Pixsys®
ELECTRONICS

ATR 401

Controller

User manual

Table of contents

Introduction

Thanks for choosing a Pixsys controller.
The ATR401 integrates in a single device all options for sensors reading and actuators control, beside extended range power supply 24…230 Vac/Vdc. Thanks to dual universal analogue input and outputs configurable as relay or SSR, the user or the retailer can reduce stock needs. The series includes also a model with serial communication RS485/ Modbus-RTU and analogue output 0-10 V, 0/4-20 mA.
The possibility to copy parameterization is simplified by the Memory Cards with internal battery that do not require power supply for the controller.

1 Safety standards

Carefully read the instructions and safety measures in this manual before using the device. Disconnect power before performing any interventions on the electrical connections or hardware settings.
Only qualified personnel may use/perform maintenance in full respect of the technical data and declared environmental conditions.
Do not dispose of electrical appliances together with household waste.
In compliance with the European Directive 2002/96/EC, waste electrical equipment must be collected separately for eco-compatible reuse or recycling.

2 Model Identification

ATR401 series includes five versions.
Looking at the following table it is possible to find the required model.

Power supply 24…230 Vac/Vdc +/-15% 50/60 Hz – 5,5 VA	
ATR401-22ABC	2 Analogue inputs + 2 Relays 8 A + 1 SSR + D.I.
ATR401-23ABC	2 Analogue inputs + 3 Relays 8 A + 1 SSR + D.I.
ATR401-24ABC	2 Analogue inputs + 4 Relays 8 A + 1 SSR + D.I.
ATR401-22ABC-T	2 Analogue inputs + 2 Relays 8 A + 1 SSR 1 Output V / mA + RS485
ATR401-22ABC-D	2 Analogue inputs + 2 Relays 8 A + 1 SSR 1 Output V / mA + D.I.

3 Technical data

3.1 General data

Indicators	4 display 0,40 inches - 4 display 0,30 inches
Operating temperature	Temperature 0..45 °C - Humidity 35..95 uR%
Sealing	Front IP54 (IP65 with gasket), box IP30 , terminal blocks IP20
Material	Box: Noryl UL94V1 self-exstinguish Front: PC ABS UL94V0 self-exstinguish
Weight	Approx 350 g

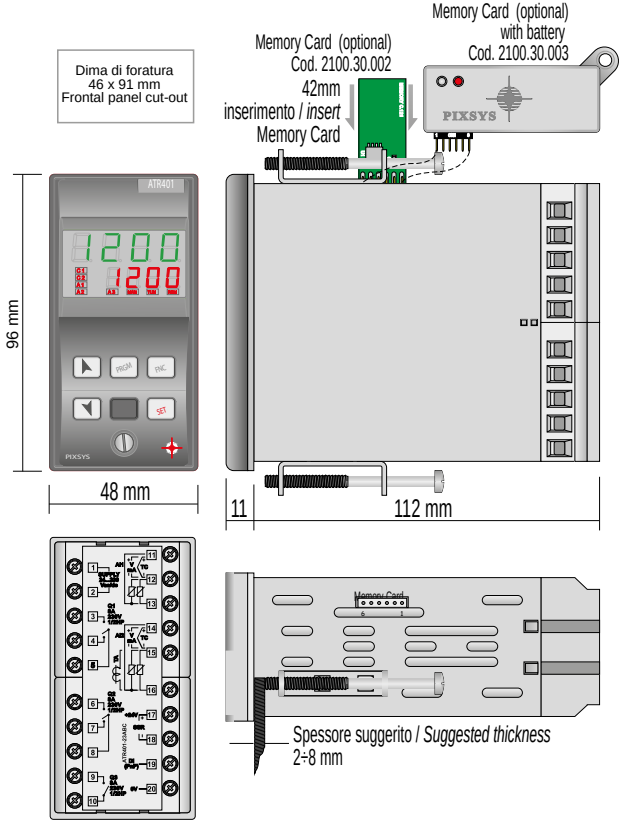
3.2 Hardware data

Analogue input	**AI1 – AI2**: Configurable via software. **Thermocouples:** type K, S, R, J. Automatic compensation of cold junction from 0 … 50°C. **Thermoresistances**: PT100, PT500, PT1000, Ni100, PTC 1K, NTC 10K (β 3435K) **Input V/mA**: 0-10 V, 0-20 o 4-20 mA, 0-40 mV. **Input Potentiometer**: 6 KΩ, 150 KΩ. **ONLY AI2 input T.A.**: 50 mA.	Tolerance (25 °C) +/-0.2% ±1 digit (full scale) for thermocouple, thermoresistance and V / mA. Cold junction accuracy 0.1 °C/°C. **Impedance**: **0-10 V**: Ri>110 KΩ **0-20 mA**: Ri<5 Ω **4-20 mA**: Ri<5 Ω **0-40 mV**: Ri>1 MΩ
Relay outputs	Configurable as control and alarm output.	Contacts: 8 A - 250 V~ for resistive charges.
SSR output	Configurable as control and alarm output.	24 V/25 mA.
Analogue output	Configurable as control output, alarm, retransmission of process or setpoint.	Configurable: **0-10 V** 9500 points +/-0.2% (full scale) **0-20 mA** 7500 points +/-0.2% (full scale) **4-20 mA** 6000 points +/-0.2% (full scale)
Power supply	Extended range 24..230 Vac/Vdc ±15% 50/60 Hz.	Consumption: 5.5 VA.

3.3 Software data

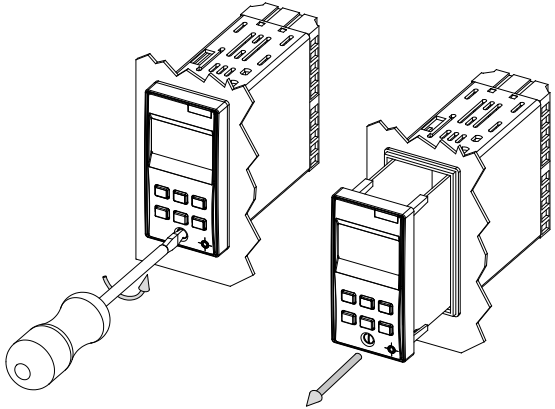
Regulation algorithms	ON - OFF with hysteresis. P, P.I., P.I.D., P.D. proportional time.
Proportional band	0...9999 °C o °F
Integral time	0,0...999,9 sec. (0 excludes integral function)
Derivative time	0,0...999,9 sec. (0 excludes derivative function)
Controller functions	Manual or automatic tuning, selectable alarms, protection of control and alarm setpoints.

4 Dimensions and Installation



5 Electronics Removal

To configure internal Jumpers, remove the electronics by twisting off the screw on front panel.



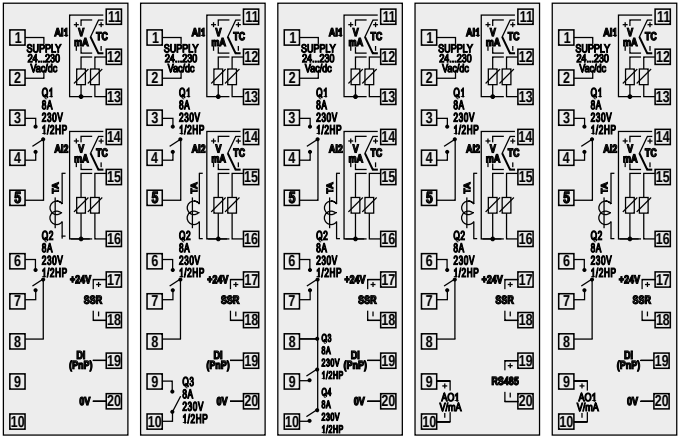
Disconnect the device from power supply before starting to configurate or service it.

5.1 Electrical wirings

This device 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:

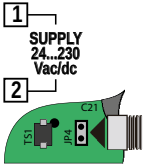
- Separate control line from power wires.
- Avoid proximity of remote control switches, electromagnetic contactors, powerful engines and use specific filters.
- Avoid proximity of power groups, especially those with phase control.
- It is strongly recommended to install adequate mains filter on power supply of the machine where the controller is installed, particularly if supplied 230Vac. 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.

5.2 Wiring diagram



ATR401-22ABC ATR401-23ABC ATR401-24ABC ATR401-22ABC-T ATR401-22ABC-D

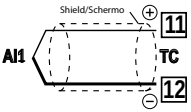
5.2.a Power



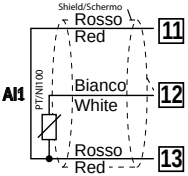
Switching power supply with extended range; 2 selections:
- 24 Vac/dc ±15% with Jumper insertion JP4;
- 115…230 Vac/dc ±15% without Jumper JP4;

50/60 Hz – 5,5 VA (with galvanic isolation).

5.2.b Analogue Input AI1

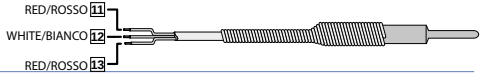


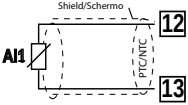
For thermocouples K, S, R, J.
- Comply with polarity.
- For possible extensions, use a compensated wires and terminals suitable for the thermocouples used.
- When shielded cable is used, it should be grounded at one side only.



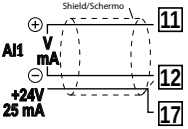
For thermoresistances PT100, NI100.

- For a three-wires connection use cables with the same diameter.
- For a **two-wires** connection short-circuit terminals 11 and 13.
- When shielded cable is used, it should be grounded at one side only.





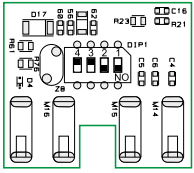
For thermoresistances NTC, PTC, PT500, PT1000 and linear potentiometers.
When shielded cable is used, it should be grounded at one side only.



For linear signals Volt / mA.

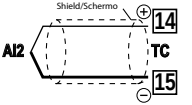
- Comply with polarity.
- When shielded cable is used, it should be grounded at one side only.

5.2.c Analogue Input AI2



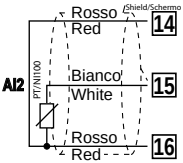
To enable the second analogue input, set the dip switches as indicated in the figure.

In this configuration input T.A. (current transformer) **is not** available.



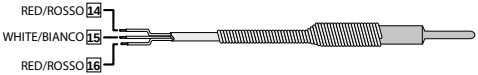
For thermocouples K, S, R, J.

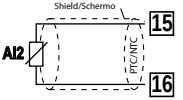
- Comply with polarity.
- For thermocouples extensions, make sure to use the correct extension/compensating cable.
- When shielded cable is used, it should be grounded at one side only.



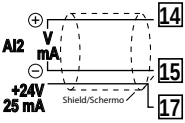
For thermoresistances PT100, NI100.

- For a three-wires connection use cables with the same diameter.
- For a **two-wires** connection short-circuit terminals 14 and 16.
- 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.



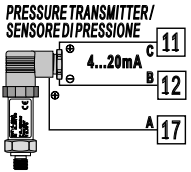
For linear signals Volt / mA.

- Comply with polarity.
- When shielded cable is used, it should be grounded at one side only.

5.2.d Examples of connection for linear input AI1

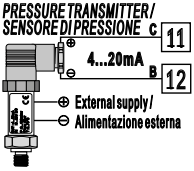
For linear signals 0..10 V.

Comply with polarity.



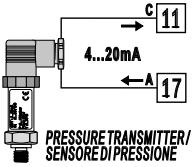
For linear signals 0/4..20 mA **with three-wires sensors**.

Comply with polarity:
C = Sensor output
B = Sensor ground
A = Sensor supply (24 Vdc / 25 mA)



For linear signals 0/4..20 mA **with external power supply** for sensor.

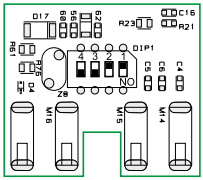
Comply with polarity:
C = Sensor output
B = Sensor ground

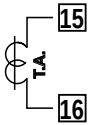


For linear signals 0/4..20 mA **with two-wires sensors**.

Comply with polarity:
C = Sensor output
A = Sensor supply (24 Vdc / 25 mA)

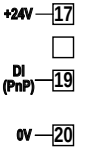
5.2.e T.A. Input (Current transformer)





To enable T.A. input, set the dip switches as indicated in the figure.
In this configuration it is possible to set t.A. on parameter 11 SEn.2.
- Input for current transformer 50mA
- Sampling time 100 ms.
- Configurable by parameters.

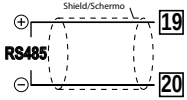
5.2.f Digital input (not available on ATR401-22ABC-T)



Digital input (par. 84 dGt. 1).

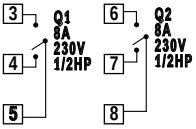
Short-circuit pin "DI" (19) and pin "+24 V" (17) to enable digital input.

5.2.g Serial input (only on ATR401-22ABC-T)



Communication RS485 Modbus RTU with galvanic isolation.

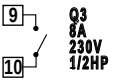
5.2.h Relay outputs Q1, Q2



Contacts capacity:
- 8 A, 250 Vac, resistive charge 10^5 operations.
- 30/3 A, 250 Vac, cosφ = 0.3, 10^5 operations.

Output Q1 operates through 2 independent relays and, for the valves management, both contacts can be opened.
NB: See the graphic below

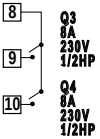
5.2.i Relay output Q3 (ATR401-23ABC)



Contacts capacity:
- 8 A, 250 Vac, resistive charge 10^5 operations.
- 30/3 A, 250 Vac, cosφ = 0.3, 10^5 operations.

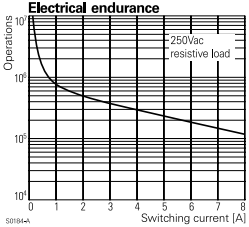
NB: See the graphic below

5.2.j Relay outputs Q3, Q4 (ATR401-24ABC)



Contacts capacity:
- 8 A, 250 Vac, resistive charge 10^5 operations.
- 30/3 A, 250 Vac, cosφ = 0.3, 10^5 operations.

NB: See the graphic below

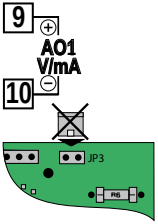


Electrical endurance Q1/Q2/Q3/Q4:
- 8 A, 250 Vac, resistive charge 105 operations.
- 30/3 A, 250 Vac, cosφ = 0.3, 105 operations.

5.2.k SSR output

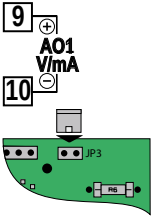
SSR Command output capacity 24 V / 25 mA.

5.2.l Output mA or Volt (ATR401-22ABC-T e ATR401-22ABC-D)



Analogue output in **mA** (galvanic isolated) configurable using parameters as command (par. 1 c.out) or retransmission of process-setpoint (par. 88 rEtr).

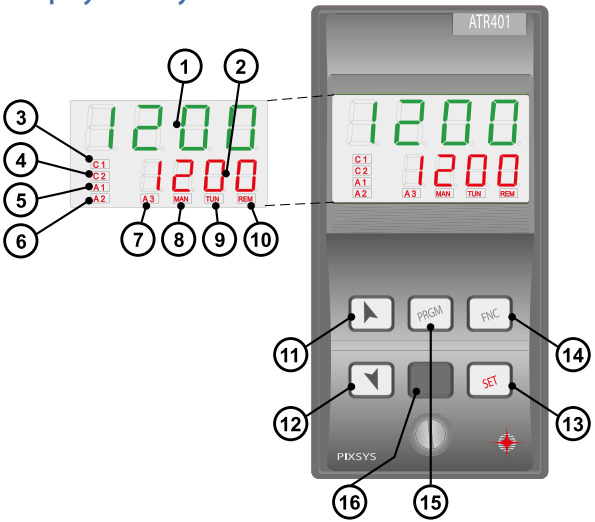
To use analogue output in mA do not place JP3.



Analogue output in **Volt** (galvanic isolated) configurable using parameters as command (par. 1 c.out) or retransmission of process-setpoint (par. 88 rEtr).

To use analogue output in Volt place JP3 as indicated in the figure.

6 Display and Key Functions



6.1 Numeric Indicators (Display)

1	123.4	Normally visualizes process. In configuration mode visualizes parameter that is being entered.
2	123.4	Normally visualizes setpoints. In configuration mode visualizes value of parameter that is being entered.

6.2 Meaning of Status Lights (Led)

3	**C1**	On when command output is active. For open / close logic: on during valve opening.
4	**C2**	For open / close logic: on during valve closing.
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	**MAN**	On when “Manual” function is active.
9	**TUN**	On when controller is executing an auto-tuning cycle.
10	**REM**	On when serial communication is in progress. Flashing when remote setpoint is enabled.

6.3 Keys

11	▲	• Increases main setpoint. • In configuration mode allows to scroll and modify parameters. • Press after **SET** key increases alarm setpoint.
12	▼	• Decreases main setpoint. • In configuration mode allows to scroll and modify parameters. • Press after **SET** key decreases alarm setpoints.
13	**SET**	• Allows to visualize command and alarm setpoints. • In configuration mode allows to access the parameter to change and confirm its modification.
14	**FNC**	• Allows to enter Tuning launch, selection automatic / manual. • In configuration mode operates as exit key (ESCAPE).
15	**PRGM**	• If pressed allows to enter configuration password. • In configuration mode assigns at selected parameter a mnemonic code or a number. • Allows to switch from local to remote setpoint (see par. 7.3).
16		• If pressed for 1 second, allows to switch from local to remote setpoint (see par. 7.2).

7 Dual input mode

Each ATR401 model is provided with two analogue inputs:
it is possible to do mathematic operations between 2 measured process values, correlating obtained result to the command or alarm outputs, or use a process as remote setpoint. It is also possible to use the controller for 2 independent control loops: one loop ON/OFF only, one loop ON/OFF - PID.

7.1 Selection of process value related to the command output and to the alarms

When second input is enabled (par.11 SEn.2 other than diS) it is possible to choose the process value to be related to command output, to alarms and to retransmission. Following options are available:

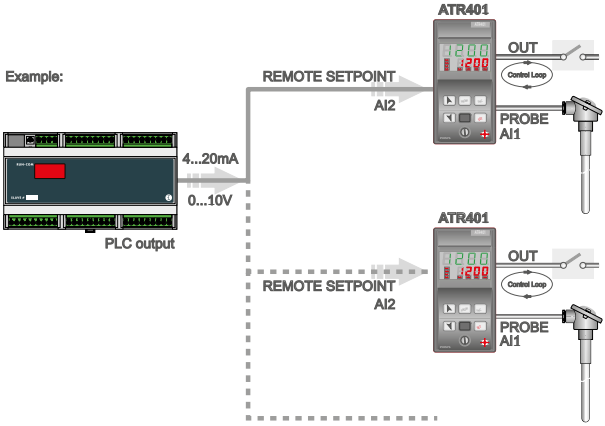
- Pro.1: Value read by input AI1;
- Pro.2: Value read by input AI2;
- MEAn: Mean between inputs AI1 and AI2;
- diFF.: Difference between inputs: AI1-AI2;
- AbS.d.: Difference between inputs as absolute value: AI1-AI2;
- SuM: Addition between inputs: AI1+AI2.
- Process related to command output must be set on parameter 19 c.Pro.
- Process related to alarms must be set on par. 38 A.1.Pr. for alarm 1, on par. 47 A.2.Pr. for alarm 2, on par. 56 A.3.Pr. for alarm 3 and on par. 65 A.4.Pr. for alarm 4.
- Value to retransmit must be set on par. 88 rEtr.

It is possible to choose the visualization for display 2 on parameter 86 u.i.d.2.

Mean, difference and addition are available only if both inputs are configured either for temperature sensors or for linear signals V / mA.

7.2 Remote setpoint by analogue input

It is possible to enable remote setpoint function setting En. on par. 20 rEM.S.



In this example the command setpoint is the value read on second analogue input AI2: if par. 19 c.Pro. is selected as Pro.1 (AI1) this becomes main process (sensor input) and AI2 becomes the setpoint.
If par. 19 c.Pro. is selected as Pro.2 (AI2) this becomes the main process (sensor input) and AI1 becomes the setpoint.
NB: Remote setpoint function works only with one of these two settings on par. 19 c.Pro.
It is possible to switch from remote to local setpoin pressing for a second.
This selection is stored even after subsequent instrument restart.
When remote setpoint is active **REM** is on, it flashes if local setpoin has been selected.

7.3 Remote setpoint by serial input

It is possible to enable remote setpoint function selecting En.SE. on par. 20 rEM.S. Remote setpoint has to be wrote on word modbus 5001 (tenth of degree if the command process is a temperature sensor).
It is possible to switch from remote to local setpoint pressing **PRGM**.
When remote setpoint is active, **REM** is on (if there is serial communication), it flashes if local setpoin has been selected.
At restarting the controller backs to remote setpoint mode (setpoint value is initialized to 0).

Decimal point setting parameter for remote setpoint input is locked and it is automatically changed when command input decimal point variates.

8 Controller Functions

8.1 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.
2	SET	Visualize alarm setpoint on display 1.	
3	▲ ▼	Value on display 2 changes.	Increases or decreases the alarm setpoint value.

8.2 Auto-Tuning

Tuning procedure to calculate regulation parameters can be manual or automatic and according to selection on parameter 28 tunE.

8.3 Manual Tuning

Manual procedure allows the user more flexibility on deciding when to update regulation parameters of P.I.D. algorithm.
Press key **FNC** until display 1 visualizes writing tunE and display 2 visualizes oFF. Pressing ▲, display 2 visualizes on. Led **TUN** switches on and procedure starts.

8.4 Automatic Tuning

Automatic tuning starts when the controller is switched-on or when setpoint value has been modified over 35%.
To avoid overshooting, the threshold where controller calculates new P.I.D. parameters is determinated by setpoint value minus "Set Deviation Tune" value (see parameter 29 S.d.tu). To interrupt Tuning keeping the P.I.D. values unchanged, press key **FNC** until display 1 visualizes writing tunE and display 2 visualizes on. Pressing ▼, display 2 visualizes oFF, led **TUN** switch off and procedure ends. Setting oncE on parameter 28 tunE autotuning procedure starts only once when instrument is switched on: after calculating P.I.D. parameters parameter 28 tunE returns to di5.

8.5 Automatic / Manual Regulation for % Output Control

This function allows to switch from automatic functioning to manual control of output porcentage. With parameter 83 Au.MA., it is possible to select two modes.

1 **First selection** (En.). Pressing key **FNC** display 1 visualizes writing P.--- on display 1, while display 2 visualizes Autu. Press key ▲ to select manual mode MAn. With ▲ and ▼ change output percentage. To return to automatic mode with the same procedure select Autu on display 2: led **MAN** switches on and operation returns to automatic mode.

2 **Second selection** (En.St.). Enable the same functioning, but with two important variants:

- In case of power failure or after a switch-off, at restart both the manual functioning and the previously fixed output percentage value will be maintained.
- If during automatic functioning there is a sensor failure, controller will automatically switch to manual mode while maintaining command output percentage unchanged as generated by P.I.D. immediately before failure.

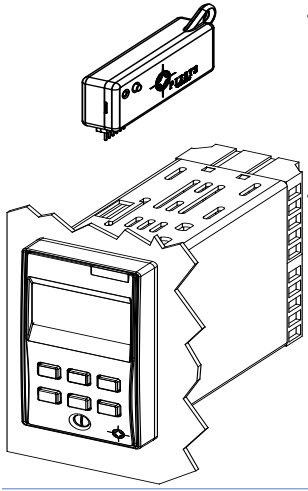
Example: an extruder will keep command output % on heating elements even in case of sensor failure.

8.6 Soft-Start

At switch-on the controller follows a rising gradient expressed in units (ex. Degree / Hour) to reach the setpoint. The chosen rising gradient in Unit / hour must be set on parameter 85 r.Gr; at **next switch-on** the controller will execute Soft-Start function. Automatic and manual Tuning function cannot be enabled if Soft-Start function is active.

8.7 Memory Card (optional)

Parameters and setpoint values can be easily copied from one controller to others using the MEMORY CARD (2100.30.003). Two modes are available:



- **With the controller connected to the power supply**:
  Insert Memory card when the controller is off. At switch-on display 1 visualizes MEMo and display 2 visualizes ---- (only if correct values are stored on Memory). Pressing ▲ display 2 visualizes LoAd. Confirm with **FNC**. Controller loads news values and restarts.

- **With the controller not connected to power supply**:
  The memory card is equipped with an internal battery with an autonomy of about 1000 operations (button battery, replaceable). Insert the memory card and press the programming button. When writing the parameters, led turns red and on completing the procedure it turns to green.
  It is possible to repeat the procedure without any particular attention. **NB**: parameters may be copied only on controllers of the same model! When trying to copy parameters on a controller with different code, the LED will remain red.

Updating Memory Card

To update the memory card values, follow the procedure described in the first method, setting display 2 to ---- so as not to load the parameters on controller[1].
Enter configuration level by password and change at least one parameter (display will start flashing). Exiting configuration mode, the settings will be automatically saved on Memory card.

[1] *If on activation the controller does not display MEMo it means no data have been saved on the memory card, but it is possible to update values.*

8.8 LATCH ON Functions (only AI1)

For use with input *Pot.1* (potentiometer 6 KΩ) and *Pot.2* (potentiometer 150 KΩ) and with linear input (0…10 V, 0...40 mV, 0/4…20 mA), it is possible to associate start value of the scale (parameter 6 *LL.r.1*) to the minimum position of the sensor and value of the scale end (parameter 7 *uL.r.1*) to the maximum position of the sensor (parameter 8 *LAtc.* configured as *Std.*).

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 setting *u.0.St.* or *u.0.in.* in parameter 8 *LAtc.*

If you set *u.0.in.* the virtual zero will reset after each activation of the device;
if you set *u.0.St.* the virtual zero remains fixed once tuned.

To use the LATCH ON function, first choose the selected option on parameter *LAtc.*[2] Then refer to the following table for the calibration procedure:

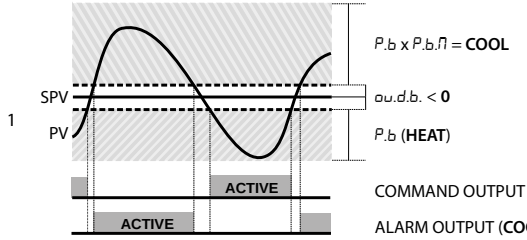
	Press	Display	Do
1	**FNC**	Exit parameters configuration. Display 2 visualizes writing *LAtc.*	Place the sensor on minimum operating value (corresponding to *LL.r.1*
2	▼	Store value on minimum. Display shows *LoU.*	Place sensor on maximum operating value (corresponding to *uL.r.1*).
3	▲	Store value on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

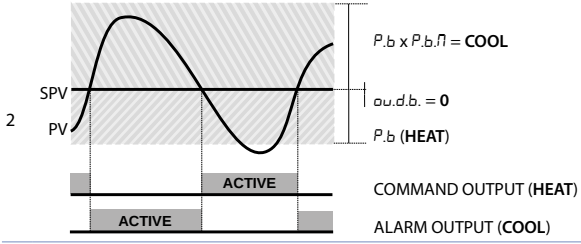
[2] *The tuning procedure starts by exiting the configuration after changing the parameter.*

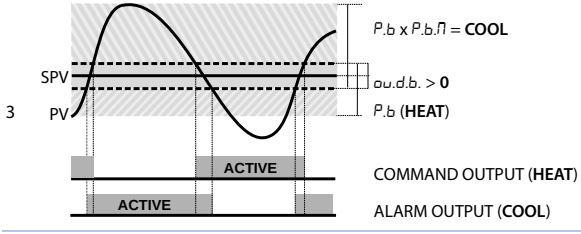
8.9 Heating-Cooling P.I.D.

ATR401 is suitable also for applications requiring a combined heating-cooling P.I.D. action.
Command output must be configured as Heating P.I.D.
(*Act.t.* = *HEAt* and *P.b.* greater than 0 and one of alarms
(*AL. 1, AL. 2, AL. 3* or *AL. 4*) has to be configured as *cooL*.
Command output must be connected to actuator responsible for heating action, while alarm will control the cooling action.
Parameters to configure for Heating P.I.D. are:
Act.t. = *HEAt* Command output action type (Heating);
P.b.: Proportional band Heating;
t.i.: Integral time Heating and cooling;
t.d.: Derivative time Heating and cooling;
t.c.: Cycle time Heating.
Configuration parameters for Cooling P.I.D. are (example: action associated to alarm 1):
AL. 1 = *cooL* Alarm 1 selection (Cooling);
P.b.M.: Proportional band multiplier;
ou.d.b.: Overlapping / Dead band;
co.t.c.: Cycle time Cooling.
Parameter *P.b.M.* (that ranges from 1.00 to 5.00) sets the proportional band for cooling action, according to the formula here below:
Proportional band cooling action = *P.b.* x *P.b.M.*
In this way it is possible to have a proportional band for cooling action that will be equal to heating proportional band if *P.b.M.* = 1.00, or 5 times greater if *P.b.M.* = 5.00.
Integral time and **derivative time** are the same for both actions.
Parameter *ou.d.b.* sets the percentage overlapping between the two actions. For installations where heating and cooling output cannot be activated at the same time, a dead band will be configured (*ou.d.b.* ≤ 0),
vice versa an overlapping will be configured (*ou.d.b.* > 0).

Figure here below shows an example of double action P.I.D. (heating-cooling) with *t.i.* = 0 and *t.c.* = 0.







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

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

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

8.10 Heater Break Alarm by current transformer (T.A. input)

This function allows to measure load current and to manage an alarm in case of malfunctioning (with power in short circuit or always off).
The current transformer connected to terminals 15 and 16 must be 50 mA (sampling time 100 ms).

- Set end scale value of the current transformer in Amperes on par. 73 t.A.
- Set the intervention threshold of the Heater Break Alarm in Amperes on par. 74 H.b.A.t.
- Set the intervention delay time of the Heater Break Alarm on par. 75 H.b.A.d.
- It is possible to associate the alarm with a relay by setting the parameter AL. 1, AL. 2, AL. 3 or AL. 4 as H.b.A.

If a remote control switch or SSR remains closed, controller signals the fault by showing H.b.A.c. on display 2 (alternatively with a command setpoint).
If the power stage remains open, or the load current is lower than the value set on H.b.A.E., controller shows H.b.A.o. on display. It is possible to display the current absorbed during the closure phase of the power stage.

	Press	Display	Do
1	**FNC**	This key enables to scroll on display 2 the output percentage, auto / man selection, setpoint and alarms.	Press **FNC** until the writing AM.E.A. appears on display 1 and display 2 shows the current in amperes (E.A. >0). The value is also maintained when no current circulates on the load.

Setting on parameter 74 H.b.A.E. the value 0 it is possible to visualize the current absorbed without generating the Heater Break Alarm.

9 Serial Communication

ATR401-22ABC-T is provided with RS485 and can receive / broadcast data via MODBUS-RTU protocol. Device can be configured only as Slave.
This function allows to control multiple controllers connected to a supervisory system. Each instrument will answer to a Master query only if contains same address as on parameter 93 SL.Ad.
Allowed addresses are from 1 to 254 and there should not be controllers with the same address on the same line.
Address 255 can be used by the Master to communicate with all connected equipments (broadcast mode), while with 0 all devices receive command, but no answer is expected.
ATR401 can introduce an answer delay (in milliseconds) to Master request.This delay has to be set on parameter 94 SE.dE.
At each parameters modification, instrument stores values in EEPROM memory (100000 writing cycles), while setpoints are stored with a delay of 10 seconds after last modification.
NB: Modifications made to Words different from those described in the following table can lead to instrument malfunction.

Modbus RTU protocol features		
Baud-rate	Selectable on parameter 92 bd.rE. 4.8 ▸ 4800 bit/sec 19.2▸ 19200bit/sec 38.4▸ 38400bit/sec 115.2 115200bit/sec	9.6 ▸ 9600bit/sec 28.8▸ 28800bit/sec 57.6▸ 57600bit/sec
Format	8, N, 1 (8 bit, no parity, 1 stop)	
Supported functions	WORD READING (max 20 word) (0x03, 0x04) SINGLE WORD WRITING (0x06) MULTIPLE WORDS WRITING (max 20 word) (0x10)	

Looking at the table here below it is possible to find all available addresses and functions:

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

Modbus address	Descrizione	Read Write	Reset value
0	Device type	RO	EEPROM
1	Software version	RO	EEPROM
5	Slave address	R/W	EEPROM
6	Boot version	RO	EEPROM
50	Automatic addressing	WO	-
51	Installation code comparison	WO	-
500	Loading **Default** values: **9999** Restore all values **9998** Restore all values except for baud-rate and slave address **9997** Restore all values except for baud-rate **9996** Restore all values except for slave address	R/W	0
900	Process AI1 (degrees with tenths of degree for temperature sensors; digits for linear sensors)	RO	-
901	Process AI2 (degrees with tenths of degree for temperature sensors; digits for linear sensors)	RO	-
902	Average AI1-AI2 (degrees with tenths of degree for temperature sensors; digits for linear sensors)	RO	-
903	Difference AI1-AI2 (degrees with tenths of degree for temperature sensors; digits for linear sensors)	RO	-
904	Difference AI1-AI2 as absolute value (degrees with tenths of degree for temperature sensors; digits for linear sensors)	RO	-
905	Addition AI1-AI2 (degrees with tenths of degree for temperature sensors; digits for linear sensors)	RO	-
1000	Command process (degrees with tenths of degree 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	Alarm 4	R/W	EEPROM
1009	Real setpoint (it is based on gradient)	RO	EEPROM
1010	Relay status (0 = Off, 1 = On) Bit 0 = Relay **Q4** Bit 3 = Relay **Q2** Bit 1 = Relay **Q3** Bit 4 = Relay **Q1 N.O.** Bit 2 = Relay **Q1 N.O.** Bit 5 = **SSR**	RO	0
1011	Percentage heating output (0-10000)	RO	0
1012	Percentage cooling output (0-10000)	RO	0
1013	Alarms status (0 = None, 1 = Active) Bit 0 = Alarm 1 Bit 2 = Alarm 3 Bit 1 = Alarm 2 Bit 3 = Alarm 4	RO	0

Modbus address	Descrizione	Read Write	Reset value
1014	Manual reset: write 0 to reset all alarms. In reading (0 = Not resettable, 1 = Resettable) Bit 0 = Alarm 1 Bit 2 = Alarm 3 Bit 1 = Alarm 2 Bit 3 = Alarm 4	WO	0
1015	Error flags Bit 0 = Eeprom writing error Bit 1 = Eeprom reading error Bit 2 = Cold juntion error Bit 3 = Error AI1 (sensor 1) Bit 4 = Error AI2 (sensor 2) Bit 5 = Generic error Bit 6 = Hardware error Bit 7 = Missing calibration error Bit 8 = Incongruous control parameters Bit 9 = Incongruous alarm parameters Bit 10 = Incongruous retransmission parameters Bit 11 = Incongruous visualization parameters Bit 12 = H.B.A. – Low corrent Bit 13 = H.B.A. – Short circuit	RO	0
1016	Cold junction temperature (with decimal point)	RO	-
1017	Start / Stop 0 = Controller in STOP 1 = Controller in START	R/W	0
1018	Lock conversion ON / OFF 0 = Lock conversion off 1 = Lock conversion on	R/W	0
1019	Tuning ON / OFF 0 = Tuning off 1 = Tuning on	R/W	0
1020	Automatic / Manual selection 0 = Automatic 1 = Manual	R/W	0
1021	OFF LINE* time (milliseconds)	R/W	-
1022	Digital input status 0 = Input OFF 1 = Input ON	RO	-
1023	Instantaneous current value (tenth of ampere)	RO	0
1024	Current ON value (tenth of ampere)	RO	0
1025	Current OFF value (tenth of ampere)	RO	0
1100	Process with decimal point selection	RO	-
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

Modbus address	Descrizione	Read Write	Reset value
1107	Alarm 3 with decimal point selection	R/W	EEPROM
1108	Alarm 4 with decimal point selection	R/W	EEPROM
1109	Real setpoint (gradient) with decimal point selection	RO	EEPROM
1110	Percentage heating output (0-1000)	R/W	0
1111	Percentage heating output (0-100)	R/W	0
1112	Percentage cooling output (0-1000)	RO	0
1113	Percentage cooling output (0-100)	RO	0
2001	Parameter 1	R/W	EEPROM
….	….	R/W	EEPROM
2100	Parameter 100	R/W	EEPROM
4001	Parameter 1**	R/W	EEPROM
….	….	R/W	EEPROM
4100	Parameter 100	R/W	EEPROM
5001	Remote setpoint (see par 7.3)	W	0

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

** *Parameters, modified by serial address from 4001 to 4100, are saved in EEPROM only after 10'' from the last parameter writing.*

10 Configuration

10.1 Modify configuration parameters

For configuration parameters see next paragraph.

	Press	Display	Do
1	**PRGM** for 3s.	Display 1 shows 0000 with the 1st digit flashing, while display 2 shows PASS.	
2	▲▼	Modify flashing digit and move to next digit with **SET**.	Enter password 1234
3	**PRGM** for conf.	Display 1 shows first parameter and second display shows its value.	
4	▲▼	Scroll parameters.	
5	**PRGM**	Allows to switch from mnemonic parameter code to numeric code and viceversa (ex: from c.out to P -01).	
6	**SET**	Allows parameter modification (display 2 flashes).	
7	▲▼	Increases or decreases visualized value.	Introduce new data.

	Press	Display	Do
8	**SET**	Confirms data entering (display 2 stops flashing).	To change another parameter return to point 4.
9	**FNC**	End of parameters modification Controller exits the programming mode.	

10.2 Loading default values

This procedure allows to restore factory settings of the device

	Press	Display	Do
1	**PRGM** for 3s.	Display 1 visualizes 0000 with 1st digit blinking, while display 2 shows PASS.	
2	▲▼	Change blinking digit and move to the next one with **SET**.	Enter password 9999
3	**PRGM** for conf.	Device loads default settings.	Switch the controller off and restart it

11 Table of Configuration Parameters

The following table includes all parameters. Some of them will not be visible on the models which are not provided with relevant hardware features.

1 c.out Command Output

Command output type selection

c.o1	**Default**
c.uAL	Command of open-loop valves
c.SSr	SSR command (voltage)
c4.20	Do not use this option for process retransmission
c.0.20	Do not use this option for process retransmission
c.0.10	Do not use this option for process retransmission

ATR401-22ABC			
	Command	Alarm 1	Alarm 2
c. o1	Q1	Q2	SSR
c.uAL.	Q1 * 3-5 (open) - 4-5 (close)	Q2	SSR
c.SSr	SSR	Q1	Q2

ATR401-23ABC				
	Command	Alarm 1	Alarm 2	Alarm 3
c. o1	Q1	Q2	Q3	SSR
c.uAL.	Q1 * 3-5 (open) - 4-5 (close)	Q2	Q3	SSR
c.SSr	SSR	Q1	Q2	Q3

	ATR401-24ABC				
	Command	Alarm 1	Alarm 2	Alarm 3	Alarm 4
c. o1	Q1	Q2	Q3	Q4	SSR
c.uAL.	Q1 * 3-5 (open) - 4-5 (close)	Q2	Q3	Q4	SSR
c.SSr	SSR	Q1	Q2	Q3	Q4

	ATR401-22ABC-T and ATR401-22ABC-D			
	Command	Alarm 1	Alarm 2	Alarm 3
c. o1	Q1	Q2	SSR	AO1 (V)
c.uAL.	Q1 * 3-5 (open) - 4-5 (close)	Q2	SSR	AO1 (V)
c.SSr	SRR	Q1	Q2	AO1 (V)
c4.20	4...20mA	Q1	Q2	SSR
c.0.20	0...20mA	Q1	Q2	SSR
c.0.10	0...10V	Q1	Q2	SSR

** L'uscita Q1 funziona attraverso 2 relè indipendenti che possono essere aperti contemporaneamente.*

2 SEn.1 Sensor 1

Analogue input configuration / sensor selection (AI1).

d i5.	Disabled	
tc. K	Tc-K (**Default**)	-260…1360 °C
tc. S	Tc-S	-40…1760 °C
tc. r	Tc-R	-40…1760 °C
tc. J	Tc-J	-200…1200 °C
Pt	PT100	-200…600 °C
Pt 1	PT100	-200…140 °C
ni	NI100	-60…180 °C
ntc	NTC10K	-40…125 °C
Ptc	PTC1K	-50…150 °C
Pt5	PT500	-100…600 °C
Pt 1K	PT1000	-100…600 °C
0. 10	0..10 Volt	
0. 20	0..20 mA	
4. 20	4..20 mA	
0. 40	0..40 mVolt	
Pot.1	Potentiometer max 6 Kohm (full scale)	
Pot.2	Potentiometer max 150 Kohm (full scale)	

3 d.P. Decimal Point 1

Select type of visualized decimal point for Analogue Input 1.

0	**Default**
0.0	1 decimal
0.00	2 decimals
0.000	3 decimals

4 LL.1 Lower Linear Input

AI1 lower range limit only for linear signals. Example: with input 4...20 mA this parameter takes value associated to 4 mA.
-999…+9999 digit[1 p. 50], **Default**: 0.

5 uL.1 Upper Limit Input 1

AI1 upper range limit only for linear signals. Example: with input 4...20 mA this parameter takes value associated to 20 mA.
-999…+9999 digit[1 p. 50], **Default**: 1000.

6 o.cA.1 Offset Calibration 1

Offset AI1 calibration. Value added/subtracted to visualized process value (normally used to correct ambient temperature value)
-999…+1000 digit[1 p. 50] for linear sensors and potentiometers.
-99.9…+100.0 tenths for temperature sensors, **Default**: 0.0.

7 G.cA.1 Gain Calibration 1

AI1 gain calibration. % Value multiplied with displayed value to calibrate process value.
-99.9%…+100.0%, **Default**: 0.0.
Example: to correct a scale 0...1000°C which is showing 0...1010°C, enter -1.0 on this parameter

8 Ltc.1 Latch-On 1

Automatic setting of limits for linear input.
dis. Disabled (**Default**)
Std. Standard
u.0St. Virtual Zero Stored *(See par. 8.8)*
u.0in. Virtual Zero Initialized *(See par. 8.8)*

9 LLS.1 Lower Limit Setpoint 1

AI1 lower limit setpoint.
-999…+9999 digit[1 p. 50] (degrees if temperature), **Default**: 0.

10 uLS.1 Upper Limit Setpoint 1

AI1 upper limit setpoint.
-999…+9999 digit[1 p. 50] (degrees if temperature), **Default**: 1750.

11 SEn.2 Sensor 2

Analogue input 2 configuration / sensor selection AI2. Select dip-switches as indicated on *5.2*

d i S.	Disabled (**Default**)	
tc. K	Tc-K	-260…1360 °C
tc. S	Tc-S	-40…1760 °C
tc. r	Tc-R	-40…1760 °C
tc. J	Tc-J	-200…1200 °C
Pt	PT100	-200…600 °C
Pt 1	PT100	-200…140 °C
n i	NI100	-60…180 °C
ntc	NTC10K	-40…125 °C
Ptc	PTC1K	-50…150 °C
PtS	PT500	-100…600 °C
Pt 1K	PT1000	-100…600 °C
0. 10	0…10 Volt	
0. 20	0…20 mA	
4. 20	4…20 mA	
0. 40	0…40 mVolt	
Pot.1	Potenc. max 6 Kohm (full scale)	
Pot.2	Potenc. max 150 Kohm (full scale)	
t.A.	Current measured by amperometric transformer	

12 d.P. 2 Decimal Point 2

Select decimal type visualized for analogue input 2.

0	**Default**
0.0	1 Decimal
0.00	2 Decimals
0.000	3 Decimals

13 LL.i2 Lower Linear Input 2

AI2 lower range limit only for linear signals. Example: with input 4...20 mA this parameter takes value associated to 4 mA.
-999…+9999 digit[1 p. 50], **Default**: 0.

14 uL.i2 Upper Linear Input 2

AI2 upper range limit only for linear signals. Example: with input 4...20 mA this parameter takes value associated to 20 mA
-999…+9999 digit[1 p. 50], **Default**: 1000.

15 o.cA.2 Offset Calibration 2

AI2 offset calibration. Number added to visualized process value (normally correcting ambient temperature value).
-999…+1000 digit[1 p. 50] for linear sensors and potentiometers.
-99.9…+100.0 tenths for temperature sensors, **Default**: 0.0.

16 G.cA.2 Gain Calibration 2

AI2 Gain calibration. % Value multiplied with displayed value to calibrate process value.
-99.9%…+100.0%, **Default**: 0.0.

17 L.L.S.2 Lower Limit Setpoint 2

AI2 lower limit setpoint.
-999…+9999 digit[1 p. 50] (degrees i f temperature), **Default**: 0.

18 u.L.S.2 Upper Limit Setpoint 2

AI2 upper limit setpoint.
-999…+9999 digit[1 p. 50] (degrees i f temperature), **Default**: 1750.

19 c.Pro. Command Process

Selects process value related to command output and visualized on display 1. This determinates which is the primary process

- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- diFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Ab5.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

20 rEM.S. Remote Setpoint

Enables remote setpoint. The control setpoint is sent by another device and is received by second analogue input.
Parameter c.Pro. must be selected as Pro.1 or Pro.2

- diS. Disabled (**Default**)
- En. Enabled
- En.SE. Enables remote setpoint by serial input only on ATR401-ABC-T *(See par. 7.3)*

21 Act.t. Command Action Type

Regulation type for command output

- HEAt Heating (N.O.) (**Default**)
- cooL Cooling (N.C.)
- H.o.o.S. Lock command above SPV. Example: command output is not activated when reaching setpoint, even with P.I.D. value other than 0.

22 c. HY. Command Hysteresis

Hysteresis in ON / OFF or dead band in P.I.D.
0.0-999.9 digit[1 p. 50] (tenth of degree if temperature), **Default**: 0.

23 c. rE. Command Rearmament

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

- A.rE. Automatic Reset (**Default**)
- M.rE. Manual Reset by keyboard.
- M.rE.S. Manual reset stored. (keeps relay status also after an eventual power failure)

24 c. SE. Command State Error

Contact state for command output in case of error

- c.o. Open contact (**Default**)
- c.c. Closed contact

25 c. Ld. Command Led

Defines led C1 state corresponding to relevant contact

- c.o. ON with open contact
- c.c. ON with closed contact (**Default**)

26 c. dE. Command Delay

Command delay (only in ON / OFF functioning). (In case of valves it works also in P.I.D. and represents delay between opening and closure of two contacts).
-600…+600 seconds (tenth of second in case of servo valve).
Negative: delay when turning off.
Positive: delay when turning on.
Default: 0.

27 c. S.P. Command Setpoint Protection

Allows/prevents changes to command setpoint value by keyboard

- FrEE Modification allowed (**Default**)
- Loch Protected

28 tunE Tune

Autotuning type selection

- dis. Disabled (**Default**)
- Auto Automatic (P.I.D. parameters calculation at each activation and / or each change)
- MAn. Manual (launch by keyboards or by digital input)
- oncE Once (P.I.D. parameters calculation only at first start)

29 S.d.tu. Setpoint Deviation Tune

Selects deviation from command setpoint as threshold used by autotuning to calculate P.I.D. parameters
0…5000 digit[1 p. 50] (tenth of degree if temperature), **Default**: 10.0.

30 P.b. Proportional Band

Process inertia in units (example: °C if temperature)
0 ON / OFF if also t.i. is equal to 0 (**Default**).
1…9999 digit↑ p. 50 (tenth of degree if temperature).

31 t.i. Integral Time

Process inertia in seconds
0.0…999.9 seconds. 0 integral disabled, **Default**: 0.0

32 t.d. Derivative Time

Normally ¼ of integral time.
0.0…999.9 seconds. 0 derivative disabled, **Default**: 0.0.

33 t.c. Cycle Time

Cycle time (for P.I.D. on remote control switch 10 / 15 sec., for P.I.D. on SSR 1 sec.) or servo time (value declared by servo-motor manufacturer).
0.1…300.0 seconds, **Default**: 10.0.

34 LL.o.P. Lower Limit Output Percentage

Select minimum value for command output percentage.
0…100%, **Default**: 0%.
Example: with c.out selected as 0...10 V and LL.o.P set at 10%, command output can change from a min. of 1 V to a max. of 10 V.

35 uL.o.P. Upper Limit Output Percentage

Selects maximum value for command output percentage.
0…100%, **Default**: 100%.
Example: c.out selected as 0...10 V and uL.o.P. selected as 90%, command output may vary between 0V and max. 9 V

36 dEGr. Degree

Select degree type.

°c	Centigrade (**Default**)	°F	Fahrenheit

37 AL. 1 Alarm 1

Alarm 1 selection. Alarm intervention is correlated to AL1 *(See par. 12)*

d iS.	Disabled (**Default**)
A. AL.	Absolute alarm, referring to process
b. AL.	Band alarm
H.d.AL.	Upper deviation alarm
L.d.AL.	Lower deviation alarm
A.c.AL.	Absolute alarm, referring to command setpoint
St.AL.	Status alarm (active in Run / Start)
cool.	Cooling action
H.b.A.	Load control alarm (Heater Break Alarm)
L.b.A.	Sensor failure alarm (Loop Break Alarm)

Example: status of contactor/ SSR or heating elements

38 A.1Pr. Alarm 1 Process

Select value correlated to alarm 1

- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- diFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Ab5.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

39 A.1S.o. Alarm 1 State Output

Alarm 1 output contact and type of action

- n.o. S. (N.O. start) Normally open, active from start (**Default**)
- n.c. S. (N.C. start) Normally closed, active from start
- n.o. t. (N.O. threshold) Normally open, active from alarm reaching[2 p. 50]
- n.c. t. (N.C. threshold) Normally closed, active from alarm reaching[2 p. 50]

40 A.1HY. Alarm 1 Hysteresis

-999…+999 digit[1 p. 50] (tenths of degree if temperature), **Default**: 0.0.

41 A1.rE. Alarm 1 Rearmament

Type of reset for contact of alarm 1

- A.rE. Automatic Reset (**Default**)
- M.rE. Manual Reset by keyboard
- M.rE.S. Manual reset stored (keeps relay status also after an eventual power failure)

42 A.1S.E. Alarm 1 State Error

Contact status for alarm 1 output in case of error

- c.o. Open contact (**Default**)
- c.c. Closed contact

43 A.1Ld. Alarm 1 Led

Defines led **A1** status corresponding to relevant contact

- c.o. ON with open contact
- c.c. ON with closed contact (**Default**)

44 A.1dE. Alarm 1 Delay

-600…+600 seconds.
Negative: delay at exit from alarm.
Positive: delay at starting of alarm.
Default: 0.

45 A.1S.P. Alarm 1 Setpoint Protection

Alarm 1 set protection. Does not allow the user to change setpoint

- FrEE Modification allowed (**Default**)
- Loch Protected
- HidE Protected and not visualized

46 AL.2 Alarm 2

Alarm 2 selection. Alarm intervention is associated to AL2 *(See par. 12)*

- dis. Disabled (**Default**)
- A.AL. Absolute alarm, referring to process
- b.AL. Band alarm
- H.d.AL. Upper deviation alarm
- L.d.AL. Lower deviation alarm
- A.c.AL. Absolute alarm, referring to command setpoint
- St.AL. Status alarm (active in Run / Start)
- cool Cooling action
- H.b.A. Load control alarm (Heater Break Alarm)
- L.b.A. Sensor failure alarm (Loop Break Alarm)

-Example: status of contactor/ SSR or heating elements

47 A.2.Pr. Alarm 2 Process

Selects value related to alarm 2

- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- diFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Ab5.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

48 A.2.S.o. Alarm 2 State Output

Alarm 2 output contact and type of action

- n.o. S. (N.O. start) Normally open, active from Start (**Default**)
- n.c. S. (N.C. start) Normally closed, active from Start
- n.o. t. (N.O. threshold) Normally open, active from alarm reaching[2 p. 50]
- n.c. t. (N.C. threshold) Normally closed, active from alarm reaching[2 p. 50]

49 A.2.HY. Alarm 2 Hysteresis

-999…+999 digit[1 p. 50] (tenth of degree if temperature), **Default**: 0.0.

50 A.2.rE. Alarm 2 Rearmament

Type of reset for alarm 2 contact

- A.rE. Automatic Reset (**Default**)
- M.rE. Manual Reset by keyboard
- M.rE.S. Manual reset stored (keeps relay status also after an eventual power failure)

51 A.2.S.E. Alarm 2 State Error

Contact status for alarm 2 output in case of error

- c.o. Open contact (**Default**)
- c.c. Closed contact

52 A2Ld. Alarm 2 Led

Defines led **A2** status corresponding to relevant contact

- c.o. ON with open contact
- c.c. ON with closed contact (**Default**)

53 A2dE. Alarm 2 Delay

Ritardo allarme 2
-600…+600 seconds.
Negative: delay at exit from alarm
Positive: delay at starting of alarm. **Default**: 0.

54 A2SP. Alarm 2 Setpoint Protection

Alarm 2 set protection. Does not allow the user to change set value

- FrEE Modification allowed (**Default**)
- Loch Protected
- HidE Protected and not visualized

55 AL. 3 Alarm 3

Alarm 3 selection. Alarm intervention is associated to AL3 *(See par. 12)*

- di5. Disabled (**Default**)
- A. AL. Absolute alarm, referring to process
- b. AL. Band alarm
- H.d.AL. Upper deviation alarm
- L.d.AL. Lower deviation alarm
- A.c.AL. Absolute alarm, referring to command setpoint
- St.AL. Status alarm (active in Run / Start)
- cool Cooling action
- H.b.A. Load control alarm (Heater Break Alarm)
- L.b.A. Sensor failure alarm (Loop Break Alarm)

Example: status of contactor/ SSR or heating elements

56 A3Pr. Alarm 3 Process

Selects value correlated to alarm 3

- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- diFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Ab5.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

57 A3So. Alarm 3 State Output

Alarm 3 output contact and type of action

- n.o. S. (N.O. start) Normally open, active from start (**Default**)
- n.c. S. (N.C. start) Normally closed, active from start
- n.o. t. (N.O. threshold) Normally open, active from alarm reaching *2 p. 50*
- n.c. t. (N.C. threshold) Normally closed, active from alarm reaching *2 p. 50*

58 A3HY. **Alarm 3 Hysteresis**

-999…+999 digit[1 p. 50] (tenths of degree if temperature), **Default**: 0.0.

59 A3rE. **Alarm 3 Rearmament**

Type of reset for alarm 3 contact

- A.rE. Automatic Reset (**Default**)
- M.rE. Manual Reset by keyboard
- M.rE.S. Manual reset stored. (keeps relay status also after an eventual power failure)

60 A3SE. **Alarm 3 State Error**

Contact status for alarm 3 output in case of error

- c.o. Open contact (**Default**)
- c.c. Closed contact

61 A3Ld. **Alarm 3 Led**

Defines led **A3** status corresponding to relevant contact

- c.o. ON with open contact
- c.c. ON with closed contact (**Default**)

62 A3dE. **Alarm 3 Delay**

-600…+600 seconds.
Negative: delay at exit from alarm.
Positive: delay at starting of alarm. **Default**: 0.

63 A3SP. **Alarm 3 Setpoint Protection**

Alarm 3 set protection. Does not allow the user to change set value

- FrEE Modification allowed (**Default**)
- Loch Protected
- HidE Protected and not visualized

64 AL. 4 **Alarm 4**

Alarm 4 selection. Alarm intervention is associated to AL4 *(See par. 12)*

- dis. Disabled (**Default**)
- A. AL. Absolute alarm, referring to process
- b. AL. Band alarm
- H.d.AL. Upper deviation alarm
- L.d.AL. Lower deviation alarm
- A.c.AL. Absolute alarm, referring to command setpoint
- St.AL. Status alarm (active in Run / Start)
- cool. Cooling action
- H.b.A. Load control alarm (Heater Break Alarm)
- L.b.A. Sensor failure alarm (Loop Break Alarm). Example: status of contactor/ SSR or heating elements

65 A4.Pr. Alarm 4 Process

Selects value correlated to alarm 4

- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- diFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Ab5.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

66 A4.S.o. Alarm 4 State Output

Alarm 4 output contact and type of action

- n.o. S. (N.O. start) Normally open, active from start (**Default**)
- n.c. S. (N.C. start) Normally closed, active from start
- n.o. t. (N.O. threshold) Normally open, active from alarm reaching[2 p. 50]
- n.c. t. (N.C. threshold) Normally closed, active from alarm reaching[2 p. 50]

67 A4.HY. Alarm 4 Hysteresis

-999…+999 digit[1 p. 50] (tenths of degree if temperature), **Default**: 0.0.

68 A4.rE. Alarm 4 Rearmament

Type of reset for alarm 4 contact

- A.rE. Automatic Reset (**Default**)
- M.rE. Manual Reset by keyboard
- M.rE.S. Manual reset stored. (keeps relay status also after an eventual power failure)

69 A4.S.E. Alarm 4 State Error

Contact status for alarm 4 output in case of error

- c.o. Open contact (**Default**)
- c.c. Closed contact

70 A4.Ld. Alarm 4 Led

Defines led A4 status corresponding to relevant contact

- c.o. ON with open contact
- c.c. ON with closed contact (**Default**)

71 A4.dE. Alarm 4 Delay

-600…+600 seconds.

Negative: delay at exit from alarm. Positive: delay at starting of alarm. **Default**: 0.

72 A4.S.P. Alarm 4 Setpoint Protection

Alarm 4 set protection. Does not allow the user to change set value

- FrEE Modification allowed (**Default**)
- Loch Protected
- HidE Protected and not visualized

73 t.A. Current Transformer

Activation and range for current transformer
0 Disabled (**Default**)
1…200 Ampere

74 H.b.A.t. Heater Break Alarm Threshold

Heater Break Alarm activation threshold
0.0 Disabled alarm
0.1...200.0 Ampere
Default: 50.0

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

Heater Break Alarm activation delay
00.00…60.00 mm.ss
Default: 01.00

76 coo.F. Cooling Fluid

Type of refrigerant fluid for heating / cooling P.I.D.
Air Air (**Default**)
oil Oil
H2o Water

77 P.b.M. Proportional Band Multiplier

Proportional band for cooling action is given by parameter 30 multiplied for this parameter
1.00…5.00
Default: 1.00

78 ou.d.b. Overlap / Dead Band

Dead band combination for heating / cooling P.I.D.
-20.0…50.0%.
Negative: Dead band.
Positive: overlap.
Default: 0.0.

79 co.t.c. Cooling Cycle Time

Cycle Time for Cooling output
1…300 seconds
Default: 10

80 c.FLt. Conversion Filter

ADC Filter: Number of sensor readings to calculate mean that defines process value.

NB: When readings increase, control loop speed slows down

d i S.	Disabled
2. S.M.	2 Samples Mean (Mean with 2 samples)
3. S.M.	3 Samples Mean
4. S.M.	4 Samples Mean
5. S.M.	5 Samples Mean
6. S.M.	6 Samples Mean
7. S.M.	7 Samples Mean
8. S.M.	8 Samples Mean
9. S.M.	9 Samples Mean
10.S.M.	10 Samples Mean (**Default**)
11.S.M.	11 Samples Mean
12.S.M.	12 Samples Mean
13.S.M.	13 Samples Mean
14.S.M.	14 Samples Mean
15.S.M.	15 Samples Mean

81 c.Frq. Conversion Frequency

Sampling frequency of digital / analogue converter.

NB: Increasing the conversion speed will slow down reading stability (example: for fast transients, as the pressure, it is advisable to increase sampling frequency)

242H.	242 Hz (Maximum speed conversion)
123H.	123 Hz
62 H.	62 Hz
50 H.	50 Hz
39 H.	39 Hz
33.2H.	33.2 Hz
19.6H.	19.6 Hz
16.7H.	16.7 Hz (**Default**) Ideal for filtering noises 50 / 60 Hz
12.5H.	12.5 Hz
10 H.	10 Hz
8.33H.	8.33 Hz
6.25H.	6.25 Hz
4.17H.	4.17 Hz (Minimum speed conversion)

82 u.FLt. Visualization Filter

Slow down the update of process value visualized on display, to simplify reading

- d i S. Disabled (maximum speed of display update)
- PtcH Pitchfork filter > **Default**.
- F i.or. First Order
- F.or.P. First Order with Pitchfork
- 2. S.M. 2 Samples Mean
- 3. S.M. 3 Samples Mean
- 4. S.M. 4 Samples Mean
- 5. S.M. 5 Samples Mean
- 6. S.M. 6 Samples Mean
- 7. S.M. 7 Samples Mean)
- 8. S.M. 8 Samples Mean)
- 9. S.M. 9 Samples Mean
- 10.S.M. 10 Samples Mean

83 Au.MA. Automatic / Manual

Enables automatic / manual selection

- d i S. Disabled (**Default**)
- En. Enabled
- En.St. Enabled with memory

84 dGt. i. Digital Input

- d i S. Disabled (**Default**: 0)
- 2t.S. 2 Setpoints Switch
- 2t.S. i. 2 Setpoints Switch Impulsive
- 3t.S. i. 3 Setpoints Switch Impulsive
- 4t.S. i. 4 Setpoints Switch Impulsive
- St.St. Start / Stop
- rn.n.o. Run N.O. (enables regulation with N.O. contact)
- rn.n.c. Run N.C. (enables regulation with N.C. contact)
- L.c.n.o. Lock conversion N.O. (stop conversion and display value with N.O.)
- L.c.n.c. Lock conversion N.C. (stop conversion and display value with N.C.)
- tunE Manual Tune (by digital input)
- A.MA. i. Automatic / Manual Impulse (if enabled on parameter 83)
- A.MA.c. Automatic / Manual Contact (if enabled on parameter 83)
- Act.c. Action Type. Heating regulation with open D.I.
  Cooling regulation with closed D.I
- r.S.En. Remote Setpoint enabling. Enables Remote setpoint with closed D.I. Desables Remote setpoint with open D.I. (selection En. must be enabled on parameter 20 rEM.S.)

85 r i.Gr. Rising Gradient

Rising gradient for Soft-Start
0 Disabled.
1..9999 Digit/hour[1 p. 50] (degrees/hour with decimal visualization if temperature), **Default**: 0.

86 u i.d.2 Visualization Display 2

Set visualization on display 2

- out.P. Output Percentage
- AMP. Ampere
- c.SPu. Command Setpoint (**Default**)
- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- d iFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Abs.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

87 u i.tY. Visualization Type

Set visualization type on display

- Std. Display 1 process + Display 2 as u i.d.2 (**Default**)
- d.2Hi. Display 1 process + Display 2 as u i.d.2 hidden after 3 sec.
- SuAP Display 1 as u i.d.2 + Display 2 process
- S.d.2H. Display 1 as u i.d.2 + Display 2 process hidden after 3 sec.

88 rEtr. Retransmission

Retransmission for output 0…10 V or 0/4…20 mA. Parameters 90 and 91 defines upper/lower limit of scale

- d iS. Disabled (**Default**)
- c.SPu. Command Setpoint
- Pro.1 Value read on input AI1. (**Default**)
- Pro.2 Value read on input AI2.
- MEAn Arithmetic average of the value read on inputs AI1 and AI2 [(AI1+AI2)/2].
- d iFF. Difference of the values read on inputs AI1 and AI2 (AI1-AI2).
- Abs.d. Module of the difference of the values read on inputs AI1 and AI2 (|AI1-AI2|).
- SuM Sum of values read on inputs AI1 and AI2 (AI1+AI2).

89 rE.tY. Retransmission Type

Select retransmission type

- 0- 10 0…10 Volt (**Default**)
- 0-20 0…20 mA
- 4-20 4…20 mA

90 Lo.L.r. Lower Limit Retransmission

Lower limit analogue output range

-999…9999 digit[1 p. 50] (degrees if temperature), **Default**: 0.

91 uP.L.r. Upper Limit Retransmission

Upper limit analogue output range

-999…9999 digit[1 p. 50] (degrees if temperature), **Default**: 1000.

92 bd.rt. Baud Rate

Selects baudrate for serial communication

4.8	4800 bit/s
9.6	9600 bit/s
19.2	19200 bit/s (**Default**)
28.8	28800 bit/s
39.4	39400 bit/s
57.6	57600 bit/s
115.2	115200 bit/s

93 SL.Ad. Slave Address

Selects slave address for serial communication
1 – 254. **Default**: 254

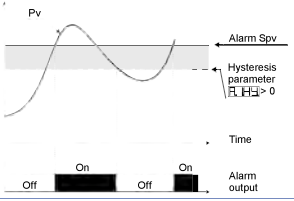
94 SE.dE. Serial Delay

Selects serial delay
0 – 100 milliseconds
Default: 20

12 Alarm Intervention Modes

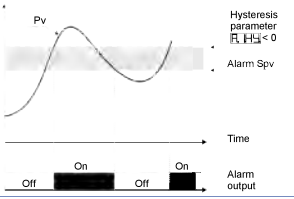
12.a Absolute alarm ("Absolute" selection) (A. AL. selection)

1



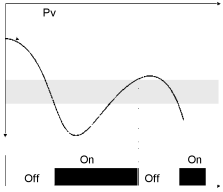
Absolute alarm with controller in heating functioning (par. 21 Act.t. selected HEAt) and **hysteresis value greater** than "0" (par. 40 A.I.HY. > 0). *

2



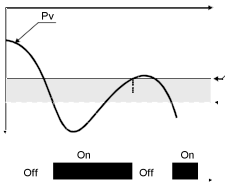
Absolute alarm with controller in heating functioning (par. 21 Act.t. selected HEAt) and **hysteresis value less** than "0" (par. 40 A.I.HY. < 0). *

3



Absolute alarm with controller in cooling functioning (par. 21 Act.t. selected cooL) and **hysteresis value** than "0" (par. 40 A.I.HY. > 0). *

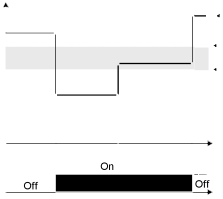
4



Absolute alarm with controller in cooling functioning (par. 21 Act.t. selected cooL) **hysteresis value minor** than "0" (par. 40 A.I.HY. < 0). *

12.b Absolute Alarm or Threshold Alarm Referring to Setpoint Command (selection A.c.AL)

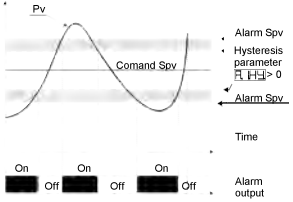
1



Absolute alarm refers to the command set, with the controller in heating functioning (par. 21 Act.t. selected HEAt) **hysteresis value greater** than "0 (par. 40 A.I.HY. > 0). Command set can be changed by pressing the arrow keys on front panel. *

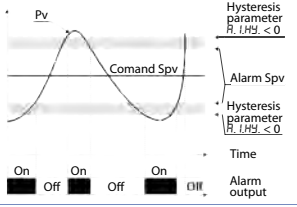
12.c Band Alarm (selection b. AL)

1



Band alarm with hysteresis value greater than “0”. (par. 40 A. I.HY. > 0). *

2

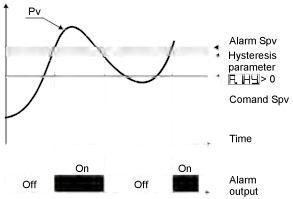


Band alarm with hysteresis value minor than “0”. (par. 40 A. I.HY. < 0). *

* *The example refers to alarm 1; the function can also be enabled for alarm 2*

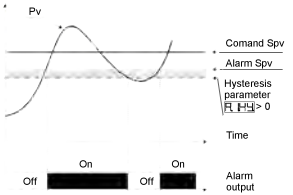
12.d Upper Deviation Alarm (selection H.d.AL)

1



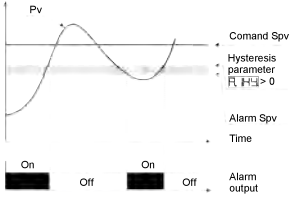
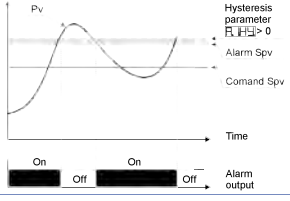
Upper deviation alarm value of alarm setpoint greater than “0” and hysteresis value greater than“0” (par. 40 A. I.HY. > 0). **

2



Upper deviation alarm value of alarm setpoint minor than “0” and hysteresis value greater than “0” (par. 40 A. I.HY. > 0). **

12.e Lower Deviation Alarm (selection L.d.AL)

1		Lower deviation alarm value of alarm setpoint greater than “0” and hysteresis value greater than “0” (par. 40 A. I.HY. > 0). **
2		Lower deviation alarm value of alarm setpoint minor than “0” and hysteresis value greater than “0” (par. 40 A. I.HY. > 0). **

*** a) The example refers to alarm 1; the function can also be enabled for alarm 2 .b) With hysteresis value less than “0” (A. I.HY. < 0) the dotted line moves over the alarm setpoint.*

13 Table of Anomaly Signals

If installation malfunctions, controller will switch off regulation output and will report the anomaly. 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-01 SYS.E.	EEPROM programming error.	Call Assistance.
E-02 SYS.E.	Cold junction temperature sensor failure or environment temperature out of range.	Call Assistance.
E-04 SYS.E.	Incorrect configuration data. Possible loss of instrument calibration.	Verify that configuration parameters are correct.
E-05 Pro.1	Sensor connected to AI1 broken or temperature out of range.	Control connection with probes and their integrity.
E-06 Pro.2	Sensor connected to AI2 broken or temperature out of range.	Control connection with probes and their integrity.
E-08 SYS.E.	Missing calibration.	Call Assistance.

	Cause	What to do
E-10 c.PA.r	Incorrect control parameters.	Verify control parameters.
E-11 A.PA.r	Incorrect alarms parameters.	Verify alarm parameters.
E-12 r.PA.r	Incorrect retransmission parameters.	Verify retransmission parameters.
E-13 u.PA.r	Incorrect visualization parameters.	Verify visualization parameters.
E-14 S.PA.r	Incorrect remote setpoint parameters.	Verify remote setpoint parameters.

14 Configuration EASY-UP

To simplify the setting of parameters and the integration of the different components involved in the control system, Pixsys introduces the EASY-UP coding which allows to set sensors and/or command outputs in one single step. By means of the code listed in the data sheet enclosed to the sensor or actuator (SSR, motorized valve, etc.) the EASY-UP coding will set the relevant main parameters on the controllers (ex. selection of PT100 on parameter "Sensor" and the corresponding measuring range on parameters "Lower and Upper limits of the setpoint"). Different codes may be entered on the controllers in sequence to configure inputs, control output or retransmission of signal.

Number	Parameter name	Value
Password 2200		
P-02	Sensor 1	PT100
P-09	Setpoint 1 lower limit	-100
P-10	Setpoint 1 upper limit	500
Password 2201		
P–02	Sensor	PT100
P–09	Setpoint 1 lower limit	-100
P–10	Setpoint 1 upper limit	250
Password 2202		
P-02	Sensor	PTC
P-09	Setpoint 1 lower limit	-50
P-10	Setpoint 1 upper limit	120
Password 2203		
P-02	Sensor	NTC
P-09	Setpoint 1 lower limit	-40
P-10	Setpoint 1 upper limit	125

Password 2204		
P-02	Sensor	PT1000
P-09	Setpoint 1lower limit	-50
P-10	Setpoint 1upper limit	200

Password 2301		
P-02	Sensor 1	TC J
P-09	Setpoint 1 lower limit	-100
P-10	Setpoint 1 upper limit	400

Password 2351		
P-02	Sensor 1	TC K
P-09	Setpoint 1 lower limit	-100
P-10	Setpoint 1 upper limit	800

Password 2352		
P-02	Sensor 1	TC K
P-09	Setpoint 1 lower limit	-100
P-01	Setpoint 1 upper limit	600

Password 2401		
P-02	Sensor 1	4…20mA
P-04	Setpoint 1 lower limit	0
P-05	Setpoint 1 upper limit	100
P-09	Range V/I 1 lower limit	0
P-10	Range V/I 1 upper limit	100

Password 2402		
P-02	Sensor 1	4…20mA
P-04	Setpoint 1 lower limit	0
P-05	Setpoint 1 upper limit	250
P-09	Range V/I 1 lower limit	0
P-10	Range V/I 1 upper limit	250

Password 2403		
P-02	Sensor 1	4…20mA
P-04	Setpoint 1 lower limit	0
P-05	Setpoint 1 upper limit	300
P-09	Range V/I 1 lower limit	0
P-10	Range V/I 1 upper limit	300

Password 2404		
P-02	Sensor 1	4…20mA
P-04	Setpoint 1 lower limit	0
P-05	Setpoint 1 upper limit	500
P-09	Range V/I 1 lower limit	0
P-10	Range V/I 1 upper limit	500

Password 2405		
P-02	Sensor 1	4…20mA
P-04	Setpoint 1 lower limit	-50
P-05	Setpoint 1 upper limit	400
P-09	Range V/I 1 lower limit	-50
P-10	Range V/I 1 upper limit	400

Password 2601		
P-02	Sensor 1	4…20mA
P-03	Punto decimale 1	One tenth (0.0)
P-04	Setpoint 1 lower limit	0.0
P-05	Setpoint 1 upper limit	10.0
P-09	Range V/I 1 lower limit	0.0
P-10	Range V/I 1 upper limit	10.0

Password 4400		
P-01	Outputs configuration	SSR
P-28	Tune	AUTOMATIC
P-33	Cycle time	1,0 s
ATR401 automatic reset at the end of parameters loading		

Password 4600		
P-01	Outputs configuration	VALVE
P-28	Tune	AUTOMATIC
P-33	Valve time	60,0 s
ATR401 automatic reset at the end of parameters loading		

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Password 6501		
P-01	Outputs configuration	c.o1
P-88	Retransmission	Process 1
P-89	Retransmission type	4…20mA
P-90	Retransmission lower limit	-100
P-91	Retransmission upper limit	250

Password 6502		
P-01	Outputs configuration	c.o1
P-88	Retransmission	Process 1
P-89	Retransmission type	0…10V
P-90	Retransmission lower limit	-100
P-91	Retransmission upper limit	250

Password 6600		
P-02	Sensor 1	0…10V
P-04	Setpoint 1 lower limit	0
P-05	Setpoint 1 upper limit	100
P-09	Range V/I 1 lower limit	0
P-10	Range V/I 1 upper limit	100
P-11	Sensor 2	PT100
P-17	Setpoint 2 lower limit	-40
P-18	Setpoint 2 upper limit	60
P-37	Alarm 1 type	Absolute
P-38	Alarm 1 process	Process 2 (PT100)
P-39	Alarm 1 contact	n.c. start
P-86	Display 2 visualization	Process 2
P-88	Retransmission	Process 1
P-89	Retransmission type	4…20mA
P-90	Retransmission lower limit	0
P-91	Retransmission upper limit	100
ATR401 automatic reset at the end of parameters loading		

Notes / Updates

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

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.

Table of configuration parameters

82	u.FLt.	Visualization Filter	41
83	Au.MA.	Automatic / Manual	41
84	dGt.i.	Digital Input	41
85	ri.Gr.	Rising Gradient	41
86	u i.d.2	Visualization Display 2	42
87	u i.tY.	Visualization Type	42
88	rEtr.	Retransmission	42
89	rE.tY.	Retransmission Type	42
90	Lo.L.r.	Lower Limit Retransmission	42
91	uP.L.r.	Upper Limit Retransmission	42
92	bd.rt.	Baud Rate	43
93	SL.Ad.	Slave Address	43
94	SE.dE.	Serial Delay	43

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

Prima di utilizzare il dispositivo leggere con attenzione le informazioni di sicurezza e settaggio contenute in questo manuale.

CE

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