

ATR 171

Controller / Regolatore



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Introduction

Thank you for having chosen a Pixsys instrument. With ATR171 model, Pixsys integrates in a single device all options for sensors reading and actuators control, beside an useful supply with extended range 24..230 Vac/Vdc. Thanks to 17 selectable probes and outputs configurable as relay or SSR, the user or the retailer can reduce stock needs. The series includes also a model with double analogue input, serial communication RS485 ModbusRTU and linear output 0-10 V, 0/4-20 mA. The possibility to repeat 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 Identification of the model

Power supply 24..230 Vac/Vdc +/-15% 50/60 Hz – 5,5 VA

ATR171-11 ABC 1 analogue input + 1 relay 8 A + 1 SSR

ATR171-12 ABC 1 analogue input + 2 relays 8 A + 1 SSR

ATR171-14 ABC 1 analogue input + 3 relays 8 A + 1 relay 5 A (30 V)

ATR171-23 ABC-T 2 analogue input + 3 relays 8 A - 1 output SSR/V/mA+ RS485

3 Technical data

3.1 General features

Display 4 display 0,50 inches - 4 display 0,30 inches

Operating temperature Operating temperature 0-45°C - Humidity 35..95 Rh%

Protection IP54 front panel, box IP30, terminal block IP20

Material Box: Noryl UL94V1 self-extinguish
Front panel: PC ABS UL94V0 self-extinguish

Weight Approximately 250g

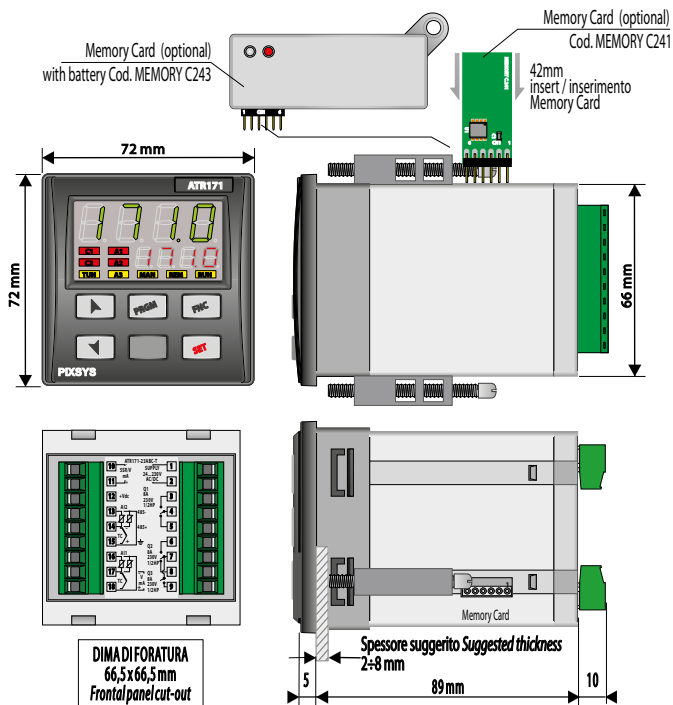
3.2 Hardware features

| | | |
|--------------------|---|---|
| Analogue input | AI1 - AI2: Configurable via software. | Tolerance (25 °C) +/-0.2% ±1 digit for thermo- couple, thermoresistance and V / mA. Cold junction accuracy 0.1 °C/°C. |
| | Input: Thermocouple type K, S, R, J. Automatic compensation of cold junction from 0..50 °C. Thermoresistances: PT100, PT500, PT1000, Ni100, PTC1K, NTC10K (β 3435K). - ONLY AI1 Input V/mA: 0-10 V, 0-20 or 4-20 mA, 0-40 mV. Input potentiometer: 6 K Ω , 150 K Ω . | Impedance: 0-10 V: Ri>110 K Ω 0-20 mA: Ri<5 Ω 4-20 mA: Ri<5 Ω 0-40 mV: Ri>1 M Ω |
| Relay output | Configurable as control and alarm output. | Contacts: Q1, Q2, Q3: 8 A - 250 V~ for resistive charges; Q4: 5 A - 30 V for resistive charges. |
| SSR/V/mA output | 1 SSR - V/mA Configurable as control output, alarm, retransmission of process or setpoint. | 12 Vdc / 30 mA. Configurable: • 0..10 V (9500 points); • 0..20 mA (7500 points); • 4..20 mA (6000 points). |
| Supply | Extended range 24..230 V AC/V DC ±15 % 50/60 Hz. | Consumption: 5.5 VA |

3.3 Software features

| | |
|-------------------------|--|
| Control algorithm | ON - OFF with hysteresis. P., P.I., P.I.D., P.D. proportional time. |
| Proportional band | 0..9999 °C or °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 alarms, protection of control and alarm setpoints, function selection from digital input, start/stop preprogrammed cycle. |

4 Dimension and installation



5 Electrical connections

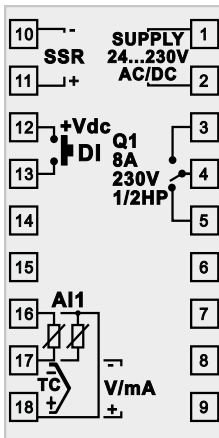


Even though this instrument has been designed to withstand the most heavy-duty disturbances in industrial environments, the following precautions should be taken:

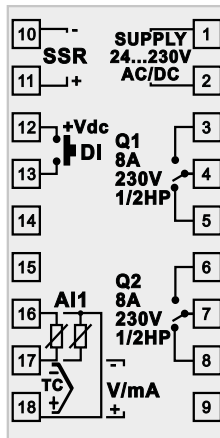
- Distinguish the supply line from the power lines.
- Keep contactor units, electromagnetic contactors and high power motors away from each other and anyway use specific filters.
- Keep power units away from each other, especially if with phase control.

5.1 Connection diagram

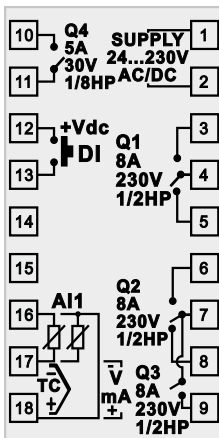
ATR171-11ABC



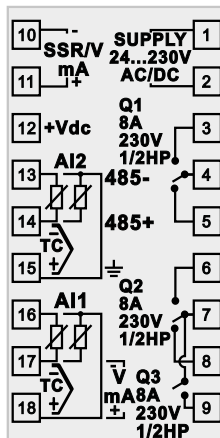
ATR171-12ABC



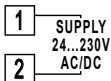
ATR171-14ABC



ATR171-23ABC-T

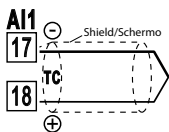


5.1.a Power supply



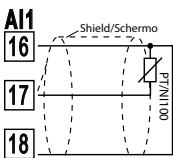
Switching supply with extended range 24..230 Vac/dc
±15% 50/60 Hz – 5,5 VA.

5.1.b Analogue input AI1



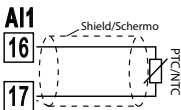
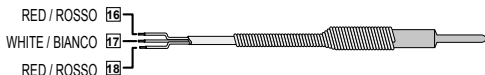
For thermocouples K, S, R, J.

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



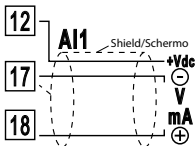
For thermoresistances PT100, NI100.

- For a three-wires connection use cables with the same diameter.
- For a two-wires connection short-circuit terminals 16 and 18.
- When shielded cable is used, it should be grounded at one side only.



For thermoresistances NTC, PTC, PT500, PT1000 and linear potentiometers.

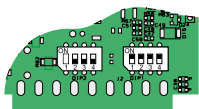
When shielded cable is used, it should be grounded at one side only.



For linear signals Volt / mA.

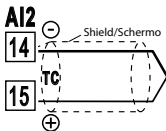
- Comply with polarity.
- When shielded cable is used, it should be grounded at one side only.

5.1.c Analogue input AI2 (only for ATR171-23ABC-T)



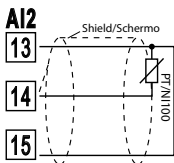
To enable the second analogue input, set the dip switches as indicated in the figure.

In this configuration the serial RS485 is **not** available.



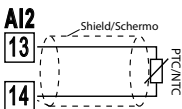
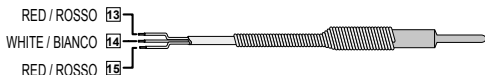
For thermocouples K, S, R, J.

- Comply with polarity.
- When extending thermocouples be 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.

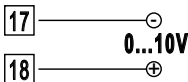
- For a three-wires connection use cables with the same diameter.
- For a two-wires connection short-circuit terminals 13 and 15.
- When shielded cable is used, it should be grounded at one side only.



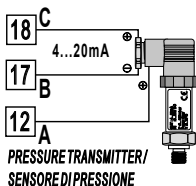
For thermoresistances NTC, PTC, PT500, PT1000 and linear potentiometers.

When shielded cable is used, it should be grounded at one side only.

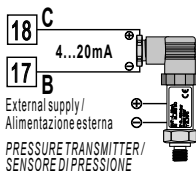
5.1.d Examples of connection for linear input



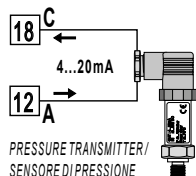
For linear signals 0..10 V.
Comply with polarity.



For linear signals 0/4..20 mA with **three-wires sensors**.
Comply with polarity:
A= Sensor supply
B= Sensor ground
C= Sensor output

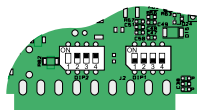


For linear signals 0/4..20 mA with **external power supply for sensor**.
Comply with polarity:
C= Sensor output
B= Sensor ground



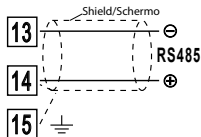
For linear signals in current 0/4..20 mA with **two-wires sensors**.
Comply with polarity:
C= Sensor output
A= Sensor supply

5.1.e Serial input (only for ATR171-23ABC-T)



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

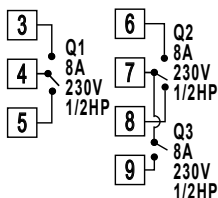
In this configuration the second analogue input is **not** available.



Communication RS485 Modbus RTU.

For networks with more than five instruments supply in low voltage.

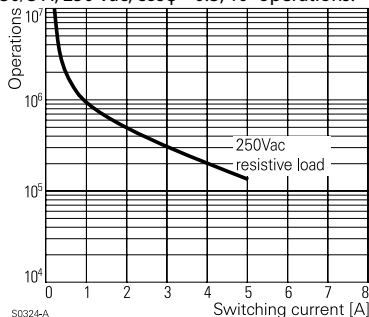
5.1.f Relay outputs Q1, Q2, Q3



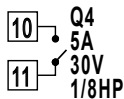
Contacts capacity:

8 A, 250 Vac, resistive charge 10^5 operations;

30/3 A, 250 Vac, $\cos\phi = 0.3$, 10^5 operations.

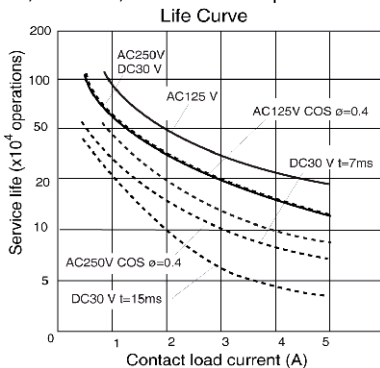


5.1.g Relay output Q4 (only for ATR171-14ABC)

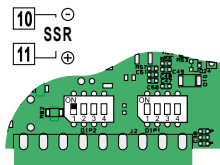


Contacts capacity:

5 A, 30 Vac/dc, resistive 18×10^4 operations.



5.1.h SSR output

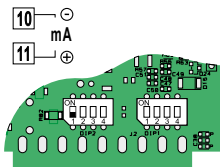


SSR Command output 12 V / 30 mA.



To use SSR output it is necessary to set channel 1 of DIP2 as indicated in the figure.

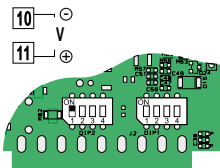
5.1.i Output mA / Volt (only for ATR171-23ABC-T)



Analogue output in mA configurable as command (Par. $c.o.u.t$) or retransmission of process-setpoint (Par. $r.E.t.r.$).



To use SSR output it is necessary to set channel 1 of DIP2 as indicated in the figure.

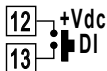


Analogue output in Volt configurable as command (Par. $c.o.u.t$) or retransmission of process-setpoint (Par. $r.E.t.r.$).



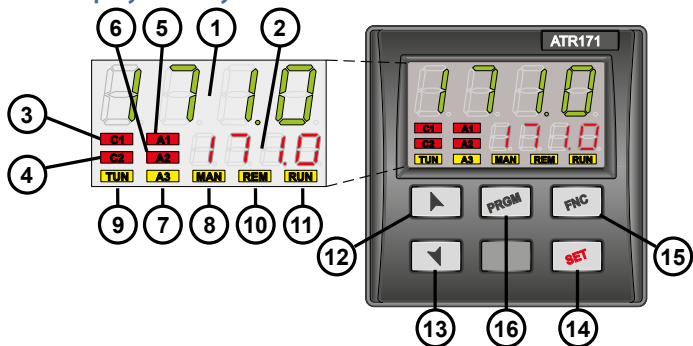
To use SSR output it is necessary to set channel 1 of DIP2 as indicated in the figure.

5.1.j Digital Input (only for ATR171-11/12/14-ABC)



Digital Input (Par. $d.i.t. i.$).

6 Display and keys functions



6.1 Numeric indicators (Display)

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

6.2 Meaning of Status Lights (Led)

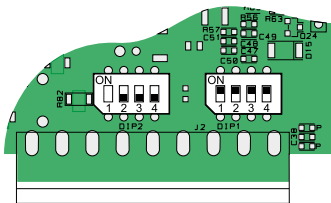
- | | | |
|----|------------|--|
| 3 | C1 | On when command output is active. For open / close logic: on during valve opening. |
| 4 | C2 | For open/ close logic: on during valve closing. |
| 5 | A1 | On when alarm 1 is active. |
| 6 | A2 | On when alarm 2 is active. |
| 7 | A3 | On when alarm 3 is active. |
| 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. |
| 11 | RUN | On when counting of Timer function is active. |

6.3 Keys

- | | |
|----------------|---|
| 12 ▲ | <ul style="list-style-type: none">Increases main setpoint.In configuration mode allows to scroll and modify parameters.Press after SET key increases alarm setpoints or time value of timer. |
| 13 ▼ | <ul style="list-style-type: none">Decreases main setpoint.In configuration mode allows to scroll and modify parameters.Press after SET key decreases alarm setpoints or time value of timer. |
| 14 SET | <ul style="list-style-type: none">Allows to visualize alarm setpoints or time value of Timer.In configuration mode allows to access the parameter to change and confirm its modification. |
| 15 FNC | <ul style="list-style-type: none">Allows to enter tuning launch, selection automatic / manual.In configuration mode operates as exit key (ESCAPE).If <i>u.n.l.p.</i> other than <i>d.5.</i>, it is possible to modify parameters of pre-programmed cycle. |
| 16 PRGM | <ul style="list-style-type: none">If pressed allows to enter configuration password.In configuration mode assigns at selected parameter a mnemonic code or a number.Starts or stops timer counting.It allows to reset alarms if programmed for manual reset. |

7 Dual input mode (only for ATR171-23ABC-T)

To enable second input it is necessary to set dip switches as indicated in the figure.



In this configuration some parameters and functions are not available. For example: RS485 serial, preprogrammed cycle and soft-start function are disabled.

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

When second input is enabled (par. 9 $5E_{n.2}$ other than d_{i5}) it is possible to choose the process value to be related to command output, to alarms and to retransmission. Following options are available:

- $P_{r_{o.1}}$: Value read by input AI1;
- $P_{r_{o.2}}$: Value read by input AI2;
- \overline{MEAN} : Mean between inputs AI1 and AI2;
- d_{iFF} : Difference between inputs: AI1-AI2;
- $\overline{ABS.d.}$: Difference between inputs AI1-AI2 as absolute value.
- Process related to command output must be set on parameter 15 $c.P_{r_{o.}}$.
- Process related to alarms must be set on par. 34 $R_{iPr.}$ for alarm 1, on par. 43 $R_{i2Pr.}$ for alarm 2 and on par. 52 $R_{i3Pr.}$ for alarm 3.
- Value to retransmit must be set on par. 79 $rEt_{r.}$.

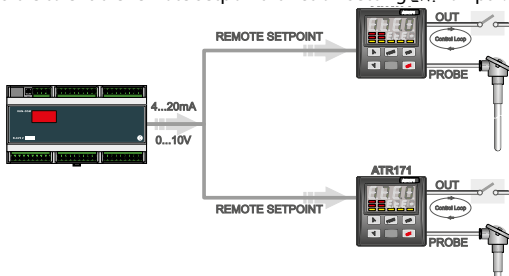
It is possible to choose the visualization for display 2 on parameter 77 $u_{i.d.2}$.



Mean and difference are available only if both inputs are configured for temperature sensors.

7.2 Remote setpoint

It is possible to enable remote setpoint function setting $E_{n.}$ on par. 16 $rE_{n.5}$.



In this configuration the value read by one of the two inputs becomes the main control setpoint:



- If par. 15 $c.P_{r_{o.}}$ is set as $P_{r_{o.1}}$, AI1 becomes the main process (command) and AI2 becomes the setpoint value;
- If par. 15 $c.P_{r_{o.}}$ is set as $P_{r_{o.2}}$, AI2 becomes the main process (command) and AI1 becomes the setpoint value.

Remote setpoint function works only with one of these two settings of par. 15 $c.P_{r_{o.}}$.

8 Controller functions

8.1 Modification of main and alarm setpoint value

Setpoint value can be modified from keyboard as follows:


| | | | |
|---|---|--|---|
| 1 |  | Value on display 2 changes | Increase or decrease main setpoint value |
| 2 | SET | Visualizes alarm setpoint on display 1 | |
| 3 |  | Value on display 2 changes | Increase or decrease alarm setpoint value |

8.2 Auto-tuning

Tuning procedure to calculate regulation parameters can be manual or automatic and selected from parameter 24 t_{UNE} .


8.3 Manual Tuning

Manual procedure allows user more flexibility on deciding when to update regulation parameters of P.I.D. algorithm.

Press **FNC** key until display 1 visualizes writing t_{UNE} 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 determined by setpoint value minus "Set Deviation Tune" value (see parameter 25 $S.d.t_U$).




To interrupt Tuning keeping the P.I.D. values unchanged, press key **FNC** until display 1 visualizes writing t_{UNE} and display 2 visualizes ON . Pressing , display 2 visualizes OFF , led **TUN** switches off and procedure ends.

Setting $ONCE$ on parameter 24 t_{UNE} autotuning procedure starts only once when instrument is switched on: after calculating P.I.D. parameters parameter 24 t_{UNE} returns to $d.5$.

8.5 Automatic / manual regulation of % control output

This function allows to switch from automatic functioning to manual control of output percentage.

With parameter 71 $R_U.P.A.$, it is possible to select two modes.

- The first selection** (E_n): pressing key **FNC** display 1 visualizes writing $P----$, while display 2 visualizes $R_U.t.d.$. Press  to select manual mode MAN . With  and  change output percentage. To return to automatic mode with the same procedure, select $R_U.t.d.$ on display 2: led **MAN** switches on and operation returns to automatic mode.
- The second selection** ($E_n.5t$): enables 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.

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 $73 r_i \dot{C}_r$; at next switch-on the controller will execute Soft Start function.

In model ATR171-23ABC-T the Soft-Start function may be enabled only if dip-switches are configured for serial communication (AI2 disabled). Automatic tuning does not work when only the par. $73 r_i \dot{C}_r$ is different from 0. If parameter $75 \Pi R_{t_i}$ is different from 0 and parameter $24 t_{unE}$ is set on R_{uE} the tuning starts when Soft-Start time is finished, while if parameter $24 t_{unE}$ is set on ΠR_n the tuning can be started at anytime.

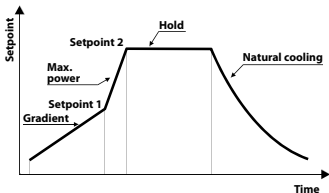
8.7 Pre-programmed cycle

This function allows to program a simple working cycle on time basis, and can be enabled setting $P_{r.Cy}$ on parameter $70 oP_{\Pi o}$: process reaches setpoint1 according to gradient set on parameter $73 \dot{C}_r R_d$, then it reaches setpoint2 with the maximum power.

Once reached setpoint2, process is hold for the time set on parameter $75 \Pi R_{t_i}$. At expiry, process reaches environmental temperature according to gradient set on parameter $74 FR_{\dot{C}_r}$ and then command output is disabled and controller visualizes $S_{t o P}$.

It is possible to handle Start/Stop also by digital input

It is also possible to modify parameters of pre-programmed cycle from user menu setting parameter $76 u_{\Pi.C.P}$. To start modification, press **FNC**.



Cycle starts at each activation of the controller, or via digital input if it is enabled for this type of functioning (see parameter $72 d\dot{C}_t_i$).

Automatic tuning never works, but if parameter $24 t_{unE}$ is set on ΠR_n , the tuning can be started at anytime.

In model ATR171-23ABC-T the pre-programmed cycle function may be enabled only if dip-switches are configured for serial communication (AI2 disabled).

8.8 Memory Card (optional)

Parameters and setpoint values can be easily copied from one controller to others using the Memory Card. Two modes are available:

- 1 With the controller connected to the power supply.** Insert Memory card when the controller is off. At switch-on display 1 visualizes $\Pi E \Pi \square$ and display 2 visualizes ---- (only if correct values are stored on Memory). Pressing \blacktriangle display 2 visualizes $L \square R d$. Confirm with **FNC**. Controller loads news values and restarts.
- 2 With the controller not connected to power supply.** The memory card is equipped with an internal battery with an autonomy of about 1000 uses. 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.



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 controller¹. Enter configuration and change at least one parameter. Exit configuration. Changes are saved automatically.

8.9 LATCH-ON function

For use with input $P_{\square 1}$ (potentiometer 6 K Ω) and $P_{\square 2}$ (potentiometer 150 K Ω) and with linear input (0..10 V, 0..40 mV, 0/4..20 mA), you can associate start value of the scale (parameter 4 $L \square L \square$) to the minimum position of the sensor and value of the scale end (parameter 7 $\square P L \square$) to the maximum position of the sensor (parameter 8 $L R E c$. configured as $S t d$).

It is also possible to fix the point in which the controller will display 0 (however keeping the scale range between $L \square L \square$ and $\square P L \square$)

using the "virtual zero" option by setting $\square \square S t$ or $\square \square i n$ in parameter 8 $L R E c$.

If you set $\square \square i n$, the virtual zero will reset after each activation of the tool;

if you set $\square \square S t$, the virtual zero remains fixed once tuned.

To use the LATCH ON function configure as you wish the parameter $L R E c$ ².

For the calibration procedure refer to the following table:

| | Press | Display | Do |
|---|----------------------|--|--|
| 1 | FNC | Exit parameters configuration. Display 2 visualizes writing $L R E c$. | Place the sensor on minimum operating value (corresponding to $L \square L \square$). |
| 2 | \blacktriangledown | Store value on minimum. Display shows $L \square L$. | Place sensor on maximum operating value (corresponding to $\square P L \square$). |

¹ If on activation the controller does not display $\Pi E \Pi \square$ it means no data have been saved on the memory card, but it is possible to update values.

² Calibration procedure starts by exiting configuration after parameter change.

| | Press | Display | Do |
|---|------------|--|--|
| 3 | ▲ | Store value on max. Display shows $H_i U_h$. | To exit standard proceeding press FNC . For "virtual zero" setting, place the sensor to zero point. |
| 4 | SET | Set the virtual zero. Display shows $u i r t . .$ N.B.: If $u . 0 i n .$ is selected, the procedure must be executed at each start | To exit procedure press FNC . |



8.10 Timer function

To enable a timer with time value selectable by the user, configure parameter 60 $t n r f$ as follows:

- $n n . 5 5$: Timer with time base in seconds (mm.ss);
- $h h . n n$: Timer with time base in minutes (hh.mm).

To modify counting time duration, follow the steps below:

| | Press | Display | Do |
|---|------------|---|--|
| 1 | SET | Press until $t n r .$ is visualized on display 1. | |
| 2 | ▲▼ | Value on display 2 changes | Increase or decrease time value of selected Timer. |

To start or stop timer press **PRGM** or act via digital input if parameter 72 $d u t . i .$ is selected as $t n r . i .$

During counting led **RUN** is on and display 2 visualizes decrementing time.

At expiry of Timer led **RUN** turns off and display 2 blinks showing time value until a key is pressed.

8.11 Digital input functions (only for ATR171-11/12/14ABC)

Select chosen function on parameter 72 $d u t . i .$ (par. 70 $o p . n o .$, must be set on $\epsilon o n t .$).

- $5 t . 5 t .$: Start of Pre-programmed cycle (See par. 8.7);
- $r n . n . o . o r n . n . c .$: enables regulation;
- $L . c . n . o . o L . c . n . c .$: (Hold Function) allows to lock sensors reading when digital input is active. It's useful when measure oscillates on less significant values. During hold phase display 2 blinks showing $L R t c . .$
- $t u n E$: enable / disables Tuning by digital input if par. 24 $t u n E$ is set on $n n . .$
- $R . n r . i . o R . n r . c .$: switch from automatic to manual mode if parameter 71 $R u . n r .$ is set on $E n .$ or $E n . 5 t . .$

- tP.r. i. : start / stop of Timer function (See par. 8.10);

The parameter 70 oP. n. o. , enable other functions to use digital input:

- $P.r. c. y.$: Pre-programmed cycle (See par. 8.7);
- 2t.5. i. , 2t.5. i. , 3t.5. i. , 4t.5. i. : It's possible to use digital input for setpoint change function. This mode allows to recall 2 to 4 thresholds / setpoints by external button without pressing the arrow keys during operation. The setpoints can be entered during operation pressing **SET** key.

8.12 Heating-Cooling P.I.D.

ATR171 is suitable also for also for applications requiring a combined heating-cooling P.I.D. action.

Command output has to be configured as heating P.I.D. ($A_{c.t.t.} = hERt$ and $P.b.$ greater than 0), and one of alarms ($AL. 1$, $AL. 2$ or $AL. 3$) has to be configured as $c.o.o.L.$. 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:

$A_{c.t.t.} = hERt$ 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):

$AL. 1 = c.o.o.L.$ Alarm 1 selection (Cooling);

$P.b. n.$: Proportional band multiplier;

$o.u.d.b.$: Overlapping / dead band;

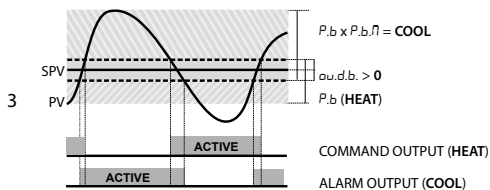
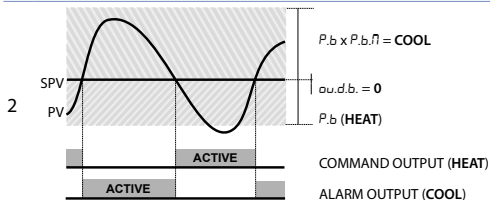
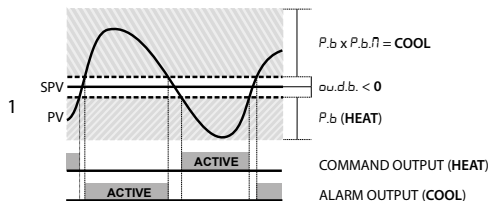
$c.o.t.c.$: Cycle time Cooling.

Parameter $P.b. n.$ (that ranges from 1.00 to 5.00) sets the proportional band for cooling action, according to the formula here below:

Proportional band for cooling action = $P.b. \times P.b. n.$.

In this way it is possible to have a proportional band for cooling action that will be equal to heating proportional band if $P.b. n. = 1.00$, or 5 times greater if $P.b. n. = 5.00$. Integral time and derivative time are the same for both actions.

Parameter $o.u.d.b.$ 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 ($o.u.d.b. \leq 0$), vice versa an overlapping will be configured ($o.u.d.b. > 0$). Figure here below shows an example of double action P.I.D. (heating-cooling) with $t.i. = 0$ and $t.d. = 0$.



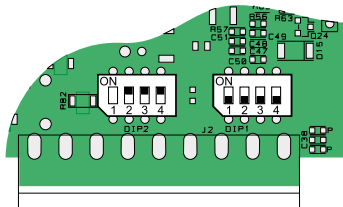
Parameter $c.o.t.c.$ has the same meaning of cycle time for heating action $t.c.$.
Parameter $c.o.o.f.$ (Cooling Fluid) pre-selects the proportional band multiplier $P.b.n$, and the cooling P.I.D. cycle time $c.o.t.c.$ according to cooling fluid type:

| $c.o.o.f.$ | Cooling fluid type | $P.b.n$ | $c.o.t.c.$ |
|------------------|--------------------|---------|------------|
| Air | Air | 1.00 | 10 |
| Oil | Oil | 1.25 | 4 |
| H ₂ O | Water | 2.50 | 2 |

Once parameter $c.o.o.f.$ has been selected, the parameters $P.b.n$, $o.u.d.b.$ and $c.o.t.c.$ can be however modified.

9 Serial communication (only for ATR171-23ABC-T)

To enable serial input set the dip switches as indicated in the figure:



In this configuration mode, parameters and functioning related to double analogue input are not available.

9.1 Modbus RTU

ATR171-23ABC-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 (SCADA).

Each instrument will answer to a Master query only if contains same address as on parameter 84 *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. ATR171 can introduce an answer delay (in milliseconds) to Master request. This delay has to be set on parameter 85 *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.

N.B.: Modifications made to Words different from those described in the following table can lead to instrument malfunction.

Modbus RTU protocol features

| | | |
|---------------------|---|---------------------|
| | Selectable on parameter 83 <i>bd.rE.</i> | |
| Baud-rate | 4.8 ↯ 4800 bit/sec | 9.6 ↯ 9600bit/sec |
| | 19.2 ↯ 19200bit/sec | 28.8 ↯ 28800bit/sec |
| | 38.4 ↯ 38400bit/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 | Description | 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: | R/W | 0 |
| | 9999 restore all values | | |
| | 9998 restore all values except for baud-rate and slave address | | |
| | 9997 restore all values except for baud-rate | | |
| 1000 | 9996 restore all values except for slave address | RO | ? |
| | Process (degrees with tenths of degree for temperature sensors; digits for linear sensors) | | |
| 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) | RO | 0 |
| | Bit 0 = SSR Bit 2 = Relay Q2 | | |
| | Bit 1 = Relay Q1 Bit 3 = Relay Q3 | | |
| 1010 | Heating output percentage (0-10000) | RO | 0 |
| 1011 | Heating output percentage (0-10000) | RO | 0 |
| 1012 | Alarms status (0 = None, 1 = Active) | RO | 0 |
| | Bit 0 = Alarm 1 | | |
| | Bit 1 = Alarm 2 | | |
| 1013 | Bit 2 = Alarm 3 | WO | 0 |
| | Manual reset: write 0 to reset all alarms. | | |
| | In reading (0 = Not resettable, 1 = Resettable): | | |
| | Bit 0 = Alarm 1 | | |
| 1014 | Bit 1 = Alarm 2 | RO | 0 |
| | Bit 2 = Alarm 3 | | |
| | Error flags | | |
| | Bit 0 = Eeprom writing error | | |
| | Bit 1 = Eeprom reading error | | |
| | Bit 2 = Cold junction error | | |
| | Bit 3 = Error AI1 (probe 1) | | |

| Modbus address | Description | Read Write | Reset value |
|----------------|--|------------|-------------|
| | Bit 4 = Error AI2 (probe 2) | | |
| | Bit 5 = Generic error | | |
| | Bit6 = Hardware error | | |
| | Bit 7 = Missing calibration error | | |
| 1024 | Bit 8 = Incongruous control parameters | RO | 0 |
| | Bit 9 = Incongruous alarm parameters | | |
| | Bit 10 = Incongruous retransmission par. | | |
| | Bit 11 = Incorrect visualization parameters error | | |
| | Bit 12 = Incorrect remote setpoint par. error | | |
| 1015 | Cold junction temperature (with decimal point) | 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 | OFF LINE* time (milliseconds) | R/W | 0 |
| 1100 | Process with decimal point | RO | ? |
| 1101 | Setpoint 1 with decimal point | RW | EEPROM |
| 1102 | Setpoint 2 with decimal point | RW | EEPROM |
| 1103 | Setpoint 3 with decimal point | RW | EEPROM |
| 1104 | Setpoint 4 with decimal point | R/W | EEPROM |
| 1105 | Alarm 1 with decimal point | R/W | EEPROM |
| 1106 | Alarm 2 with decimal point | RW | EEPROM |
| 1107 | Alarm 3 with decimal point | RW | EEPROM |
| 1108 | Setpoint gradient with decimal point | RO | EEPROM |
| 1109 | Percentage heating output (0-1000) | R/W | 0 |
| 1110 | Percentage heating output (0-100) | RW | 0 |
| 1111 | Percentage cooling output (0-1000) | RO | 0 |
| 1112 | Percentage cooling output (0-100) | RO | 0 |
| 2001 | Parameter 1 | R/W | EEPROM |
| ... | ... | ... | ... |
| 2085 | Parameter 85 | R/W | EEPROM |
| 4001 | Parameter 1** | R/W | EEPROM |
| ... | ... | ... | ... |
| 4085 | Parameter 85 | R/W | EEPROM |

* If it is 0, control is disabled. If it is different from 0, it is "maximum time that can elapse between two pollings before the controller goes off-line". If it goes Off-line, the controller goes to Stop mode, the control output is disabled, but the controllers keeps alarms activated.

** Parameters changed using serial address from 4001 to 4085 are saved in eeprom only after 10" after the last writing of parameters.

10 Configuration

10.1 Modify configuration parameters

For configuration parameters see next paragraph.

| | Press | Display | Do |
|---|-------------------------|--|--|
| 1 | PRGM for 3s. | Display 1 shows 0.000 with 1st digit flashing, while display 2 shows <i>PASS</i> . | |
| 2 | ▲ ▼ | Modify flashing digit and move to next digit with SET . | Enter password: 1234. |
| 3 | PRGM to conf. | Display 1 shows first parameter and second display shows its value. | |
| 4 | ▲ ▼ | Scroll parameters. | |
| 5 | PRGM | Allows to pass from mnemonic parameter code to the numeric one and viceversa. | |
| 6 | SET | Allows parameter modification (display 2 flashes). | |
| 7 | ▲ ▼ | Increases or decreases visualized value. | Introduce new data that will be stored when keys are released. |
| 8 | SET | Confirms data entering (display 2 stops flashing). | To change another parameter return to point 4. |
| 9 | FNC | End of parameters modification. Controller esc from programming mode. | |

10.2 Loading default values

This procedure allows to restore default settings of the instrument.

| | Press | Display | Do |
|---|---------------------------|---|-----------------------------------|
| 1 | PRGM for 3s. | Display 1 visualizes 0.000 with 1st digit blinking, while display 2 shows <i>PASS</i> . | |
| 2 | ▲ ▼ | Changes blinking digit and moves to the next one with SET . | Enter password: 9999. |
| 3 | PRGM to confirm | Device loads default settings. | Switch the instrument off and on. |

11 Table of configuration parameters

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

1 *c.out* Command Output

Command output type selection

c. ol **Default**

c.uAL Command of open-loop valves

c.SSr SSR command (voltage)

c.4.20 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

ATR171-11ABC

| | Command | Alarm 1 |
|--------------|------------------------|---------|
| <i>c. ol</i> | Q1 | SSR |
| <i>c.uAL</i> | Q1 (open) - Q2 (close) | - |
| <i>c.SSr</i> | SSR | Q1 |

ATR171-12ABC

| | Command | Alarm 1 | Alarm 2 |
|--------------|------------------------|---------|---------|
| <i>c. ol</i> | Q1 | Q2 | SSR |
| <i>c.uAL</i> | Q1 (open) - Q2 (close) | SSR | - |
| <i>c.SSr</i> | SSR | Q1 | Q2 |

ATR171-14ABC

| | Command | Alarm 1 | Alarm 2 | Alarm 3 |
|--------------|------------------------|---------|---------|---------|
| <i>c. ol</i> | Q1 | Q2 | Q3 | Q4 |
| <i>c.uAL</i> | Q1 (open) - Q2 (close) | Q1 | Q4 | - |

ATR171-23ABC-T

| | Command | Alarm 1 | Alarm 2 | Alarm 3 |
|---------------|------------------------|---------|---------|---------|
| <i>c. ol</i> | Q1 | Q2 | Q3 | SSR |
| <i>c.uAL</i> | Q1 (open) - Q2 (close) | Q1 | SSR | - |
| <i>c.SSr</i> | SRR | Q1 | Q2 | Q3 |
| <i>c.4.20</i> | 4...20mA | Q1 | Q2 | Q3 |
| <i>c.0.20</i> | 0...20mA | Q1 | Q2 | Q3 |
| <i>c.0.10</i> | 0...10V | Q1 | Q2 | Q3 |

2 **SEn.1** Sensor 1

Analogue input configuration / sensor selection (AI1).

| | | |
|----------|---|---------------|
| d.S. | Disabled (Default) | |
| t.c. t | Tc-K | -260..1360 °C |
| t.c. S | Tc-S | -40..1760 °C |
| t.c. r | Tc-R | -40..1760 °C |
| t.c. J | Tc-J | -200..1200 °C |
| Pt | PT100 | -200..600 °C |
| Pt 1 | PT100 | -200..140 °C |
| n i | NI100 | -60..180 °C |
| n t c | NTC10K | -40..125 °C |
| P t c | PTC1K | -50..150 °C |
| P t S | PT500 | -100..600 °C |
| P t 1 t | PT1000 | -100..600 °C |
| 0. 10 | 0..10 Volt | |
| 0. 20 | 0..20 mA | |
| 4. 20 | 4..20 mA | |
| 0. 40 | 0..40 mVolt | |
| P o t. 1 | Potentiometer max 6 Kohm (full scale) | |
| P o t. 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 **L0L.1** Lower Linear Input 1

AI1 lower range limit only for linear signals

-999..+9999 digit³ (degrees if temperature), **Default:** 0

5 **uPL.1** Upper Limit Input 1

AI1 upper limit setpoint

-999..+9999 digit³ (degrees if temperature), **Default:** 1750

6 **o.c.A.1** Offset Calibration 1

Offset AI1 calibration. Value added/subtracted to visualized process value (normally used to correct ambient temperature value)

-999..+1000 digit³ for linear sensors and potentiometers.

-99.9..+100.0 tenths for temperature sensors, **Default:** 0.0.

³ The display of the decimal point depends on the setting of parameter **SEn.** and **d.P. 1** or **SEn.2** and **d.P. 2**.

7 G.c.A.1 Gain Calibration 1

AI1 gain calibration. % value multiplied with displayed value to calibrate process value. -99.9%..+100.0%, **Default:** 1000

Example: to correct a scale 0...1000°C which is showing 0...1010°C, enter -1.0 on this parameter

8 L.t.c.1 Latch-On

Automatic setting of limits for linear input.

d.i.s. Disabled. **Default**

S.t.d. Standard

v.05t. Virtual Zero Stored (*See par. 8.9*)

v.0i.n. Virtual Zero Initialized (*See par. 8.9*)

9 S.E.n.2 Sensor 2

Analogue input 2 configuration / sensor selection AI2. Select dip-switches as indicated on 5.1.c.

d.i.s. Disabled (**Default**)

t.c. t Tc-K -260..1360 °C

t.c. S Tc-S -40..1760 °C

t.c. r Tc-R -40..1760 °C

t.c. J Tc-J -200..1200 °C

P.t PT100 -200..600 °C

P.t i PT100 -200..140 °C

n.i NI100 -60..180 °C

n.t.c NTC10K -40..125 °C

P.t.c PTC1K -50..150 °C

P.t5 PT500 -100..600 °C

P.t It PT1000 -100..600 °C

10 d.P. 2 Decimal Point 2

Select decimal type visualized for analogue input 2.

0 **Default**

0.0 1 Decimal

11 a.c.A.2 Offset Calibration 2

Offset AI1 calibration. Number added to visualized process value (normally correcting environment temperature value) (only on **ATR171-24ABC-T**)

-99.9..+100.0 tenths of degree. **Default:** 0.0

12 G.c.A.2 Gain Calibration 2

AI2 Gain calibration. % Value multiplied with displayed value to calibrate process value. -99.9%..+100.0%, **Default:** 1000

ex: if input value is 0..1010°C and visualization is expected to be 0..1000°C set parameter as -1.0

13 *Lo.L.S.* Lower Limit Setpoint

AI lower limit selectable for setpoint.

-999..+9999 digit⁴ (degrees if temperature), **Default:** 0.

14 *u.P.L.S.* Upper Limit Setpoint 2

AI2 upper limit setpoint.

-999..+9999 digit⁴ (degrees if temperature), **Default:** 1750.

15 *c.Pro.* Command Process

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

Pro.1 Process 1 (**Default**)

Pro.2 Process 2

MEAN Process mean

dIFF. Processes difference

ABS.d. Processes difference as absolute value

16 *r.EN.S.* Remote Setpoint

Enables remote setpoint. Command setpoint is the secondary process. It works if *Pro.1* or *Pro.2* is selected on parameter *c.Pro.*

d.S. Disabled (**Default**)

En. Enabled

17 *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.

18 *c.HY.* Command Hysteresis

Hysteresis in ON / OFF or dead band in P.I.D.

-999..+999 digit⁴ (tenth of degree if temperature), **Default:** 0.0.

19 *c.rE.* Command Rearmament

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

R.rE. Automatic Reset (**Default**)

π.rE. Manual reset with **PRGM.**

π.rE.S. Manual reset stored. (keeps relay status also after an eventual power failure)

⁴ The display of the decimal point depends on the setting of parameter *SEn.* and *d.P. 1* or *SEn.2* and *d.P. 2*.

20 c. SE. Command State Error

Contact state for command output in case of error

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

c.c. Closed contact

21 c. Ld. Command Led

Defines led OUT1 state corresponding to relevant contact

c.o. ON with open contact

c.c. ON with closed contact (**Default**)

22 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.

23 c. S.P. Command Setpoint Protection

Allows/prevents changes to command setpoint value by keyboard

FrEE Modification allowed (**Default**)

LoCt Protected

24 t.u.nE Tune

Autotuning type selection

d.i.S. Disabled (**Default**)

RuLo Automatic (P.I.D. parameters calculation at each activation and / or each change)

πRn. Manual (launch by keyboards or by digital input)

oNcE Once (P.I.D. parameters calculation only at first start)

25 S.d.t.u. Setpoint Deviation Tune

Selects deviation from command setpoint as threshold used by autotuning to calculate P.I.D. parameters

0..5000 digit⁵ (tenth of degree if temperature), **Default:** 10.0.

26 P.b. Proportional Band

Process inertia in units (example: °C if temperature)

0 ON / OFF if also t. r. is equal to 0 (**Default**).

1..9999 digit⁵ (tenth of degree if temperature).

⁵ The display of the decimal point depends on the setting of parameter SE.n. and d.P. 1 or SE.n.2 and d.P. 2.

27 *t.i.* Integral Time

Process inertia in seconds

0.0..999.9 seconds. 0 integral disabled, **Default:** 0

28 *t.d.* Derivative Time

Normally ¼ of integral time.

0.0..999.9 seconds. 0 derivative disabled, **Default:** 0

29 *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

30 *l.l.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 *l.l.o.p.* set at 10%, command output can change from a min. of 1 V to a max. of 10 V.

31 *u.l.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 *u.l.o.p.* selected as 90%, command output may vary between 0V and max. 9 V

32 *dEGr.* Degree

Select degree type.

°C Centigrade (**Default**)

°F Fahrenheit

33 *AL. 1* Alarm 1

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

d.i.s. 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

t.run Timer run

t.End Timer end

34 *R.1.P.r.* Alarm 1 Process

Select value correlated to alarm 1

Pro.1 Process 1 (**Default**)

Pro.2 Process 2

MEAN Processes mean

diff. Processes difference

Abs.d. Processes difference as absolute value

35 *R.1.S.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 reaching⁶

n.c. t. (N.C. threshold) Normally closed, active from alarm reaching⁶

36 *R.1.H.y.* Alarm 1 Hysteresis

-999..+999 digit⁷ (tenths of degree if temperature), **Default:** 0.0.

37 *R.1.r.E.* Alarm 1 Rearmament

Type of reset for contact of alarm 1

R.r.E. Automatic Reset (**Default**)

r.r.E. Manual reset with **PRGM.**

r.r.E.S. Manual reset stored. (keeps relay status also after an eventual power failure)

38 *R.1.S.E.* Alarm 1 State Error

Contact status for alarm 1 output in case of error

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

c.c. Closed contact

39 *R.1.L.d.* Alarm 1 Led

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

c.o. ON with open contact

c.c. ON with closed contact (**Default**)

40 *R.1.d.E.* Alarm 1 Delay

-600..+600 seconds.

Negative: delay at exit from alarm.

Positive: delay at starting of alarm.

Default: 0.

⁶ On activation, the output is inhibited if the controller is in alarm mode. Activates only if alarm condition reappears, after that it was restored.

⁷ The display of the decimal point depends on the setting of parameter *SEn.1* or *SEn.2* and *d.P. 2*.

41 *R.I.S.P.* Alarm 1 Setpoint Protection

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

| | |
|-------------|---|
| <i>FrEE</i> | Modification allowed (Default) |
| <i>LoCF</i> | Protected |
| <i>HiDE</i> | Protected and not visualized |

42 *AL. 2* Alarm 2

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

| | |
|----------------|---|
| <i>dis.</i> | Disabled (Default) |
| <i>A.AL.</i> | Absolute alarm, referring to process |
| <i>b.AL.</i> | Band alarm |
| <i>H.d.AL.</i> | Upper deviation alarm |
| <i>L.d.AL.</i> | Lower deviation alarm |
| <i>A.c.AL.</i> | Absolute alarm, referring to command setpoint |
| <i>St.AL.</i> | Status alarm (active in Run / Start) |
| <i>cool</i> | Cooling action |
| <i>t.run</i> | Timer run |
| <i>t.End</i> | Timer end |

43 *R.2.Pr.* Alarm 2 Process

Selects value related to alarm 2

| | |
|---------------|--|
| <i>Pro.1</i> | Process 1 (Default) |
| <i>Pro.2</i> | Process 2 |
| <i>MEAN</i> | Processes mean |
| <i>dIFF.</i> | Processes difference |
| <i>ABS.d.</i> | Processes difference as absolute value |

44 *R.2.S.o.* Alarm 2 State Output

Alarm 2 output contact and type of action

| | |
|----------------|---|
| <i>n.o. S.</i> | (N.O. start) Normally open, active from Start (Default) |
| <i>n.c. S.</i> | (N.C. start) Normally closed, active from Start |
| <i>n.o. t.</i> | (N.O. threshold) Normally open, active from alarm reaching ⁸ |
| <i>n.c. t.</i> | (N.C. threshold) Normally closed, active from alarm reaching ⁸ |

45 *R.2.HY.* Alarm 2 Hysteresis

-999..+999 digit⁹ (tenth of degree if temperature), **Default:** 0.0.

⁸ On activation, the output is inhibited if the controller is in alarm mode. Activates only if alarm condition reappears, after that it was restored.

⁹ The display of the decimal point depends on the setting of parameter *SEn.* and *d.P.* 1 or *SEn.2* and *d.P.* 2.

46 *A.2.rE.* Alarm 2 Rearmament

Type of reset for alarm 2 contact

A.rE. Automatic Reset (**Default**)

Π.rE. Manual reset with **PRGM**.

Π.rE.S. Manual reset stored. (keeps relay status also after an eventual power failure)

47 *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

48 *A.2.L.d.* Alarm 2 Led

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

c.o. ON with open contact

c.c. ON with closed contact (**Default**)

49 *A.2.dE.* Alarm 2 Delay

Ritardo allarme 2

-600..+600 seconds.

Negative: delay at exit from alarm

Positive: delay at starting of alarm. **Default: 0.**

50 *A.2.S.P.* Alarm 2 Setpoint Protection

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

FrEE Modification allowed (**Default**)

LoCt Protected

HiDc Protected and not visualized

51 *AL. 3* Alarm 3

Alarm 3 selection. Alarm intervention is associated to AL3 (*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

t.run Timer run

t.End Timer end

52 *A.3.Pr.* Alarm 3 Process

Selects value correlated to alarm 3

Pro.1 Process 1 (**Default**)

Pro.2 Process 2

MEAN Processes mean

diff. Processes difference

Abs.d. Processes difference as absolute value

53 *A.3.5.o.* Alarm 3 State Output

Alarm 3 output contact and type of action

n.o. 5. (N.O. start) Normally open, active from start (**Default**)

n.c. 5. (N.C. start) Normally closed, active from start

n.o. t. (N.O. threshold) Normally open, active from alarm reaching¹⁰

n.c. t. (N.C. threshold) Normally closed, active from alarm reaching¹⁰

54 *A.3.HY.* Alarm 3 Hysteresis

-999..+999 digit¹¹ (tenths of degree if temperature), **Default:** 0.0.

55 *A.3.rE.* Alarm 3 Rearmament

Type of reset for alarm 3 contact

r.E. Automatic Reset (**Default**)

Pr.E. Manual reset with **PRGM.**

Pr.E.S. Manual reset stored. (keeps relay status also after an eventual power failure)

56 *A.3.5.E.* Alarm 3 State Error

Contact status for alarm 3 output in case of error

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

c.c. Closed contact

57 *A.3.Ld.* Alarm 3 Led

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

c.o. ON with open contact

c.c. ON with closed contact (**Default**)

58 *A.3.dE.* Alarm 3 Delay

-600..+600 seconds.

Negative: delay at exit from alarm.

Positive: delay at starting of alarm. **Default:** 0.

¹⁰ On activation, the output is inhibited if the controller is in alarm mode. Activates only if alarm condition reappears, after that it was restored.

¹¹ The display of the decimal point depends on the setting of parameter *SEn.* and *d.P. 1* or *SEn.2* and *d.P. 2*.

59 *R.3.5.P.* Alarm 3 Setpoint Protection

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

FrEE Modification allowed (**Default**)

LoCF Protected

HiDE Protected and not visualized

60 *tPrF* Timer functions

Enabling timer function and select time base (*See par. 8.10*)

d i S. (**Default**)

nn.SS Timer with time base in seconds

HH.nn Timer with time base in minutes

63 *COO.F.* Cooling Fluid

Type of refrigerant fluid for heating / cooling P.I.D.

Air Air (**Default**)

Oil Oil

H2O Water

64 *P.b.n.* Proportional Band Multiplier

Proportional band for cooling action is given by parameter 18 multiplied for this parameter

1.00..5.00

Default: 1.00

65 *ov.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

66 *CO.t.c.* Cooling Cycle Time

Cycle Time for Cooling output

1..300 seconds

Default: 10

67 *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.n. 2 Samples Mean (Mean with 2 samples)

3. S.n. 3 Samples Mean

4. S.n. 4 Samples Mean

| | |
|---------|------------------------------------|
| 5. S.N. | 5 Samples Mean |
| 6. S.N. | 6 Samples Mean |
| 7. S.N. | 7 Samples Mean |
| 8. S.N. | 8 Samples Mean |
| 9. S.N. | 9 Samples Mean |
| 10.S.N. | 10 Samples Mean (Default) |
| 11.S.N. | 11 Samples Mean |
| 12.S.N. | 12 Samples Mean |
| 13.S.N. | 13 Samples Mean |
| 14.S.N. | 14 Samples Mean |
| 15.S.N. | 15 Samples Mean |

68 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 |
| 62 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) |

69 u.FLT. Visualization Filter

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

| | |
|---------|---|
| d.S. | Disabled (maximum speed of display update) |
| Ptch | Pitchfork filter (First order filter with pitchfork) > Default . |
| F1.or. | First order |
| F.or.P. | First order with pitchfork |
| 2. S.N. | 2 Samples Mean |
| 3. S.N. | 3 Samples Mean |
| 4. S.N. | 4 Samples Mean |
| 5. S.N. | 5 Samples Mean |
| 6. S.N. | 6 Samples Mean |
| 7. S.N. | 7 Samples Mean) |
| 8. S.N. | 8 Samples Mean) |
| 9. S.N. | 9 Samples Mean |
| 10.S.N. | 10 Samples Mean (Maximum slow down of display update) |

70 $\alpha P. \Pi \alpha$. Operating mode

Selects operating mode. In model ATR171-23ABC-T, this parameter is visible only if dip-switches are configured for serial communication (AI2 disabled).

| | |
|-----------------|-------------------------------|
| $c \alpha n t.$ | Controller (Default) |
| $P r. c y.$ | Programmed Cycle |
| $2 t. 5.$ | 2 Setpoints Switch |
| $2 t. 5. i.$ | 2 Setpoints Switch Impulsive |
| $3 t. 5. i.$ | 3 Setpoints Switch Impulsive |
| $4 t. 5. i.$ | 4 Setpoints Switch Impulsive |

71 $R. \Pi R.$ Automatic / Manual

Enables automatic / manual selection

| | |
|-------------|-----------------------------|
| $d i s.$ | Disabled (Default) |
| $E n.$ | Enabled |
| $E n. 5 t.$ | Enabled with memory |

72 $d G t. i.$ Digital Input

(par. 70 selection must be $c \alpha n t.$ or $P r. c y.$). In model ATR171-23ABC-T, this parameter is visible only if dip-switches are configured for serial communication (AI2 disabled).

| | |
|----------------|--|
| $d i s.$ | Disabled (Default: 0) |
| $5 t. 5 t.$ | Start / Stop |
| $r n. n. o.$ | Run N.O. (enables regulation with N.O. contact) |
| $r n. n. c.$ | 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.) |
| $t u n E$ | Manual Tune (by digital input) |
| $R. \Pi R. i.$ | Automatic / Manual Impulse |
| $R. \Pi R. c.$ | Automatic / Manual Contact |
| $t \Pi r. i.$ | Impulse Start timer |

73 $r i. G r.$ Rising Gradient

Rising gradient for Soft-Start or pre-programmed cycle. In model ATR171-23ABC-T, this parameter is visible only if dip-switches are configured for serial communication (AI2 disabled).

0 Disabled.

1..9999 Digit/hour¹² (degrees/hour with decimal visualization if temperature),
Default: 0.

74 *FAGr* Falling Gradient

Falling gradient for pre-programmed cycle. In model ATR171-23ABC-T, this parameter is visible only if dip-switches are configured for serial communication (AI2 disabled).

0 Disabled.

1.9999 Digit/hour¹² (degrees/hour with decimal visualization if temperature),

Default: 0.

75 *MA.t.* Maintenance Time

Holding time for pre-programmed cycle. In model ATR171-23ABC-T, this parameter is visible only if dip-switches are configured for serial communication (AI2 disabled).

00.00-24.00 hh.mm, **Default:** 00.00

76 *U.M.C.P.* User Menu Cycle Programmed

Allows to modify rise gradient, falling and maintenance time from user menu, when pre-programmed cycle is selected. To start modification of parameters press **FNC** key. In model ATR171-23ABC-T, this parameter is visible only if dip-switches are configured for serial communication (AI2 disabled).

d.i.S. Disabled (**Default**)

r.i.Gr. Rising Gradient

MA.t. Maintenance Time

r.G.M.t. Rising Gradient and Maintenance Time

FAGr Falling Gradient

r.F.Gr. Rising and Falling Gradient

F.G.M.t. Falling Gradient and Maintenance Time

ALL All

77 *U.i.d.2* Visualization Display 2

Set visualization on display 2

c.SP.u. Command Setpoint (**Default**)

Pro.1 Process 1

Pro.2 Process 2

MEAN Processes mean

d.i.FF. Processes difference

AbS.d. Processes difference as absolute value

78 *U.i.t.Y.* Visualization Type

Set visualization type on display

S.t.d. Display 1 process + Display 2 as *U.i.d.2* (**Default**)

d.2.H.i. Display 1 process + Display 2 as *U.i.d.2* hidden after 3 sec.

S.u.A.P. Display 1 as *U.i.d.2* + Display 2 process

S.d.2.H. Display 1 as *U.i.d.2* + Display 2 process hidden after 3 sec.

79 rEtr. Retransmission

Retransmission for output 0..10 V or 0/4..20 mA. Parameters 81 and 82 defines upper/lower limit of scale

| | |
|--------|--|
| d iS. | Disabled (Default) |
| cSPu. | Command Setpoint |
| Pro.1 | Process 1 |
| Pro.2 | Process 2 |
| MEAn | Processes Mean |
| d iFF. | Processes Difference |
| AbS.d. | Processes Difference as absolute value |

80 rEty. Retransmission Type

Select retransmission type

| | |
|------|-------------------------------|
| 0-10 | 0..10 Volt (Default) |
| 0-20 | 0..20 mA |
| 4-20 | 4..20 mA |

81 Lo.Lr. Lower Limit Retransmission

Lower limit analogue output range

-999..9999 digit¹² (degrees if temperature), **Default: 0.**

82 uP.Lr. Upper Limit Retransmission

Upper limit analogue output range

-999..9999 digit¹² (degrees if temperature), **Default: 1000.**

83 bd.rt. Baud Rate

Selects baudrate for serial communication

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

84 SLAd. Slave Address

Selects slave address for serial communication

1 – 254. **Default: 254**

85 SE.dE. Serial Delay

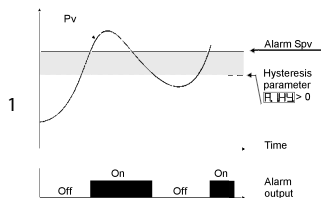
Selects serial delay

0 – 100 milliseconds. **Default: 20**

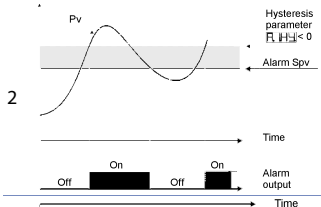
¹² The display of the decimal point depends on the setting of parameter SE.n.1 and d.P. 1 or SE.n.2 and d.P. 2. for only ATR171-23ABC-T.

12 Alarm Intervention Modes

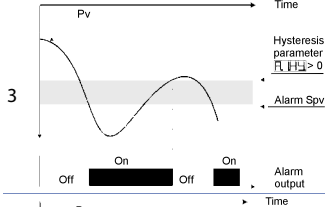
12.a Absolute alarm ("Absolute" selection) (R. RL selection)



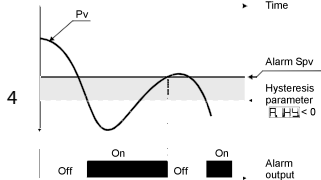
Absolute alarm with controller in heating functioning (par. 17 $R_{c.t.t.}$ selected $HEAT$) and hysteresis value greater than "0" (par. 36 $R.I.HY. > 0$). *



Absolute alarm with controller in heating functioning (par. 17 $R_{c.t.t.}$ selected $HEAT$) and hysteresis value less than "0" (par. 36 $R.I.HY. < 0$). *

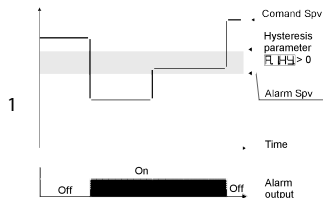


Absolute alarm with controller in cooling functioning (par. 17 $R_{c.t.t.}$ selected $COOL$) and hysteresis value than "0" (par. 36 $R.I.HY. > 0$). *



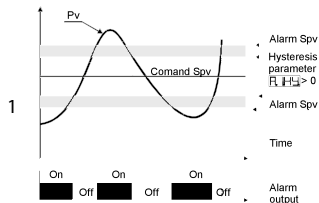
Absolute alarm with controller in cooling functioning (par. 17 $R_{c.t.t.}$ selected $COOL$) hysteresis value minor than "0" (par. 36 $R.I.HY. < 0$). *

12.b Absolute Alarm or Threshold Alarm Referring to Setpoint Command (selection $R.C.AL$)

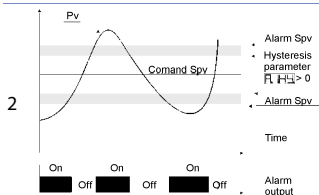


Absolute alarm refers to the command set, with the controller in heating functioning (par. 17 $R.C.E.$ selected $HEAT$) **hysteresis value greater than "0"** (par. 36 $R.I.HY. > 0$). Command set can be changed by pressing the arrow keys on front panel. *

12.c Band Alarm (selection $b. AL$)



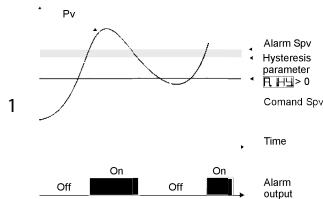
Band alarm with hysteresis value greater than "0". (par. 36 $R.I.HY. > 0$). *



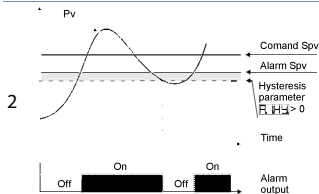
Band alarm with hysteresis value minor than "0". (par. 36 $R.I.HY. < 0$). *

* a) The example refers to alarm 1; the function can also be enabled for alarm 2 and 3 on models that include it.

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

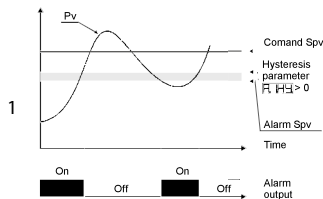


Upper deviation alarm value of alarm setpoint greater than "0" and hysteresis value greater than "0" (par. 36 $R.I.HY. > 0$). **

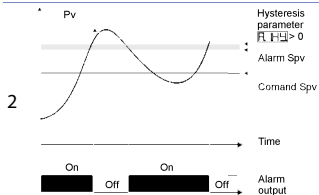


Upper deviation alarm value of alarm setpoint minor than "0" and hysteresis value greater than "0" (par. 36 $R.I.HY. > 0$). **

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



Lower deviation alarm value of alarm setpoint greater than "0" and hysteresis value greater than "0" (par. 36 $R.I.HY. > 0$). **



Lower deviation alarm value of alarm setpoint minor than "0" and hysteresis value greater than "0" (par. 36 $R.I.HY. > 0$). **

** a) The example refers to alarm 1; the function can also be enabled for alarm 2 and 3 on models that include it. b) With hysteresis value less than "0" ($R.I.HY. < 0$) 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 Pr _{0,1} | Sensor connected to AI1 broken or temperature out of range. | Control connection with probes and their integrity. |
| E-06 Pr _{0,2} | 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. |
| 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. |

Notes / Updates
