COMPARA Plus+ switches the related regulation loop, from automatic to manual and vice versa.
- Au.MA.c.: If par. 48 A.MA.1. is selected as EnAb. or En.Sto. the COMPARA Plus+ switches to manual the related regulation loop, with digital input active, otherwise the regulation is automatic.
- AcE.EY.: COMPARA Plus+ execute a cooling type regulation with digital input active, otherwise the regulation is of heating type;
- A.1. 0: Zero tare function: brings the analogue input to 0.
- M.RES.: Allows the reset of the output if manual reset is active for the alarms and for the command outputs;
- t.1.RUN: If timer 1 is enabled (par. 328 tMr.1 different from d.SAb.), with digital input active, the timer is switched to RUN, otherwise is kept in STOP;
- t.1.S.E.: If timer 1 is enabled (par. 328 tMr.1 different from d.SAb.), acting on the digital input, the status of the timer switches from STOP to RUN e vice versa;• t.1.StA.: If il timer 1 is enabled (par. 328 tMr.1 differnet from d.SAb.), acting on the digital input, the timer is switched to RUN;
- t.1.End.: If il timer 1 is enabled (par. 328 tMr.1 differnet from d.SAb.), acting on the digital input, the timer is switched to STOP;
- t.2.RUN: If timer 2 is enabled (par. 331 tMr.2 different from d.SAb.), with digital input active, the timer is switched to RUN, otherwise is kept in STOP;
- t.2.S.E.: If timer 2 is enabled (par. 331 tMr.2 different from d.SAb.), acting on the digital input, the status of the timer switches from STOP to RUN e vice versa;
- t.2.StA.: If timer 2 is enabled (par. 331 tMr.2 different from d.SAb.), acting on the digital input, the timer is switched to RUN;
- t.2.End.: If timer 2 is enabled (par. 331 tMr.2 different from d.SAb.), acting on the digital input, the timer is switched to STOP;
- Lo.cFG.: With digital input active, the access to setpoint configuration/modification is locked;
- uP.KEY: simulate button ▲ operation;
- doWN.K.: simulate button ▼ operation;
- FNc. K.: simulate button FNC operation;
- SEt. K.: simulate button SET operation;
- ExE.AL.: External Alarm. The controller goes to STOP and the alarms are disabled. To return to START condition, one of following events is required:
  - switching off and on the controller
  - activation of the digital input if the relative parameter is St./St.
  - by pressure SET button if par. 286 s.k.s.f. set on St./St.
  - START by serial commad on word modbus 1214).

7.7 Automatic / Manual regulation for % output control

This function allows to switch from automatic functioning to manual command of the output percentage.
With par. 48 A.MA.1. it is possible to select two modes.

1 **First selection** (EnAb.) allows to enable with FNC the writing P.--- on display 1, while on display 2 is showed AutoM.
Press SET to visualize MAnu.; it's now possible, during the process visualization, modify through the keys ▲ and ▼ the output percentage. To back to automatic, with the same procedure, select AutoM. on display 2: immediately led MAN switches off and functioning backs to automatic.

2 **Second selection** (En.Sto.) enables the same functioning but with two important variants:

- If there is a temporary power failure or after switch-off, the manual functioning as well as the previous output percentage value will be maintained at restarting.
- If the sensor breaks during automatic functioning, the controller switches to manual mode while maintaining the output percentage command unchanged as generated by the PID immediately before breakage.
  Ex: on an extruder the command in percentage of the resistance (load) is maintained also in case of input sensor failure.

7.8 Heater Break Alarm on CT (Current Transformer)

This function allows to measure load current to manage an alarm during a malfunctioning with power in short circuit, always open or partial break of the charge. To enable this function set 50 H2 or 60 H2 on par. 287 Ct F. and the value of the connected transfomer, on par. 288 Ct u..

- Select on par. 290 H.b.A.t. the Heater Break Alarm intervention threshold in Ampere.
- Select on par. 291 ocu.t. the intervention threshold in Ampere to control the overcurrent.
- Select on par. 292 H.b.A.d. the delay time in seconds for the Heater Break Alarm intervention.

- It is possible to associate an alarm, selecting *H.b.A.* on par. 123 *AL.1F.* on par. 141 *AL2F.* or par. 159 *AL3.F.* or par. 177 *AL4.F.* or par. 195 *AL5.F.*.

It is possible to visualize on display 2 the average current, selecting *AMPEr.* on par. 278 *u.d.2.*
Selecting 0 on par. 290 *H.b.A.t.* it is possible to visualize the current consumption without generating an Heater Break Alarm.

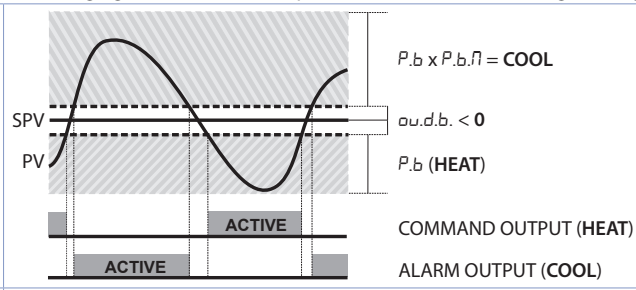
7.9 Dual Action (Heating-Cooling)

COMPARA Plus + is suitable also for systems requiring a combined heating-cooling action.
The command output has to be configured as PID for Heating (Par. 38 *Ac.t.1* = *HEAt* and *P.b. 1* greater than 0), and one of the alarms (*AL.1F.*, *AL2.F.*, *AL3.F.* , *AL4.F.* , *AL5.F.*) has to be configured as *cooL*.
The command output must be connected to the actuator responsible for heating, while the alarm will control cooling action.
Parameters to be configured for the heating PID are:
Ac.t.1 = *HEAt* Command output action type (Heating);
P.b. 1: Heating proportional band;
i.t. 1: Integral time of heating and cooling;
d.t. 1: Derivative time of heating and cooling;
c.t. 1: Heating time cycle.
Parameters to be configured for the cooling PID related to regulation loop 1 and alarm 1 are:
AL.1F. = *cooL*. Alarm 1 selection (Cooling);
P.b.M.1: Proportional band multiplier;
o.d.b.1: Overlapping / Dead band;
c.c.t.1: Cooling time cycle.
Par. *P.b.M.1* (that ranges from 1.00 to 5.00) determines the proportional band of cooling action basing on the formula:

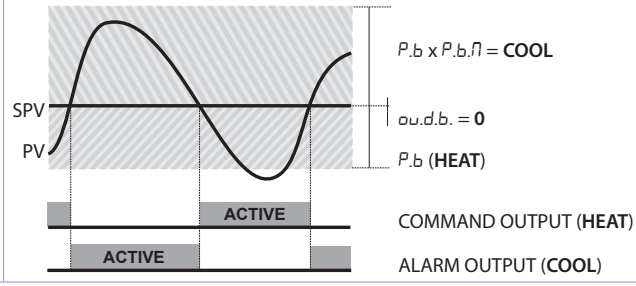
Proportional band for cooling action = *P.b. 1* x *P.b.M.1*.
This gives a proportional band for cooling which will be the same as heating band if *P.b.M.1* = 1.00, or 5 times greater if *P.b.M.1* = 5.00.

Integral and derivative time are the same for both actions.
Par. *o.d.b.1* determines the percentage overlapping between the two actions. For systems in which the heating output and cooling output must never be simultaneously active a Dead Band (*o.d.b.1* ≤ 0), must be configured, vice versa you can configure an overlapping (*o.d.b.1* > 0).
The following figure shows an example of dual action PID (heating-cooling) with *i.t. 1* = 0 e *d.t. 1* = 0.

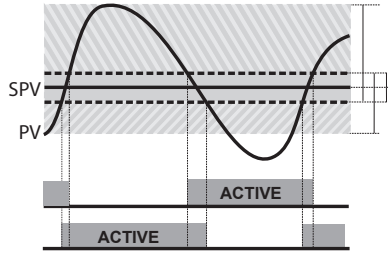
1



2



3



P.b x P.b.M = **COOL**

ou.d.b. > **0**

P.b (**HEAT**)

COMMAND OUTPUT (**HEAT**)

ALARM OUTPUT (**COOL**)

Parameter c.c.t.1 has the same meaning of cycle time for heating action c.t. 1.
Parameter co.F.1 (Cooling Fluid) pre-selects the proportional band multiplier P.b.M.1 and the cooling PID cycle time c.c.t.1 according to cooling fluid type:

co.F.1	Cooling fluid type	P.b.M.1	c.c.t.1
Air	Air	1.00	10
oil	Oil	1.25	4
H2o	Water	2.50	2

Once parameter co.F.1 has been selected, the parameters P.b.M.1, o.d.b.1 and c.c.t.1 can be however modified.

7.10 LATCH ON Function

For use with input Pot. and with linear input (0..10 V, 0..40 mV, 0/4..20 mA) it is possible to associate start value of the scale (par. 4 LL. r.1) to the minimum position of the sensor and value of the scale end (par. 5 uL. r.1) to the maximum position of the sensor (par. 10 Ltc.1 configured as Stndr).
It is also possible to fix the point in which the controller will display 0 (however keeping the scale range between LL. r.1 and uL. r. 1 using the *"virtual zero"* option by selectin u.0.Sto. or u.0.t.on. on par. 10 Ltc.1.
Selecting u.0.t.on. the virtual zero must be reset at each switching on; selecting u.0.Sto. the virtual zero will remain fixed once calibrated. To use the LATCH ON function, configure the par. Ltc.1[1]
Then refer to the following table for the calibration procedure:

	Press	Display	Do
1	FNC	Exit parameters configuration. Display 2 visualizes writing LAtc.	Place the sensor on minimum operating value (corresponding to LL. r.1)
2	▼	Store value on minimum. Display shows LoU.	Place sensor on maximum operating value (corresponding to uL. r.1).
3	▲	Store value on max. Display shows HiGh.	To exit standard proceeding press SET. For *"virtual zero"* setting, place the sensor to zero point.
4	FNC	Set virtual zero. Display shows 2Ero. If *"Virtual zero at start"* is selected, point 4 must be repeated at each starting.	To exit procedure press SET.

7.11 Soft-Start Function

COMPARA Plus + is provided with two types of softstart selectable on parameter 264 SS.tY. (*"Softstart Type"*).

1 First selection (GrAd.) enables gradient softstart. AAt starting the controller reaches setpoint basing on the rising gradient set on parameter 266 SS.Gr. (*"Softstart Gradient"*) in Unit/hour (ex. °C/h). If parameter 269 SS.t r. (*"Softstart Time"*) is different to 0, at starting when the time selected on par. 269 is elapsed, the controller stops to follow the gradient and reaches setpoint with the maximum power.

1 The tuning procedure starts by exiting the configuration after changing the parameter.

2 Second selection (PErc.) enables output percentage softstart. On par. 268 SS.tH. it is possible to set the threshold under which starts the softstart (*"Softstart Threshold"*). On par. 267 SS.PE. (*"Softstart Percentage"*) an output percentage is selectable (from 0 to 100), which controller keeps until the process exceeds the threshold set on par. 268 or until the time in minutes set on par. 269 SS.t ı. (*"Softstart Time"* word 2084).

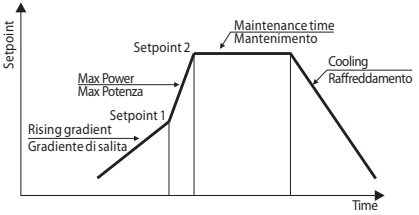
If the Sof-Start function is active the automatic/manual Tuning function cannot be activated.

7.12 Pre-Programmed cycle

Pre-programmed cycle function activates by setting ENAb. on parameter 263 Pr.cY..

Controller reaches setpoint 1 basing on the gradient set on parameter 266 SS.Gr., then it reaches max. power up to setpoint 2. When the process reaches max. power, this setpoint is maintained for the time set on parameter 270 MA.t. ı..

At expiry, process will reach ambient temperature according to gradient entered on parameter 271 FA.Gr., then command output will be disabled and display will visualize StoP.



Cycle starts at each activation of the controller, or via digital input if it is enabled for this type of functioning (parameters 231, 239 set as St. / St. or Run).

7.13 Retransmission function on analogue output

If not used as command, the analogue output can be used to retransmit process/ setpoint/ current read by the C.T. input/ output percentage.

Select on parameter 298 rtM.I ("Retransmission 1") the value to be retransmitted and on parameter 299 r.ItY. ("Retransmission 1 Type") the output type.

It is possible also to select on parameters 300 r.ILL. and 301 r.IuL. the input value rescale limits.

7.14 Timer functions

The COMPARA Plus + integrates two timers that can be independent, sequential or looped together.

Timer 1 is enabled on parameter 328 tMr.I; timer 2 on parameter 331 tMr.2:

- ENAb. the timer starts from the keyboard or digital input (user intervention is required)
- EN.StR. the timer starts counting when the regulator is in RUN.

The timer time-base set in MM.SS or hh.MM by changing parameters 329 t.b.t.I for timer 1 and 332 t.b.t.2 for timer 2.

In parameter 334 tMrS. can be define whether the timers should be independent or related to each other.

- SINGL. The timers work independently of each other.
- SEQuE. When timer 1 ends, timer 2 starts. The sequence is active only by starting timer 1. When timer 2 expires, the sequence is interrupted.
- LooP When a timer ends, another starts: the sequence repeats itself cyclically.

To change the duration of the counting time, follow the steps below:

	Press	Display	Do
1	SET	Press until t IME 1 or t IME 2 visualized on display 1.	
2	▲ ▼	Digits on display 1 changes.	Increase or decrease time value for the selected timer.

To start the keyboard count follow the steps below:

	Press	Display	Do
1	FNC	Press until t IME 1 or t IME 2 visualized on display 2. Display 1 shows STOP if the timer is stopped, otherwise it shows the remaining time.	

	Press	Display	Do
2	SET	The timer stops if active or starts counting if in STOP.	

Start/Stop of Timer is possibile also by digital input (see parameters d.i.1F ... d.i.4F.)

The alarm outputs can be associated with the timers (parameters AL.1F .... AL.5F). On parameters 330 A.tM.1 and 333 A.tM.2 is possible to select the activation mode. The proposed solutions are as follows:

StArt	Alarm active during timer counting
End	Alarm active when the timer expiry
WArn.	Alarm active 5 " before the timer expiry

8 Serial communication

COMPARA Plus+ is equipped with RS485 and can receive/broadcast data via serial communication using MODBUS RTU protocol. The device can only be configured as a Slave. This function enables the control of multiple controllers connected to a supervisory system / SCADA.
Each controller responds to a Master query only if the query contains the same address as parameter 318 SL.Ad. (*"Slave Address"*).
The addresses permitted range from 1 to 254 and there must not be controllers with the same address on the same line.
Address 255 can be used by the Master to communicate with all the connected equipment (broadcast mode), while with 0 all the devices receive the command, but no response is expected.
The baud rate is selected on parameter 319 bd.rt. (*"Baud Rate"*).
COMPARA Plus+ can introduce a delay (in milliseconds) of the response to the master request. This delay must be set on parameter 321 SE.dE. (*"Serial Delay"*).
Each parameter modification is saved by the controller in the EEPROM memory (100000 writing cycles), while the setpoints are saved with a delay of 10 seconds after the last modification.
Changes made to words that are different from those reported in the following table can lead to malfunction.

Modbus RTU protocol features	
Baud-rate	Selectable on parameter 319 bd.rt. 1200bit/s 28800bit/s 2400bit/s 38400bit/s 4800bit/s 57600bit/s 9600bit/s 115200bit/s 19200bit/s
Format	Selectable on parameter 320 S.P.P. 8N1 8N2 8E1 8E2 8O1 8O2
Supported functions	WORD READING (max 50 word) (0x03, 0x04) SINGLE WORD WRITING (0x06) MULTIPLE WORDS WRITING (max 50 word) (0x10)

Here below a list of all available addresses and supported functions:

RO = Read Only	R/W = Read/Write	WO = Write Only

Modbus address	Description	Read Write	Reset value
0	Device type	RO	474
1	Software version	RO	Flash
2	Boot version	RO	Flash
3	Slave Address	RO	Eepr/dip
6	Baud rate	RO	Eepr/dip
50	Slave address automatic learning	WO	-
51	System code comparison for slave address automatic learning	WO	-
500	Loading default values (write 9999)	RW	0
501	Restart COMPARA Plus + (write 9999)	RW	0
502	Setpoint storing delay time	RW	10

Modbus address	Description	Read Write	Reset value
503	Parameters storing delay time	RW	1
701	First character of the custom alarm message 1	RW	“u“
...			
723	Last character of the custom alarm message 1	RW	0
751	First character of the custom alarm message 2	RW	“u“
...			
773	Last character of the custom alarm message 2	RW	0
801	First character of the custom alarm message 3	RW	“u“
...			
823	Last character of the custom alarm message 3	RW	0
851	First character of the custom alarm message 4	RW	“u“
...			
873	Last character of the custom alarm message 4	RW	0
901	First character of the custom alarm message 5	RW	“u“
...			
923	Last character of the custom alarm message 5	RW	0
951	First character of the custom alarm message 6	RW	“u“
...			
973	Last character of the custom alarm message 6	RW	0
1000	AI1 value (degrees with tenth)	RO	-
1006	Real setpoint (gradient) of the regulation loop 1	RO	0
1008	Alarms status (0=absent, 1=present) Bit0 = Alarm 1 Bit3 = Alarm 4 Bit1 = Alarm 2 Bit4 = Alarm 5 Bit2 = Alarm 3 Bit5 = Alarm 6	RO	0
1009	Error flags 1 Bit0 = AI1 process error (sensor 1) Bit1 = Reserved Bit2 = Cold junction error Bit3 = Safety error Bit4 = Generic error Bit5 = Hardware error Bit6 = Error H.B.A. (partial rupture of the load) Bit7 = Error H.B.A. (SSR in short circuit) Bit8 = Overcurrent error Bit9 = Parameters out of range error Bit10= CPU eeprom writing error Bit11= RFid eeprom writing error Bit12= CPU eeprom reading error Bit13= RFid eeprom reading error Bit14= Eeprom calibrations bench corrupted Bit15= Eeprom constants bench corrupted	RO	0
1010	Error flags 2 Bit0 = Missing calibrations error Bit1 = Eeprom CPU bench parameters corrupted Bit2 = Eeprom CPU setpoint bench corrupted Bit3 = RFid memory not formatted	RO	0
1011	Digital inputs status (0=not active, 1=active) Bit0 = Digital inp. 1 Bit1 = Digital inp. 2	RO	0
1012	Outputs status (0=off, 1=on) Bit 0 = Q1 Bit 3 = DO1 Bit 1 = Q2 Bit 4 = DO2 Bit 2 = Q3	RO	0

Modbus address	Description	Read Write	Reset value
1013	Led status (0=OFF, 1=ON) Bit 0 = Led UP ▲ Bit 6 = Led TUN Bit 1 = Led C1 Bit 7 = Led point time 2 Bit 2 = Led C2 Bit 8 = Led MAN Bit 3 = Led A1 Bit 9 = Led REM Bit 4 = Led A2 Bit 10 = Led DOWN arrow Bit 5 = Led A3 Bit 11 = Led point time 1	RO	0
1014	Key status (0=released, 1=pressed) Bit 0 = Key UP arrow Bit 2 = Key FNC Bit 1 = Key DOWN arrow Bit 3 = Key SET	RO	0
1015	Cold junction temperature (degrees with tenth)	RO	-
1016	Current CT instantaneous (Ampere with tenth)	RO	0
1017	Current CT average (Ampere with tenth)	RO	0
1018	Current CT ON (Ampere with tenth)	RO	0
1019	Current CT OFF (Ampere with tenth)	RO	0
1100	AI1 value with decimal point selection	RO	-
1106	Real setpoint (gradient) of the regulation loop 1 with decimal point selection	RO	0
1200	Setpoint 1 of regulation loop 1 (degrees with tenth)	R/W	EEPROM
1201	Setpoint 2 of regulation loop 1 (degrees with tenth)	R/W	EEPROM
1202	Setpoint 3 of regulation loop 1 (degrees with tenth)	R/W	EEPROM
1203	Setpoint 4 of regulation loop 1 (degrees with tenth)	R/W	EEPROM
1208	Alarm 1 setpoint (degrees with tenth) Alarm 1 upper setpoint if Par. 123 AL.1.F. = A.bAnd	R/W	EEPROM
1209	Alarm 2 setpoint (degrees with tenth) Alarm 2 upper setpoint if Par. 141 AL.2.F. = A.bAnd	R/W	EEPROM
1210	Alarm 3 setpoint (degrees with tenth) Alarm 3 upper setpoint if Par. 159 AL.3.F. = A.bAnd	R/W	EEPROM
1211	Alarm 4 setpoint (degrees with tenth) Alarm 4 upper setpoint if Par. 177 AL.4.F. = A.bAnd	R/W	EEPROM
1212	Alarm 5 setpoint (degrees with tenth) Alarm 5 upper setpoint if Par. 195 AL.5.F. = A.bAnd	R/W	EEPROM
1214	Start/Stop 0=controller in STOP 1=controller in START	R/W	0
1215	Hold conversion ON/OFF 0=Hold conversion OFF 1=Hold conversion ON	R/W	0
1216	Tune management for regulation loop 1		
	With automatic Tune (par. 73 tun.1 = Auto): 0=autotunig function OFF 1=autotuning ON	RO	0
	With manual Tune (par. 73 tun.1 = MAnu. or OnCE): 0=autotunig function OFF 1=autotuning ON	R/W	0
	With synchronized Tune (par. 73 tun.1 = SYnCH): 0=autotunig function OFF 1=command output OFF (forces the cooling) 2=command output ON (forces the heating) 3=autotuning ON 4=autotuning ended	R/W	0
1218	Automatic/manual selection for regulation loop 1 0=automatic; 1=manual	R/W	0
1220	Command output percentage for regulation loop 1 (0-10000) Heating output percentage with regulation 1 in double loop (0-10000)	R/W	0
1221	Command output percentage for regulation loop 1 (0-1000) Heating output percentage with regulation 1 in double loop (0-1000)	R/W	0

Modbus address	Description	Read Write	Reset value
1222	Command output percentage for regulation loop 1 (0-100) Heating output percentage with regulation 1 in double loop (0-100)	R/W	0
1223	Cooling output percentage with regulation 1 in double loop (0-10000)	RO	0
1224	Cooling output percentage with regulation 1 in double loop (0-1000)	RO	0
1225	Cooling output percentage with regulation 1 in double loop (0-100)	RO	0
1232	Command output manual reset for regulation loop 1: write 0 to reset the command output. In reading 0=reset not allowed, 1=reset allowed	R/W	0
1233	Alarms manual reset: write 0 to reset all alarms. In reading 0=reset not allowed, 1=reset allowed Bit0 = Alarm 1 Bit3 = Alarm 4 Bit1 = Alarm 2 Bit4 = Alarm 5 Bit2 = Alarm 3	R/W	0
1235	Alarm 1 remote stauts (0=absent, 1=present)	R/W	0
1236	Alarm 2 remote stauts (0=absent, 1=present)	R/W	0
1237	Alarm 3 remote stauts (0=absent, 1=present)	R/W	0
1238	Alarm 4 remote stauts (0=absent, 1=present)	R/W	0
1239	Alarm 5 remote stauts (0=absent, 1=present)	R/W	0
1241	Value AO1 by serial (Par. 298 rtn.1 = Md.bus)	R/W	0
1243	Tare of zero AI1 (1=tare; 2=reset tare)	R/W	0
1249	Value of remote setpoint by command 1 serial	R/W	0
1251	Alarm 1 lower setpoint if Par. 123 AL.1.F. = A.bAnd (degrees with tenth)	R/W	EEPROM
1252	Alarm 2 lower setpoint if Par. 141 AL.2.F. = A.bAnd (degrees with tenth)	R/W	EEPROM
1253	Alarm 3 lower setpoint if Par. 159 AL.3.F. = A.bAnd (degrees with tenth)	R/W	EEPROM
1254	Alarm 4 lower setpoint if 177 AL.4.F. = A.bAnd (degrees with tenth)	R/W	EEPROM
1255	Alarm 5 lower setpoint if Par. 195 AL.5.F. = A.bAnd (degrees with tenth)	R/W	EEPROM
1300	Setpoint 1 of regulation loop 1, with decimal point selection	R/W	EEPROM
1301	Setpoint 2 of regulation loop 1, with decimal point selection	R/W	EEPROM
1302	Setpoint 3 of regulation loop 1, with decimal point selection	R/W	EEPROM
1303	Setpoint 4 of regulation loop 1, with decimal point selection	R/W	EEPROM
1308	Alarm 1 setpoint, with decimal point selection Alarm 1 upper setpoint if Par. 123 AL.1.F. = A.bAnd	R/W	EEPROM
1309	Alarm 2 setpoint, with decimal point selection Alarm 2 upper setpoint if Par. 141 AL.2.F. = A.bAnd	R/W	EEPROM
1310	Alarm 3 setpoint, with decimal point selection Alarm 3 upper setpoint if Par. 159 AL.3.F. = A.bAnd	R/W	EEPROM
1311	Alarm 4 setpoint, with decimal point selection Alarm 4 upper setpoint if Par. 177 AL.4.F. = A.bAnd	R/W	EEPROM
1312	Alarm 5 setpoint, with decimal point selection Alarm 5 upper setpoint if Par. 195 AL.5.F. = A.bAnd	R/W	EEPROM
1351	Alarm 1 lower setpoint if Par. 123 AL.1.F. = A.bAnd, with decimal point selection	R/W	EEPROM
1352	Alarm 2 lower setpoint if Par. 141 AL.2.F. = A.bAnd, with decimal point selection	R/W	EEPROM
1353	Alarm 3 lower setpoint if Par. 159 AL.3.F. = A.bAnd, with decimal point selection	R/W	EEPROM
1354	Alarm 4 lower setpoint if Par. 177 AL.4.F. = A.bAnd, with decimal point selection	R/W	EEPROM
1355	Alarm 5 lower setpoint if Par. 195 AL.5.F. = A.bAnd, with decimal point selection	R/W	EEPROM
2001	Parameter 1	R/W	EEPROM
2002	Parameter 2	R/W	EEPROM
...	Parameter ...	R/W	EEPROM
2366	Parameter 366	R/W	EEPROM

8.1 Serial compatibility with COMPARA-PLUS

In existing plants where it´s necessary to replace a module, it is possible to install a new COMPARA Plus+ enabling the Modbus register's compatibility.
To enable the Modbus register's compatibility with the module, simply enter the password 0243.
To return again to the COMPARA Plus+ Modbus mapping, enter the password 0244.

The new register map is the following:

Modbus address	Description of compatibility registers	R/W	Reset value
0	Device type	RO	EEPROM
1	Software version	RO	EEPROM
5	Slave address	RO	EEPROM
6	Boot version	RO	EEPROM
50	Automatic addressing	WO	-
51	System code comparison	WO	-
500	Loading default values (write 9999)	R/W	0
510	Setpoints storing time in eeprom (0-60 s)	R/W	10
999	Process subjected to the visualization filter	RO	-
1000	Process (degrees.tenths for temperature sensors; digits for linear sensors)	RO	-
1001	Setpoint 1	R/W	EEPROM
1002	Setpoint 2	R/W	EEPROM
1003	Setpoint 3	R/W	EEPROM
1004	Setpoint 4	R/W	EEPROM
1005	Alarm 1	R/W	EEPROM
1006	Alarm 2	R/W	EEPROM
1007	Alarm 3	R/W	EEPROM
1008	Setpoint gradient	RO	EEPROM
1009	Relay status (0 = Off, 1 = On): Bit 0 = Relay Q1 Bit 1 = Relay Q2 Bit 2 = Reserved Bit 3 = SSR	RO	0
1010	Heating output percentage (0-10000)	R/W	0
1011	Cooling output percentage (0-10000)	RO	0
1012	Alarms status (0 = None, 1 = Active) Bit 0 = Alarm 1 Bit 1 = Alarm 2	RO	0
1013	Manual reset: write 0 to reset all alarms. In reading (0 = Not resettable, 1 = Resettable) Bit 0 = Alarm 1 Bit 1 = Alarm 2	R/W	0
1014	Error flags Bit 0 = Eeprom writing error Bit 1 = Eeprom reading error Bit 2 = Cold junction error Bit 3 = Process error (sensor) Bit 4 = Generic error Bit 5 = Hardware error Bit 6 = L.B.A.O. error Bit 7 = L.B.A.C. error Bit 8 = Missing calibration data error	RO	0
1015	Cold junction temperature (degrees.tenths)	RO	-
1016	Start / Stop 0 = Controller in STOP 1 = Controller in START	R/W	0
1017	Lock conversion ON / OFF 0 = Lock conversion off 1 = Lock conversion on	R/W	0
1018	Tuning ON / OFF 0 = Tuning off 1 = Tuning on	R/W	0
1019	Automatic / manual selection 0 = Automatic 1 = Manual	R/W	0
1020	T.A. current ON (Ampere with tenths)	RO	0
1021	T.A. current OFF (Ampere with tenths)	RO	0
1022	OFF LINE* time (milliseconds)	R/W	-
1023	Instant Current (Ampere)	RO	0
1024	Digital Input State	RO	0

1025	Tune management for control loop 1 With automatic Tune (par. 73 tUN.1 = Auto): 0= autotuning function OFF 1= autotuning in corso	RO	0
	With manual Tune (par. 73 tUN.1 = MANU. o ONCE): 0= autotuning function OFF 1= autotuning ON	R/W	0
	With synchronized Tune (par. 73 tUN.1 = SYNCH.): 0= autotuning function OFF 1= command output OFF (forced cooling) 2= command output ON (forced heating) 3= autotuning ON 4= autotuning finished	R/W	0
1026	Zero tare AI1 (1 = tare; 2 = reset tare)	R/W	0
1099	Process subjected to the visualization filter and decimal point selection	RO	0
1100	Process with decimal point selection	RO	0
1101	Setpoint 1 with decimal point selection	R/W	EEPROM
1102	Setpoint 2 with decimal point selection	R/W	EEPROM
1103	Setpoint 3 with decimal point selection	R/W	EEPROM
1104	Setpoint 4 with decimal point selection	R/W	EEPROM
1105	Alarm 1 with decimal point selection	R/W	EEPROM
1106	Alarm 2 with decimal point selection	R/W	EEPROM
1107	Alarm 3 with decimal point selection	R/W	EEPROM
1108	Gradient Setpoint with decimal point selection	RO	EEPROM
1109	Percentage heating output (0-1000)	R/W	0
1110	Percentage heating output (0-100)	R/W	0
1111	Percentage cooling output (0-1000)	RO	0
1112	Percentage cooling output (0-100)	RO	0

* *If value is 0, the control is disabled. If different from 0, it is the max. time which can elapse between two pollings before the controller goes off-line. If it goes off-line, the controller returns to Stop mode, the control output is disabled but the alarms are active.*

9 Reading and configuration through NFC

Programmable
by RFID /NFC.
No wiring required!

The controller COMPARA Plus+ is supported by App: using an ANDROID smartphone with NFC connection it is possible to program the device without using a dedicated equipment. The App allows to read, set and backup all parameters which are stored into the internal memory.

Procedure:

- Identify the position of the NFC antenna on the smartphone (usually behind the back cover) or to one of the sides in case of metal chassis. The COMPARA Plus+'s antenna is placed on the frontal panel, between the function keys.
- Make sure that the NFC sensor of the phone is enabled or that there are no metal materials between the phone and the device (ex. aluminium cover or with magnetic stand)
- It is useful to enable the system sounds on the smartphone, as the notification sound confirms that the device has correctly been detected.

The App interface is provided with four tabs: SCAN, DATA, WRITE, EXTRA.

Select the first tab *"SCAN"* to read data stored into the internal memory of the device; place the smartphone in contact with the controller frontal panel, making sure that the phone's antenna matched with that of the controller.

Once detected the device, the App emits a notification sounds and proceeds with the model identification and the reading of the parameters.
The graphic interface shows the advancement and switches to the second tab *"DATA"*. It is now possible to move the smartphone away from the controller to make the required modifications more easily.
The device parameters are divided into collapsible groups and are displayed with name, current value and reference index to the manual.
Click on a row to open the setting screen of the related parameter with the detailed view of available options (in case of multiple choice parameters) or of the minimum/maximum/decimals limits (for numeric parameters), included the text description (as per section n. 11 of the user manual). Once selected the chosen value, the related row will be updated and underlined into the tab *"DATA"* (hold down the line to cancel modifications).
To download the new configuration on your device, select the third tab *"WRITE"*, place again the smartphone in contact with the controller and wait for the notification.
The COMPARA Plus+ will show a restart request, necessary to update the configuration with the new written modifications; if it does not restart, the COMPARA Plus+ will continue to work with the previous configuration.
In addition to the classic operation of parameters reading->modification->writing, PROGRAMADOR NFC is provided with additional functions which can be accessed by the tab *"EXTRA"*, as save parameters / e-mail loaded values/ restore default values.

9.1 Configuration through memory card

The device can be configured through a memory card. This one is linked to the micro-USB connector on the bottom of the device.

9.2 Memory card creation/update

In order to save a parameter configuration in the memory card, connect it to micro-USB connector and power the instrument. If the memory has never been configured, the device starts normally, but if its data are considered valid, it is possible to view on the display MEMo SKiP. Press **SET** in order to start the product without uploading any data from the memory card. Configure, set the parameters and exit configuration. Now, the device saves the configuration just created also in the memory.

9.3 Configuration loading from memory card

In order to charge a configuration previously created and saved in the memory card, connect it to the micro-USB connector and power the instrument. Now, if the memory is detected and its data are considered valid, it is possible to view on the display MEMo SKiP. By pressing ▲ you see MEMo LoAd and with **SET** you confirm the uploading of parameters from the memory card to the controller. If, on the other hand, you press directly **SET**, when viewing MEMo SKiP, the product starts without uploading any data from the memory card.

10 Loading default values

This procedure allows to restore factory settings of the device.

	Press	Display	Do
1	**FNC** for 3 sec	Display 1 shows PASS., while display 2 shows 0000 with the 1st digit flashing.	
2	▲ or ▼	Modify the flashing digit and move to the next one pressing **SET**.	Enter password 9999.
3	**FNC** to confirm	The device loads default settings and restarts.	

11 Access configuration

	Press	Display	Do
1	**FNC** for 3 sec.	Display 1 shows PASS., while display 2 shows 0000 with the 1st digit flashing.	

	Press	Display	Do
2	▲ ▼	Modify flashing digit and move to next digit with SET.	Enter password 1234.
3	FNC to confirm	Display 1 shows the first parameters group, display 2 shows the description.	
4	▲ or ▼	Scroll parameters groups.	
5	SET to confirm	Display 1 shows the first parameter of the group and display 2 shows its value.	Press FNC to exit configuration.
6	▲ or ▼	Scroll parameters.	
7	SET to confirm	Allows parameter modification (display 2 flashes)	
8	▲ or ▼	Increases or decreases visualized value	Introduce new data
9	SET	Confirms and stores the new value. If the value is different from default values, the arrow keys light on.	
10	FNC	Backs to parameter groups selection (see point 3).	Press again FNC to exit configuration

11.1 Parameters list functioning

The controller COMPARA Plus+ integrates many features that make the configuration parameters list very long. To make it more functional, the parameters list is dynamics and it changes as the user enables / disables the functions. Practically, using a specific function that occupies a given input (or output), the parameters referred to other functions of that resource are hidden to the user making the parameters list more concise.

To simplify the reading/interpretation of the parameters, pressing SET it is possible to visualize a brief description of the selected parameter.

Finally, keeping pressed FNC, it is possible to move from the mnemonic visualization of the parameter to the numeric one, and vice versa. Ex. The first parameter can be displayed as SEn.1 (mnemonic visualization) or as P.001 (numeric visualization).

Set the product parameters so that they are suitable for the system to be controlled. If they are not suitable, unexpected operations may occasionally cause materials damage or accidents.

12 Table of configuration parameters

GROUP A - AIn.1 - Analogue input 1

1 SEn.1 Sensor AI1

Analogue input configuration / sensor AI1 selection

tc. K	Tc-K	-260° C..1360° C. (***Default***)
tc. S	Tc-S	-40° C..1760° C
tc. R	Tc-R	-40° C..1760° C
tc. J	Tc-J	-200° C..1200° C
tc. t	Tc-T	-260° C..400° C
tc. E	Tc-E	-260° C..980° C
tc. N	Tc-N	-260° C..1280° C
tc. b	Tc-B	100° C..1820° C
Pt100	Pt100	-200° C..600° C
Ni100	Ni100	-60° C..180° C
NtC 1	NTC 10K β3435K	-40° C..125° C
PtC	PTC 1K	-50° C..150° C
Pt500	Pt500	-200° C..600° C
Pt1K	Pt1000	-200° C..600° C
0-1	0..1 V	
0-5	0..5 V	
0-10	0..10 V	
0-20	0..20 mA	
4-20	4..20 mA	
0-60	0..60 mV	

PoE.	Potentiometer (set the value on parameter 6)	
Ni120	Ni120	-60 °C..240 °C
NEc 2	NTC 10K β3694K	-40 °C..150 °C
NEc 3	NTC 2252 β3976K	-40 °C..150 °C

2 dP. 1 Decimal Point 1

Select number of displayed decimal points for AI1

0	***Default***
0.0	1 decimale
0.00	2 decimali
0.000	3 decimali

3 dEGr. Degree

°c	Celsius (***Default***)	°F	Fahrenheit	K	Kelvin

4 LL.1 Lower Linear Input AI1

AI1 lower limit only for linear signals. Ex.: with input 4..20 mA this parameter takes value associated to 4 mA. The value may be greater than the one entered on the next parameter.

-9999..+30000 [digit[1 p. 43]] ***Default***: 0.

5 uL.1 Upper Linear Input AI1

AI1 upper limit only for linear signals Ex: with input 4..20 mA this parameter takes value associated to 20 mA.The value may be lower than the one entered on the previous parameter.

-9999..+30000 [digit[1 p. 43]] ***Default***:1000

6 PuA.1 Potentiometer Value AI1

Selects the value of the potentiometer connected on AI1

1..150 kohm. ***Default***: 10kohm

7 1oL.1 Linear Input over Limits AI1

If AI1 is a linear input, allows to the process to overpass the limits (parameters 4 and 5).

diSAb.	Disabled (***Default***)
ENAb.	Enabled

8 oCA.1 Offset Calibration AI1

AI1 Offset calibration. Value added/subtracted to the process value (ex: usually correcting the ambient temperature value).

-9999..+9999 [digit[1 p. 43]] (degrees.tenths for temperature sensors). ***Default*** 0.

9 GCA.1 Gain Calibration AI1

Value multiplied to the process value to calibrate the working point. Ex: to correct the range from 0..1000°C showing 0..1010°C, set the parameter to -1.0

-100.0%...+100.0%, ***Default***: 0.0.

10 LEC.1 Latch-On AI1

Automatic setting of limits for AI1 linear input

diSAb.	Disabled (***Default***)
StNRd	Standard
V.0.Sto.	Virtual Zero Stored
V.0.t.oN.	Virtual Zero at start

11 cFL.1 Conversion Filter AI1

ADC Filter: Number of sensor readings to calculate mean that defines process value. **NB**: When readings increase, control loop speed slows down. 1...15. (***Default***: 10)

12 cFr.1 Conversion Frequency AI1

Sampling frequency of digital / analogue converter for AI1. Increasing the conversion speed will slow down reading stability

(example: for fast transients, as the pressure, it is advisable to increase sampling frequency).

4.17Hz	4.17 Hz (Min. conversion speed)	33.2Hz	33.2 Hz
6.25Hz	6.25 Hz	39.0Hz	39.0 Hz
8.33Hz	8.33 Hz	50.0Hz	50.0 Hz
10.0Hz	10.0 Hz	62.0Hz	62.0 Hz
12.5Hz	12.5 Hz	123Hz	123 Hz
16.7Hz	16.7 Hz (***Default***) Ideal for noises filtering 50 / 60 Hz	242Hz	242 Hz
19.6Hz	19.6 Hz	470Hz	470 Hz (Max. speed conversion)

13 L.cE.1 Lower Current Error 1

If AI1 is a 4-20 mA input, it determines the current value below the probe error E-05 is signaled.

2.0 mA	(***Default***)	2.6 mA	3.2 mA	3.8 mA
2.2 mA		2.8 mA	3.4 mA	
2.4 mA		3.0 mA	3.6 mA	

GROUP B - rES. - Reserved

18÷34 Reserved Parameters - Group B

GROUP C - cMd.1 - Outputs and regulation Process 1

35 c.ou.1 Command Output 1

Selects the command output related to the process1 and the outputs related to the alarms.

- c. o2 Command on relay output Q2.
- c. o1 Command on relay output Q1. (***Default***)
- c. SSR Command on digital output
- c. VAL. Servo-valve command with open loop on Q1 and Q2 relays
- c.0-10 Command 0-10 V on analogue output AO1.
- c.4-20 Command 4-20 mA on analogue output AO1.
- 0.10.S.R. Command 0-10 V on analogue output AO1 with split-range function: the analogue output sets the cooling action from 0 to 5V and heating action from 5 to 10V.
- 4.20.S.R. Command 4-20 mA on analogue output AO1 with split-range function: the analogue output sets the cooling action from 4 to 12mA and heating action from 12 to 20mA.
- c.VAL.c. Servo-valve command with open loop on Q2 and Q3 relays

	Command	AL. 1	AL. 2	AL. 3	AL. 4	AL. 5
c. o2	Q2	Q1	Q3	DO1	DO2	AO1
c. o1	Q1	Q2	Q3	DO1	DO2	AO1
c. SSR	DO1	Q1	Q2	Q3	DO2	AO1
c. VAL.	Q1(open) Q2(close)	Q3	DO1	DO2	AO1	-
c.0-10 (0.10.S.R.)	AO1 (0..10 V)	Q1	Q2	Q3	DO1	DO2
c.4-20 (4.20.S.R.)	AO1 (4..20 mA)	Q1	Q2	Q3	DO1	DO2
c. VAL.c.	Q2(open) Q3(close)	Q1	DO1	DO2	AO1	-

NB: if an output is used for functions other than alarms (for example retransmission or command n° 2), this resource will no longer be available as an alarm and the related group will be hidden from the parameter list. The correspondence of the functions/outputs remains however that indicated in the tables above.

38 Ac.t.1 Action type 1

Action type to control process 1.

- HEAt Heating (N.A.) (***Default***)
- cooL Cooling (N.C.)

39 c.HY.1 Command Hysteresis 1

Hysteresis to control process 1 in ON/OFF.

-9999..+9999 [digit[1 p. 43]] (degrees.tenths for temperature sensors). ***Default*** 0.2.

40 LLS.1 Lower Limit Setpoint 1

Lower limit setpoint selectable for command setpoint 1.
-9999..+30000 [digit[1 p. 43]] (degrees.tenths for temperature sensors). ***Default*** 0.

41 uLS.1 Upper Limit Setpoint 1

Upper limit setpoint selectable for command setpoint 1.
-9999..+30000 [digit[1 p. 43]] (degrees for temperature sensors). ***Default*** 1750.

42 c.rE.1 Command Reset 1

Type of reset for command contact 1 (always automatic in P.I.D. functioning)

- A. rES. Automatic Reset (***Default***)
- M. rES. Manual Reset (by keyboard or by digital input)
- M.rES.S. Manual Reset Stored (keeps relay status also after an eventual power failure)
- A.rES.t. Automatic reset with timed activation. The command remains active for the time set on the parameter 45 c.dE.1., even if the conditions generating it are missing. To be able to act again, the conditions for activating the command must disappear.

43 c5.E.1 Command State Error 1

State of contact for command 1 output in case of error.

If the command output 1 (Par. 35 c.ou.1) **is relay or valve:**

- oPEN Contact or valve open. ***Default***
- cLoSE Contact or valve closed.

If the command output 1 is digital output (SSR):

- oFF Digital output OFF. ***Default***
- oN Digital output ON.

If the command output 1 is 0-10V:

- 0 V 0 V. ***Default***
- 10 V 10 V.

If the command output 1 is 0-20 mA or 4-20 mA:

- 0 mA 0 mA. ***Default***
- 4 mA 4 mA.
- 20 mA 20 mA.
- 21.5mA 21.5 mA.

44 cLd.1 Command Led 1

Defines led C1 state corresponding to the relevant output. If the valve command is selected, this parameter is not managed.

- o.c. ON with open contact or SSR switched off. If command AO1, ON with output 0%, OFF if 100% and flashing between 1% and 99%.
- c.c. ON with closed contact or SSR switched on. If command AO1 ON with output 100%, OFF if 0% and flashing between 1% and 99%. (***Default***)

45 c.dE.1 Command Delay 1

Command 1 delay (only in ON / OFF functioning).
-60:00..60:00 mm:ss. ***Default***: 00:00.
Negative: delay when turning off output.
Positive: delay when turning on output.

46 c5.P.1 Command Setpoint Protection 1

Allows or not to modify command setpoint 1 value

- FREE Modification allowed (***Default***)
- Lock Protected
- FR.in. Free Initialized. At start, setpoint 1 of command 1 is initialized to the value set on parameter 51 in.SP.1 (Initial Value Setpoint 1).

47 uAt.1 Valve Time 1

Valve time related to command 1 (declared by the manufacturer of the valve)
1...300 seconds. ***Default***: 60.

48 AMA.1 Automatic / Manual 1

Enables the automatic/manual selection for command 1

- diSAb. Disabled (***Default***)
- ENAb. Enabled
- EN.Sto. Enabled with memory

49 in.S. Initial State

Choose the state of the controller when turning it on. This only works on the RS485 version or by enabling the Start/Stop from digital input or SET button.

- StArt Start (***Default***)
- StoP Stop
- StorE. Stored. State of Start/Stop prior to switching off.

50 S.uAS. State Valve Saturation

Select the valve status when the output percentage is 100%

- PErc. The valve opening relay is activated for a time equal to 5% of the valve time
- FixEd The valve opening relay is always active

51 iSP.1 Initial Value Setpoint 1

Determines the initial value (at start) of setpoint 1 of command 1 when FAin. is selected on parameter 46 c.S.P.1 (Command Setpoint Protection 1)
-9999..+30000 [digit[1 p. 43]] (degreesfor temp. sensors). ***Default*** 0.

GROUP D - rES. - Reserved

54÷72 Reserved Parameters - Group D

GROUP E - rEG.1 - Autotuning and PID 1

73 tun.1 Tune 1

Selects autotuning type for command 1

- diSAb. Disabled. If proportional band and integral time paramters are to selected to zero, the regulation is ON/OFF type.. (***Default***)
- Auto Automatic (Automatic P.I.D. parameters calculation)
- MANu. Manual (launch by keyboards or by digital input)
- oncE Once (P.I.D. parameters calculation only at first start)
- SYncH. Synchronized (Autotuning managed by serial)

74 S.d.t.1 Setpoint Deviation Tune 1

Selects deviation from command setpoint 1 as threshold used by autotuning to calculate P.I.D. parameters
0-10000 [digit[1 p. 43]] (degrees.tenths for temp. sensors). ***Default***: 30.0.

75 Pb. 1 Proportional Band 1

Proportional band or process 1 P.I.D. regulation (Process inertia).
0 ON / OFF if t.i. equal to 0 (***Default***)
1...10000 [digit[1 p. 43]] (degrees.tenths for temp. sensors).

76 it. 1 Integral Time 1

Integral time for process 1 P.I.D. regulation (process inertia duration).
0.0...2000.0 sec. (0.0 = integral disabled), ***Default*** 0.0

77 dt. 1 Derivative Time 1

Derivative time for process 1 P.I.D. regulation (Normally ¼ of integral time).
0.0...1000.0 sec. (0.0 = derivative disabled), ***Default*** 0

78 d.b. 1 Dead Band 1

Dead band of process 1 P.I.D..

0...10000 [digit[1 p. 43]] (degrees.tenths for temp. sensors) (***Default***: 0)

79 P.b.c.1 Proportional Band Centered 1

Defines if the proportional band 1 must be centered or not on the setpoint. In double loop functioning (heating/cooling), always disabled.

d.SAb. Disabled. Band under (heating) or over (cooling)(***Default***)

ENAb. Centered band

80 o.o.S.1 Off Over Setpoint 1

In P.I.D. enables the command output 1 switching off, when a certain threshold is exceeded (setpoint + Par.81)

d.SAb. Disabled (***Default***)

ENAb. Enabled

81 o.d.t.1 Off Deviation Threshold 1

Selects deviation from command setpoint 1, to calculate the intervention threshold of "Off Over Setpoint 1" function.

-9999...+9999 [digit[1 p. 43]] (degrees.tenths for temp. sensors) (***Default***: 0)

82 c.t. 1 Cycle Time 1

Cycle time for P.I.D. regulation of process 1 (for P.I.D. on remote control switch 15 s; for PID on SSR 2s). For valve refer to parameter 47 uA.t.1

1-300 seconds (***Default***:15 s)

83 coF.1 Cooling Fluid 1

Type of refrigerant fluid for heating / cooling P.I.D. for process 1. Enable the cooling output on parameter AL.1 .. AL.6.

AIR Air (***Default***)

oIL Oil

WAtEr Water

84 Pb.M.1 Proportional Band Multiplier 1

Proportional band multiplier for heating / cooling P.I.D. for process 1. Proportional band for cooling action is given by parameter P.b. 1 multiplied for this value

1.00...5.00. ***Default***: 1.00

85 o.d.b.1 Overlap / Dead Band 1

Dead band combination for heating / cooling P.I.D. (double action) for process 1.

-20.0%...50.0%

Negative: Dead band.

Positive: overlap. ***Default***: 0.0%

86 c.c.t.1 Cooling Cycle Time 1

Cycle time for cooling output in heating / cooling P.I.D. mode for process 1.

1-300 seconds (***Default***:10 s)

87 LLP.1 Lower Limit Output Percentage 1

Selects min. value for command output 1 percentage.

0%...100%, ***Default***: 0%.

88 uLP.1 Upper Limit Output Percentage 1

Selects max. value for command output 1 percentage.

0%...100%, ***Default***: 100%.

89 MGt.1 Max Gap Tune 1

Selects the max. process-setpoint gap beyond which the automatic tune recalculates PID parameters of process 1.

0-10000 [digit[1 p. 43]] (degrees.tenths for temp. sensors). ***Default***: 2.0

90 mn.P.1 Minimum Proportional Band 1

Selects the min. proportional band 1 value selectable by the automatic tune for the P.I.D. regulation of process 1.

0-10000 [digit[1 p. 43]] (degrees.tenths for temp. sensors). ***Default***: 3.0

91 MA.P.1 Maximum Proportional Band 1

Selects the max. proportional band 1 value selectable by the automatic tune for the P.I.D. regulation of process 1.

0-10000 [digit[1 p. 43]] (degrees.tenths for temp. sensors). ***Default***: 80.0

92 mn.i.1 Minimum Integral Time 1

Selects the min. integral time 1 value selectable by the automatic tune for the P.I.D. regulation of process 1.

0.0...1000.0 seconds. ***Default***: 30.0 s.

93 o.cL.1 Overshoot Control Level 1

The overshoot control function prevents this event during device switching on or when the setpoint is modified.

Setting a too low value the overshoot may not be fully absorbed, while with high values the process could reach the setpoint more slowly.

Disab.	Lev. 3	Lev. 6	Lev. 9
Lev. 1	Lev. 4	Lev. 7	Lev. 10
Lev. 2	Lev. 5 (**Default**)	Lev. 8	

GROUP F - rES. - Reserved

GROUP G - AL. 1 - Alarm 1

123 AL.1.F. Alarm 1 Function

Alarm 1 selection.

- dISAb. Disabled (***Default***)
- Ab.uP.A. Absolute Upper Activation. Absolute referred to the process, active over
- Ab.Lo.A. Absolute Lower Activation. Absolute referred to the process, active under
- bAnd Band alarm (command setpoint ± alarm setpoint)
- uP.dEv. Upper Deviation alarm
- Lo.dEv. Lower Deviation alarm
- Ab.c.u.A. Absolute Command Upper Activation. Absolute alarm referred to the command setpoint, active over
- Ab.c.L.A. Absolute Command Lower Activation. Absolute alarm referred to the command setpoint, active under
- RUn Status alarm (active in RUN/START)
- cooL Cold actuator auxiliary (Cold action in double loop)
- PRb.ER. Probe error. Alarm active in case of sensor rupture.
- tMR.1 Related to timer 1
- tMR.2 Related to timer 2
- tMR.1.2 Related to both timers
- REM. Remote. The alarm is enabled by the word 1235
- di. 1 Digital Input 1. Active when digital input 1 is active.
- di. 2 Digital Input 2. Active when digital input 2 is active.
- H.b.A. Heater Break Alarm and Overcurrent Alarm
- A.bAnd Asymmetric band alarm (command setpoint + alarm setpoint 1 H and command setpoint - alarm setpoint 1 L).

c. Au* Auxiliary for job distribution on the command output. It cyclically replaces the command output for the time set on the parameter 134 A1.dE.. Se A1.dE. = 0, it is activated parallel to the command output. It does not work in case of valve control and can only be activated on an alarm if A1.dE. is different from 0.

126 AL1.o. Alarm 1 State Output

Alarm 1 output contact and intervention type.

- n.o. St. (N.O. Start) Normally open, active at start (***Default***)
- n.c. St. (N.C. Start) Normally closed, active at start
- n.o. tH. (N.O. Threshold) Normally open, active on reaching alarm[2 p. 43]
- n.c. tH. (N.C. Threshold) Normally closed, active on reaching alarm[2 p. 43]
- n.o.tH.V. (N.O. Threshold Variation) disabled after changing control setpoint[3 p. 43]
- n.c.tH.V. (N.C. Threshold Variation) disabled after changing control setpoint[3 p. 43]

128 A1.HY. Alarm 1 Hysteresis

Alarm 1 hysteresis

-9999..+9999 [digit[1 p. 43]] (degrees for temp. sensors). ***Default*** 0.5.

129 A1.LL. Alarm 1 Lower Limit

Lower limit selectable for the alarm 1 setpoint.

-9999..+30000 [digit[1 p. 43]] (degrees for temp. sensors). ***Default*** 0.

130 A1.uL. Alarm 1 Upper Limit

Upper limit selectable for the alarm 1 setpoint

-9999..+30000 [digit[1 p. 43]] (degrees for temp. sensors). ***Default*** 1750.

131 A1.rE. Alarm 1 Reset

Alarm 1 contact reset type (always automatic if AL.1.F. = c. Aux).

- A. rES. Automatic reset (***Default***)
- M. rES. Manual reset (manual reset by keyboard or by digital input)
- M.rES.S. Stored manual reset (keeps the output status also after a power failure)
- A. rES.t. Automatic reset with timed activation. The alarm remains active for the time set on the parameter 134 A1.dE., even if the conditions generating it are missing. To be able to act again, the alarm conditions must disappear.

132 A1.SE. Alarm 1 State Error

Alarm 1 output status in case of error.

- oPEN Open contact. ***Default***
- cLoSE Closed contact.

133 A1.Ld. Alarm 1 Led

Defines the status of the led **A1** in correspondence of the relevant output

- o.c. ON with open contact or DO switched off.
- c.c. ON with closed contact or DO switched on. (***Default***)

134 A1.dE. Alarm 1 Delay

Alarm 1 Delay.

-60:00..60:00 mm:ss (hh:mm if AL.1.F. = c. Au*). ***Default***: 00:00.

Negative value: delay when exit alarm status.

Positive value: delay when enter alarm status.

135 A1.SP. Alarm 1 Setpoint Protection

Allows or not to change the alarm 1 setpoint

- FREE Editable by the user (***Default***)
- Loc* Protected
- HidE Protected and not visualized

136 A.LLb. Alarm 1 Label

Selects the message displayed in case of alarm 1 intervention.

- d.SAb. Disabled. (***Default***) 0.
- Lb. 01 Message 1 (see table on paragraph *13.1*)
- ..
- Lb. 16 Message 16 (see table on paragraph *13.1*)
- uSER.L. Custom message (modifiable by the user through the App or via modbus)

GROUP H - AL. 2 - Alarm 2

141 AL2F. Alarm 2 Function

Alarm 2 selection.

- d.SAb. Disabled (***Default***)
- Ab.uP.A. Absolute Upper Activation. Absolute referred to the process, active over
- Ab.Lo.A. Absolute Lower Activation. Absolute referred to the process, active under
- bAnd Band alarm (command setpoint ± alarm setpoint)
- uP.dEv. Upper Deviation alarm
- Lo.dEv. Lower Deviation alarm
- Ab.c.u.A. Absolute Command Upper Activation. Absolute alarm referred to the command setpoint, active over
- Ab.c.L.A. Absolute Command Lower Activation. Absolute alarm referred to the command setpoint, active under
- RUN Status alarm (active in RUN/START)
- cooL Cold actuator auxiliary (Cold action in double loop)
- PRb.ER. Probe error. Alarm active in case of sensor rupture.
- tMR.1 Related to timer 1
- tMR.2 Related to timer 2
- tMR.1.2 Related to both timers
- REM. Remote. The alarm is enabled by the word 1236
- d.i. 1 Digital Input 1. Active when digital input 1 is active.
- d.i. 2 Digital Input 2. Active when digital input 2 is active.
- H.b.A. Heater Break Alarm and Overcurrent Alarm
- A.bAnd Asymmetric band alarm (command setpoint + alarm setpoint 2 H and command setpoint - alarm setpoint 2 L).
- c. Au* Auxiliary for job distribution on the command output. It cyclically replaces the command output for the time set on the parameter 152 A.2.dE.. If A.2.dE. = 0, it is activated parallel to the command output. It does not work in case of valve control and can only be activated on an alarm if A.2.dE. is different from 0.

144 A2S.o. Alarm 2 State Output

Alarm 2 output contact and intervention type.

- N.o. St. (N.O. Start) Normally open, active at start (***Default***)
- N.c. St. (N.C. Start) Normally closed, active at start
- N.o. tH. (N.O. Threshold) Normally open, active on reaching alarm[2 p. 43]
- N.c. tH. (N.C. Threshold) Normally closed, active on reaching alarm[2 p. 43]
- N.o.tH.V. (N.O. Threshold Variation) disabled after changing control setpoint[3 p. 43]
- N.c.tH.V. (N.C. Threshold Variation) disabled after changing control setpoint[3 p. 43]

146 A.2HY. Alarm 2 Hysteresis

Alarm 2 hysteresis

-9999..+9999 [digit[1 p. 43]] (degrees for temp. sensors). ***Default*** 0.5.

147 A2LL. Alarm 2 Lower Limit

Lower limit selectable for the alarm 2 setpoint.

-9999..+30000 [digit[1 p. 43]] (degrees for temp. sensors). ***Default*** 0.

148 A2.uL. Alarm 2 Upper Limit

Upper limit selectable for the alarm 2 setpoint
-9999..+30000 [digit[1 p. 43]] (degrees for temp. sensors). ***Default*** 1750.

149 A2.rE. Alarm 2 Reset

Alarm 2 contact reset type (always automatic if AL.2.F. = c. Au).

- A. rES. Automatic reset (***Default***)
- M. rES. Manual reset (manual reset by keyboard or by digital input)
- M.rES.S. Stored manual reset (keeps the output status also after a power failure)
- A. rES.t. Automatic reset with timed activation. The alarm remains active for the time set on the parameter 152 A.2.dE., even if the conditions generating it are missing. To be able to act again, the alarm conditions must disappear.

150 A2S.E. Alarm 2 State Error

Alarm 2 output status in case of error

If the alarm output is relay

- oPEN Contact or open valve. ***Default***
- cLoSE Contact or closed valve.

If the alarm output is digital (SSR):

- oFF Digital output OFF. ***Default***
- oN Digital output ON.

151 A2Ld. Alarm 2 Led

Defines the status of the led **A2** in correspondence of the relevant output.

- o.c. ON with open contact or DO switched off.
- c.c. ON with closed contact or DO switched on. (***Default***)

152 A.2.dE. Alarm 2 Delay

Alarm 2 Delay. -60:00..60:00 mm:ss (hh:mm if AL.2.F. = c. Au). ***Default***: 00:00.
Negative value: delay when exit alarm status.
Positive value: delay when enter alarm status

153 A2S.P. Alarm 2 Setpoint Protection

Allows or not to change the alarm 2 setpoint

- FrEE Editable by the user (***Default***)
- Loc Protected
- HidE Protected and not visualized

154 A2Lb. Alarm 2 Label

Selects the message displayed in case of alarm 2 intervention.

- diSAb. Disabled. (***Default***) 0.
- Lb. 01 Message 1 (see table on paragraph *13.1*)
- ..
- Lb. 20 Message 20 (see table on paragraph *13.1*)
- uSER.L. Custom message (modifiable by the user through the App or via modbus)

GROUP I - AL. 3 - Alarm 3

159 AL3.F. Alarm 3 Function

162 A3S.o. Alarm 3 State Output

163 A3o.t. Alarm 3 Output Type

164 A3HY. Alarm 3 Hysteresis

165 A3.LL Alarm 3 Lower Limit

166 A3.uL. Alarm 3 Upper Limit

167	A3.rE.	Alarm 3 Reset
168	A3S.E.	Alarm 3 State Error
169	A3.Ld.	Alarm 3 Led
170	A3.dE.	Alarm 3 Delay
171	A3S.P.	Alarm 3 Setpoint Protection
172	A3.Lb.	Alarm 3 Label

GROUP J - AL. 4 - Alarm 4

177	AL4.F.	Alarm 4 Function
180	A4S.o.	Alarm 4 State Output
181	A4.o.t.	Alarm 4 Output Type
182	A4.HY.	Alarm 4 Hysteresis
183	A4.LL	Alarm 4 Lower Limit
184	A4.uL.	Alarm 4 Upper Limit
185	A4.rE.	Alarm 4 Reset
186	A4S.E.	Alarm 4 State Error
188	A4.dE.	Alarm 4 Delay
189	A4S.P.	Alarm 4 Setpoint Protection
190	A4.Lb.	Alarm 4 Label

GROUP K - AL. 5 - Allarme 5

195	AL5.F.	Alarm 5 Function
198	A5S.o.	Alarm 5 State Output
199	A5.o.t.	Alarm 5 Output Type
200	A5.HY.	Alarm 5 Hysteresis
201	A5.LL.	Alarm 5 Lower Limit
202	A5.uL.	Alarm 5 Upper Limit
203	A5.rE.	Alarm 5 Reset
204	A5S.E.	Alarm 5 State Error
206	A5.dE.	Alarm 5 Delay
207	A5S.P.	Alarm 5 Setpoint Protection
208	A5.Lb.	Alarm 5 Label

GROUP L - rES - Reserved

213÷230 Reserved Parameters - Group L

GROUP M - d.i. 1 - Digital input 1

231 d.i.1F. Digital Input 1 Function

Digital input 1 functioning.

- dISAb. Disabled (***Default***)
- 2t. SW. 2 Setpoints Switch
- 2t.SW.i. 2 Setpoints Switch Impulsive
- 3t.SW.i. 3 Setpoints Switch Impulsive
- 4t.SW.i. 4 Setpoints Switch Impulsive
- St./St. Start / Stop
- RUN Run
- HoLd Lock conversion (stop all conversions and display values)
- tUNE Performing manual tune
- Au.MAn.i. Automatic / Manual Impulse (if enabled on parameter 48 or 67)
- Au.MAn.c. Automatic / Manual Contact (if enabled on parameter 48 or 67)
- Act.tY. Action Type. Cooling regulat. if D.I. is active, otherwise heating reg.
- A.i. 0 Analogue Input 0. Set AI to zero
- M. RES. Manual reset. Reset the outputs if selected as manual reset.
- t.1.RUN Timer 1 run. The timer 1 count with activated D.I.
- t.1. S.E. Timer 1 Start End. D.I. starts and stops the timer 1(impulsive)
- t.1.StR. Timer 1 Start. D.I. starts the timer 1(impulsive)
- t.1.End Timer 1 End. D.I. stops the timer 1(impulsive)
- t.2.RUN Timer 2 run. The timer 2 count with activated D.I.
- t.2. S.E. Timer 2 Start End. D.I. starts and stops the timer 2(impulsive)
- t.2.StR. Timer 2 Start. D.I. starts the timer 2(impulsive)
- t.2.End Timer 2 End. D.I. stops the timer 2(impulsive)
- Lo.cFG. Lock configuration and setpoints.
- uP.KEY Simulates the functioning of up key.
- doWN.K. Simulates the functioning of down key.
- FNc. K. Simulates the functioning of fnd key.
- SEt. K. Simulates the functioning of set key.
- Ext.AL. External alarm. The controller goes on STOP and the alarms will be disabled. The controller does not return to START automatically: for this operation, the user's intervention is required.

232 d.i.1c. Digital Input 1 Contact

Defines the resting contact of the digital input 1.

- N.oPEN Normally open (***Default***)
- N.cLoS. Normally closed

GROUP N - d.i. 2 - Digital input 2

239 d.i.2F. Digital Input 2 Function

Digital input 2 functioning.

- dISAb. Disabled (***Default***)
- 2t. SW. 2 Setpoints Switch
- 2t.SW.i. 2 Setpoints Switch Impulsive
- 3t.SW.i. 3 Setpoints Switch Impulsive
- 4t.SW.i. 4 Setpoints Switch Impulsive
- St./St. Start / Stop
- RUN Run
- HoLd Lock conversion (stop all conversions and display values)
- tUNE Performing manual tune
- Au.MAn.i. Automatic / Manual Impulse (if enabled on parameter 48 or 67)
- Au.MAn.c. Automatic / Manual Contact (if enabled on parameter 48 or 67)

rEt.tY.	Action Type. Cooling regulation if D.I. is active, otherwise heating reg.
A.I. 0	Analogue Input 0. Set AI to zero
M. rES.	Manual reset. Reset the outputs if selected as manual reset.
t.1.run	Timer 1 run. The timer 1 count with activated D.I.
t.1. S.E.	Timer 1 Start End. D.I. starts and stops the timer 1(impulsive)
t.1.Str.	Timer 1 Start. D.I. starts the timer 1(impulsive)
t.1.End	Timer 1 End. D.I. stops the timer 1(impulsive)
t.2.run	Timer 2 run. The timer 2 count with activated D.I.
t.2. S.E.	Timer 2 Start End. D.I. starts and stops the timer 2(impulsive)
t.2.Str.	Timer 2 Start. D.I. starts the timer 2(impulsive)
t.2.End	Timer 2 End. D.I. stops the timer 2(impulsive)
Lo.cFG.	Lock configuration and setpoints.
uP.KEY	Simulates the functioning of up key.
doWN.K.	Simulates the functioning of down key.
FNc. K.	Simulates the functioning of fnc key.
SEt. K.	Simulates the functioning of set key.
Ext.AL.	External alarm. The controller goes on STOP and the alarms will be disabled. The controller does not return to START automatically: for this operation, the user's intervention is required.

240 d.i2.c. Digital Input 2 Contact

Defines the resting contact of the digital input 2.

N.oPEN	Normally open (***Default***)
N.cLoS.	Normally closed

GROUP O - rES. - Reserved

247÷254 Reserved Parameters - Group O

GROUP P - rES. - Reserved

255÷262 Reserved Parameters - Group P

GROUP Q - SFt.S - Soft-start and mini cycle

263 Pr.cY. Pre-programmed Cycle

Enables special functionings.

diSAb.	Disabled (***Default***)
ENAb.	Enabled (all remote setpoint functions are inhibited)

264 SS.tY. Soft-Start Type

Enables and selects the soft-start type

diSAb.	Disabled (***Default***)
GRAd.	Gradient
PERc.	Percentage (only with pre-programmed cycle disabled)

266 SS.Gr. Soft-Start Gradient

Rising/falling gradient for soft-start and pre-programmed cycle.

0..20000 Digit/hour (degrees.tenths/hour if temperature). (***Default***: 100.0)

267 SS.PE. Soft-Start Percentage

Output percentage during soft-start function.

0..100%. (**Default**: 50%)

268 SS.tH. Soft-Start Threshold

Threshold under which the soft-start percentage function is activated, at starting.

-9999...30000 [digit[1 p. 43]] (degrees.tenths for temp. sensors) (***Default***: 1000)

269 SS.t1. Soft-Start Time

Max. Softstart duration: if the processs will not reach the threshold selected on par. SS.tH. within the selected time, the controller starts to regulate on setpoint.

00:00 Disabled

00:01-24:00 hh:mm (***Default***: 00:15)

270 MA.t1. Maintenance Time

Maintenance time for pre-programmed cycle.

00:00-24:00 hh.mm (***Default***: 00:00)

271 FA.Gr. Falling Gradient

Falling gradient for pre-programmed cycle.

0 Disabled (***Default***)

1..10000 Digit/hour[1 p. 43] (degrees.tenths/hour if temperature)

272 dE.St. Delayed Start

To set the initial waiting time for the delayed start of the setting or cycle, even in case of a blackout. The elapsed time is saved every 10 minutes.

0 Initial waiting time disabled: the controller starts immediately (***Default***)

00:01-24:00 hh.mm Initial waiting time enabled.

GROUP R - dISP. - Display and interface

277 u.FLt Visualization Filter

dISAb. Disabled

PtcHF Pitchfork filter (***Default***)

F1.ord. First Order

F1.oR.P. First Order with Pitchfork

2 SA.M. 2 Samples Mean

....n Samples Mean

10.SA.M. 10 Samples Mean

278 u1.d2 Visualization Display 2

Selects visualization on display 2.

c.1.SPV Command 1 setpoint (***Default***)

ou.PE.1 Percentage of command output 1

AMPER. Ampere from current transformer

279 tMo.d. Timeout Display

Determines the display timeout

dISAb. Disabled. Display always ON (***Default***)

15 S 15 seconds

1 M.N 1 minute

5 M.N 5 minutes

10M.N 10 minutes

30M.N 30 minutes

1 H 1 hour

280 tMo.S. Timeout Selection

Selects which display is switched off when Display Timout expires

dISP.1 Display 1

dISP.2 Display 2 (***Default***)

dSP.1.2 Display 1 and 2

d.1.2.Ld. Display 1, 2 and led

281 u.MP.c. User Menu Pre-Programmed Cycle

Allows to modify rising/falling gradient and rentention time form the user menu, in pre-programmed cycle functioning. To access parameter modification, press SET.

dISAb. Disabled (***Default***)

RIS.GR. Only rising gradient

MA.Et. Only retention time
Ri.G.M.t. Rising gradient and retention time
FAL.GR Only falling gradient
Ri.FA.G. Rising and falling gradient
FA.G.M.t. Falling gradient and retention time
R.F.G.M.t. Rising gradient, retention time and falling gradient

282 u.out Voltage Output

Selects the voltage on the sensors power terminals and of the digital outputs (SSR).

12 V 12 volt (***Default***)
24 V 24 volt

283 Scl.t. Scrolling Time

Select the duration for the visualization of the user menu data, before returning to the default page.

3 S 3 seconds
5 S 5 seconds (***Default***)
10 S 10 seconds
30 S 30 seconds
1 MIN 1 minutes
5 MIN 5 minutes
10MIN 10 minutes
MAN.Sc. Manual scroll

284 d.SPF. Display Special Functions

diSAb. Special functions disabled
SWAP Shows the setpoint on display 1 and the process on display 2 (only if Par. 278 u i.d.2 set on c.ISPu)

285 nFc.L. NFC Lock

diSAb. NFC lock disabled: NFC accessible.
ENAb. NFC lock enabled: NFC not accessible.

286 S.F.S.F. Set Key Special Functions

Assign special functions to the SET button. To execute the function the button must be pressed for 1 second.

diSAb. No special function linked to the SET key. (***Default***)
St./St. Start/Stop. Pressing SET key the controller switches from Start to Stop and viceversa. Status of the controller, upon power-up, depends on parameter ini.s.
2t.SPi. 2 Threshold Command Setpoint Switch. The controller changes the regulation setpoint alternating between Set1 and Set2
3t.SPi. 3 Threshold Command Setpoint Switch. The controller changes the regulation setpoint alternating between Set1, Set2 and Set3
4t.SPi. 4 Threshold Command Setpoint Switch. The controller changes the regulation setpoint alternating between Set1, Set2, Set3 and Set4
Ai. 0 Analogue Input 0. Set analogue input to zero (zero tare)

GROUP S - ct - Current Transformer

287 ct F. Current Transformer Function

Enables the C.T. input and selects the net frequency

diSAb. Disabled (***Default***)
50 HZ 50 Hz
60 HZ 60 Hz

288 ct u. Current Transformer Value

Selects the amperometric transformer full-scale

1..200 Ampere (***Default***: 50)

290 Hb.A.t. Heater Break Alarm Threshold

Heater Break Alarm activation threshold

0 Alarm disabled. (***Default***:)
0.1-200.0 Ampere.

291 oCu.t. Overcurrent Alarm Threshold

Overcurrent alarm threshold.

0	Alarm disabled. (***Default***)
0.1-200.0	Ampere

292 H.b.A.d. Heater Break Alarm Delay

Heater Break Alarm and overcurrent alarm activation delay.

00:00-60:00	mm:ss (***Default***: 01:00)

GROUP T - A.o. 1 - Retransmission 1

298 rtM.1 Retransmission 1

Retransmission for AO1 output. Parameters 300 and 301 define lower and upper limit of the operating scale.

diSAb.	Disabled (***Default***)
c.1.SPV	Command 1 setpoint
AL. 1	Alarm 1 setpoint
AL. 2	Alarm 2 setpoint
Md.buS	Retransmits the value written on word 1241
A.IN.1	Value read on input AI1
AMPER.	Ampere from current transformer

299 r.ttY. Retransmission 1 Type

Selects the retransmission type for AO1

0.10 V	Output 0...10 V.
4.20MA	Output 4...20 mA. ***Default***

300 r.1 LL. Retransmission 1 Lower Limit

Retransmission 1 lower limit range (value related to 10 V or 0/4 mA).

-9999..+30000 [digit[1 p. 43]] (degrees if temperature), ***Default***: 0.

301 r.1 uL. Retransmission 1 Upper Limit

Retransmission 1 upper limit range 2 (value related to 10 V or 20 mA).

-9999..+30000 [digit[1 p. 43]] (degrees if temperature), ***Default***: 1000.

302 r.tS.E. Retransmission 1 State Error

Determines retransmission 1 value in case of error or anomaly

If the retransmission output is 0-10V:

0 V	0 V. ***Default***
10 V	10 V.

If the retransmission output is 0-20 mA or 4-20 mA:

0 MA	0 mA. ***Default***
4 MA	4 mA.
20 MA	20 mA.
21.5MA	21.5 mA.

GROUP U - rES. - Reserved

308÷317 Reserved Parameters - Group U

GROUP V - SEr. - Serial

318 SL.Ad. Slave Address

Selects slave address for serial communication.

1...254. ***Default***: 247.

319 bd.rt. Baud Rate

Selects baudrate for serial communication

1.2 K	1200 bit/s
2.4 K	2400 bit/s
4.8 K	4800 bit/s
9.6 K	9600 bit/s
19.2 K	19200 bit/s (***Default***)
28.8 K	28800 bit/s
38.4 K	38400 bit/s
57.6 K	57600 bit/s
115.2K	115200 bit/s

320 S.P.P. Serial Port Parameters

Selects the format for the modbus RTU serial communication.

8-N-1	8 bit, no parity, 1 stop bit (***Default***)
8-E-1	8 bit, even parity, 1 stop bit
8-o-1	8 bit, odd parity, 1 stop bit
8-N-2	8 bit, no parity, 2 stop bit
8-E-2	8 bit, even parity, 2 stop bit
8-o-2	8 bit, odd parity, 2 stop bit

321 SE.dE. Serial Delay

Selects serial delay

0...100 ms. **Default**: 5 ms.

322 oFF.L. Off Line

Selects the off-line tine. If there is no serial communication during the selected time, the controller switches-off the command output.

0	Offline disabled (***Default***)
0.1-600.0	tenths of second.

GROUP W - t.mr - Timer

328 tMr.1 Timer 1

Enabling Timer 1

d.SAb.	Disabled (***Default***)
ENAb.	Enabled
EN.StA.	Enabled and active at start

329 t.b.t.1 Time Base Timer 1

Selects time base for timer 1

MM.SS	minutes.seconds (***Default***)
HH.MM	hours.minutes

330 A.tM.1 Action Timer 1

Select the type of the action executed by the timer 1 to be related to an alarm..

StArt	Start. Active during timer counting (***Default***)
End	End. Active at timer expiry
WArN.	Warning. Active 5" before the timer expiry

331 tMr.2 Timer 2

Enabling Timer 2

d.SAb.	Disabled (***Default***)
ENAb.	Enabled
EN.StA.	Enabled and active at start

332 t.b.t.2 Time Base Timer 2

Selects time base for timer 2

- MM.SS minutes.seconds (***Default***)
- HH.MM hours.minutes

333 A.tM.2 Action Timer 2

Select the type of the action executed by the timer 2 to be related to an alarm.

- StArt Start. Active during timer counting (***Default***)
- End End. Active at timer expiry.
- WArN. Warning. Active 5" before the timer expiry.

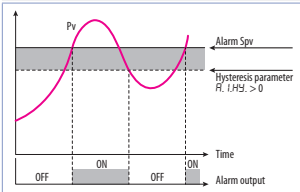
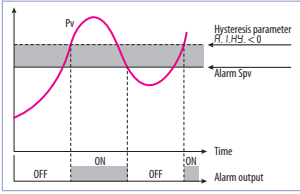
334 tMr.S. Timers Sequence

Select the correlation between the two timers.

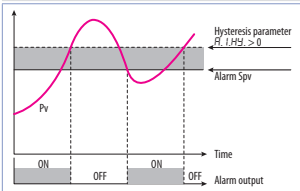
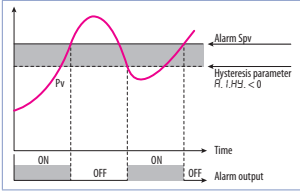
- SinGL. Singles. Timers work independently (***Default***)
- SEQuE. Sequential. When timer 1 ends, timer 2 starts.
- LooP Loop. When a timer ends, another starts.

13 Alarm Intervention Modes

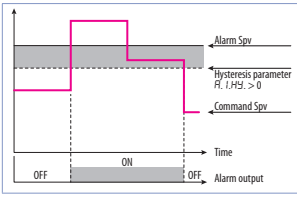
13.a Absolute or threshold alarm active over (par. 123 AL.1F. = Ab.uPA)

	Absolute alarm active over. Hysteresis value greater than "0" (Par. 128 A.1HY > 0).
	Absolute alarm active over. Hysteresis value lower than "0" (Par. 128 A.1HY < 0).

13.b Absolute or threshold alarm active below (par. 123 AL.1F. = Ab.uPA)

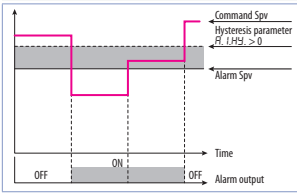
	Absolute alarm active below. Hysteresis value greater than "0" (Par. 128 A.1HY > 0).
	Absolute alarm active below. Hysteresis value lower than "0" (Par. 128 A.1HY < 0).

13.c Absolute or threshold alarm referred to command setpoint active over (par. 123 AL.1F. = Ab.c.u.A)



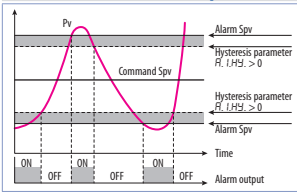
Absolute alarm referred to command setpoint active over. Hysteresis value greater than “0” (Par. 128 A. 1.HY > 0).

13.d Absolute or threshold alarm referred to command setpoint active below (par. 123 AL.1F. = Ab.c.L.A)

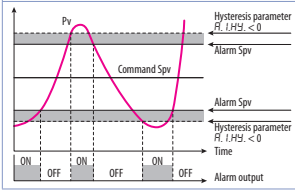


Absolute alarm referred to command setpoint active below. Hysteresis value greater than “0” (Par. 128 A. 1.HY > 0).

13.e Band alarm (par. 123 AL.1F. = bAnd)

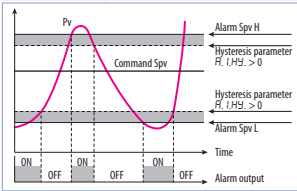


Band alarm hysteresis value greater than “0” (Par. 128 A. 1.HY > 0).

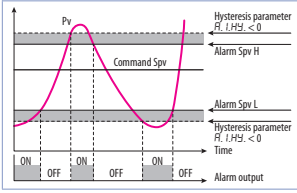


Band alarm hysteresis value lower than “0” (Par. 128 A. 1.HY < 0).

13.f Asymmetric band alarm (par. 123 AL.1F. = A.bAnd)

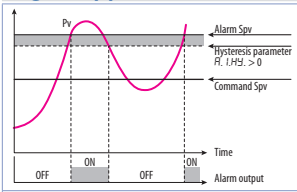


Asymmetric band alarm with hysteresis value greater than “0” (Par. 128 A. 1.HY > 0).



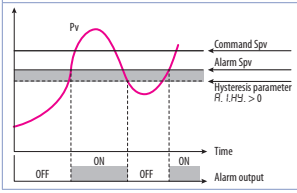
Asymmetric band alarm with hysteresis value lower than “0” (Par. 128 A. 1.HY < 0).

13.g Upper deviation alarm (par. 123 AL.1F. = uP.dEu.)



Upper deviation alarm value of alarm setpoint greater than "0" and hysteresis value greater than "0" (Par.128 A.1.HY. > 0).

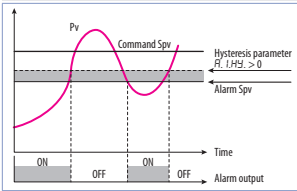
NB: with hysteresis value less than "0" (A.1.HY. < 0) the dotted line moves under the alarm setpoint.



Upper deviation alarm value of alarm setpoint less than "0" and hysteresis value greater than "0" (Par.128 A.1.HY. > 0).

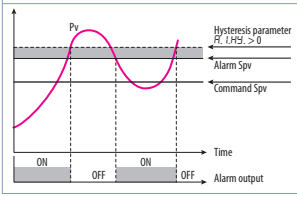
NB: with hysteresis value less than "0" (A.1.HY. < 0) the dotted line moves under the alarm setpoint.

13.h Lower deviation alarm (par. 123 AL.1F. = Lo.dEu.)



Lower deviation alarm value of alarm setpoint greater than "0" and hysteresis value greater than "0" (Par.128 A.1.HY. > 0).

NB: with hysteresis value less than "0" (A.1.HY. < 0) the dotted line moves under the alarm setpoint.



Lower deviation alarm value of alarm setpoint less than "0" and hysteresis value greater than "0" (Par.128 A.1.HY. > 0).

NB: with hysteresis value less than "0" (A.1.HY. < 0) the dotted line moves under the alarm setpoint.

13.1 Alarms label

By setting a value from 1 to 20 on the parameters 136 A.1.Lb., 154 A.2.Lb., 172 A.3.Lb., 190 A.4.Lb., 208 A.5.Lb., the display 2 will show one of the following messages in case of alarm:

Selection	Message displayed in the alarm event
1	alarm 1
2	alarm 2
3	alarm 3
4	alarm 4
5	alarm 5
6	alarm 6
7	open door
8	closed door
9	light on
10	light off

Selection	Message displayed in the alarm event
11	warning
12	waiting
13	high limit
14	low limit
15	external alarm
16	temperature alarm
17	pressure alarm
18	fan command
19	cooling
20	operating

By setting 0, no message will be displayed. While setting 21, the user will have up to 23 characters available to customize his message via the *"PROGRAMADOR NFC"* App or via modbus.

14 Fault reporting table

If installation malfunctions, the controller switches off the regulation output and reports the anomaly noticed. For example, controller will report failure of a connected thermocouple visualizing E-05 (flashing) flashing on display. For other signals see table below.

	Cause	What to do
E-02 SyStEM Error	Cold junction temperature sensor failure or environment temperature out of range	Call assistance
E-04 EEProM Error	Incorrect configuration data. Possible loss of instrument calibration	Verify that configuration parameters are correct.
E-05 ProbE 1 Error	Sensor connected to AI1 broken or temperature out of range	Control connection with probes and their integrity.
E-06 ProbE 2 Error	Sensor connected to AI2 broken or temperature out of range	Control connection with probes and their integrity.
E-08 SyStEM Error	Missing calibration	Call assistance
E-80 rFid Error	Tag rfid malfunctioning	Call assistance

Notes / Updates

1 Display of decimal point depends on setting of parameter SEn.1 and parameter d.P. 2

2 On activation, the output is inhibited if the controller is in alarm mode. Activates only if alarm condition reappers, after that it was restored.

3 Changing the control setpoint, the alarm will be disabled. It will stay disabled as long as the parameters that created it are active. It only works with deviation alarms, band alarms and absolute alarms (referring to the control setpoint).

Table of configuration parameters

GROUP A - A.in.1 - Analogue input 1			
1	SEn.1	Sensor AI1	23
2	d.P. 1	Decimal Point 1	24
3	dEGr.	Degree	24
4	LL.i.1	Lower Linear Input AI1	24
5	uL.i.1	Upper Linear Input AI1	24
6	P.uA.1	Potentiometer Value AI1	24
7	i.oL.1	Linear Input over Limits AI1	24
8	o.cA.1	Offset Calibration AI1	24
9	G.cA.1	Gain Calibration AI1	24
10	Ltc.1	Latch-On AI1	24
11	c.FL.1	Conversion Filter AI1	24
12	c.Fr.1	Conversion Frequency AI1	24
13	L.c.E.1	Lower Current Error 1	25
14÷17		Reserved Parameters - Group A	25
GROUP B - rES. - Reserved			
18÷34		Reserved Parameters - Group B	25

Read carefully the safety guidelines and programming instructions contained in this manual before using/ connecting the device.

RoHS Compliant

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