K_8

DIFFERENTIAL CONTROLLER

DIMENSIONS (mm)

1.1 Mounting requirements

This instrument is intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, exposed terminals and wiring on the back.

Select a mounting location having the following characteristics:

1. It should be easily accessible;
2. There is minimum vibrations and no impact;
3. There are no corrosive gases;
4. There are no water or other fluids (i.e. condensation);
5. The ambient temperature is in accordance with the operative temperature (0... 50°C);
6. The relative humidity is in accordance with the instrument specifications (20... 85%);

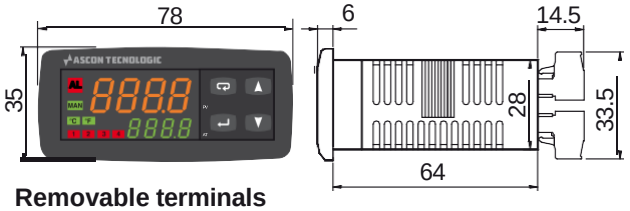
The instrument can be mounted on panel with a maximum thickness of 15 mm.

When the maximum front protection (IP65) is required, the optional gasket must be installed for KM8 and KX8 and must also be used the optional screw type bracket for the KR8.

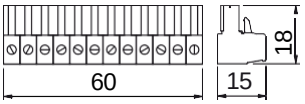
1.2 KR8

1.2.1 Outline Dimensions

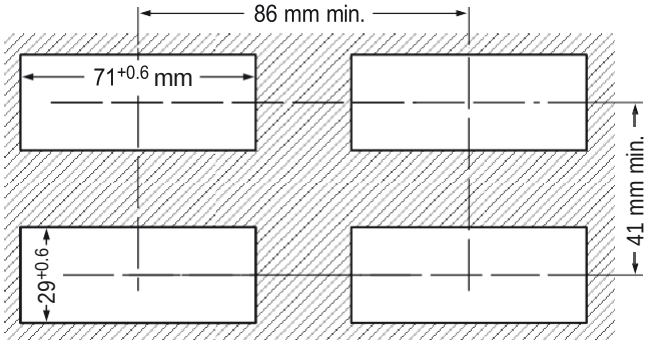
Instrument with non removable terminals



Removable terminals



1.2.2 Panel cutout

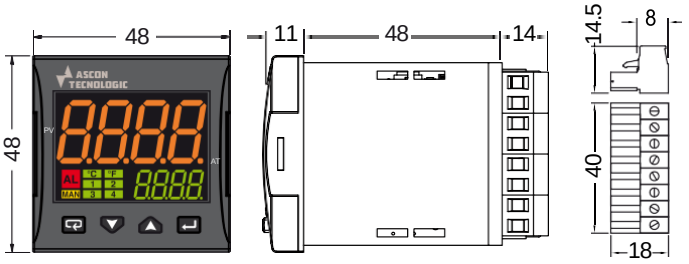


1.3 KM8

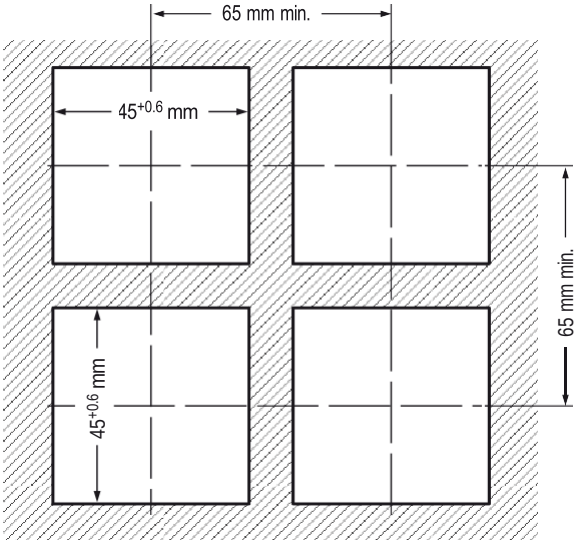
1.3.1 Outline Dimensions

Instrument with non removable terminals

Removable terminals



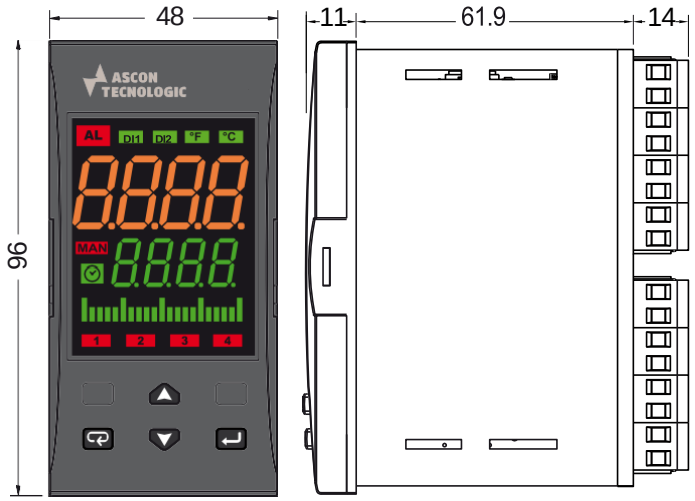
1.3.2 Panel cutout



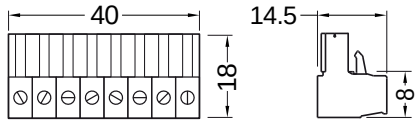
1.4 KX8

1.4.1 Outline Dimensions

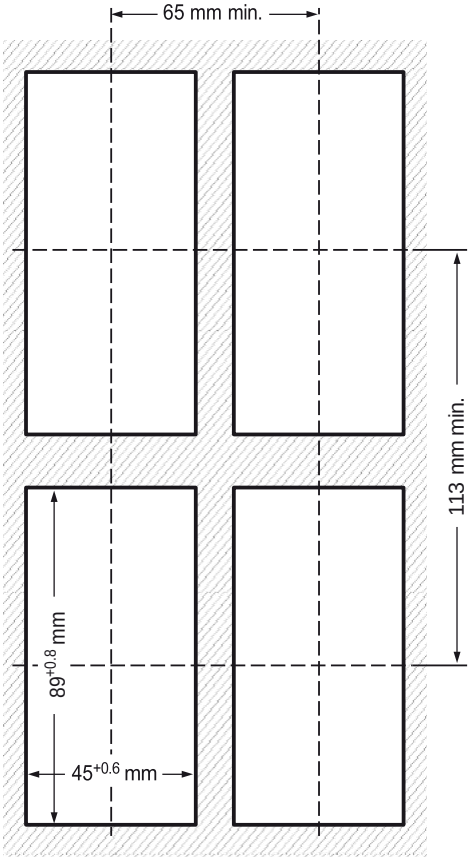
Instrument with non-removable terminals



Removable terminals



1.4.2 Panel cutout



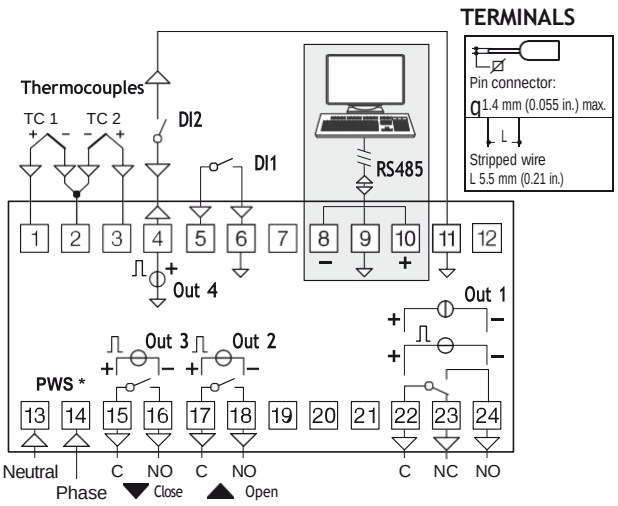
2.1 General notes about wiring

1. Do not run input wires together with power cables.
2. External components (like zener barriers, etc.) connected between sensor and input terminals may cause errors in measurement due to excessive and/or not balanced line resistance or possible leakage currents.
3. When a shielded cable is used, the protective shield should be connected at one side only.
4. Pay attention to the line resistance; a high line resistance may cause measurement errors.

2.2 Wiring diagrams

If not specifically indicated the following connecting diagrams are valid for all the models. When the connections are different, the connection of each model is illustrated.

2.2.1 KR8

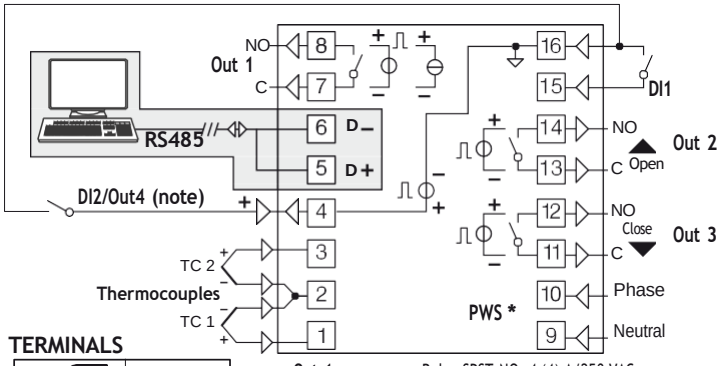


Out 1: Relay SPST-NO, 4 (4) A/250 VAC;
Out 2, 3: Relay SPST-NO, 2 (1) A/250 VAC;
Out 1, 2, 3 SSR: 10 VDC/15 mA;
Out 1 linear: 0/4... 20 mA, 0/2... 10 V;
Out 4 SSR: 12 VDC/20 mA.

*** Voltage:** 100... 240 Vac/ 24 Vac/Vdc

Servodrive models: both Out 1 and Out 2 are to be selected as "M" in Configuration code; Out 1: open, Out 2: close

2.2.2 KM8

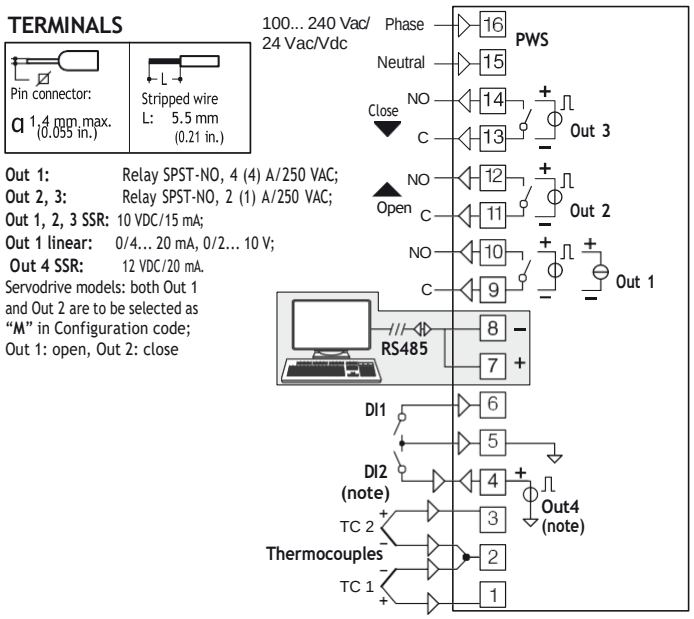


Out 1: Relay SPST-NO, 4 (4) A/250 VAC;
Out 2, 3: Relay SPST-NO, 2 (1) A/250 VAC;
Out 1, 2, 3 SSR: 10 VDC/15 mA;
Out 1 linear: 0/4... 20 mA, 0/2... 10 V;
Out 4 SSR: 12 VDC/20 mA.

*** Voltage:** 100... 240 Vac/ 24 Vac/Vdc

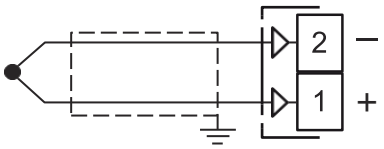
Servodrive models: both Out 1 and Out 2 are to be selected as "M" in Configuration code; Out 1: open, Out 2: close

2.2.3 KX8

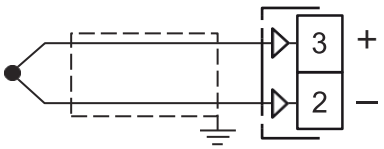


2.3 Inputs

2.3.1 Thermocouple Input 1



2.3.2 Thermocouple Input 2



External resistance: 100Ω max., maximum error 25 μV;
Cold junction: Automatic compensation between 0... 50°C;
Cold junction accuracy: 0.05°C/°C after a warm-up of 20 minutes;
Input impedance: > 1 MΩ;
Calibration: According to EN 60584-1.
Note: For TC wiring use a proper compensating cable preferable shielded.

2.3.3 Digital Inputs

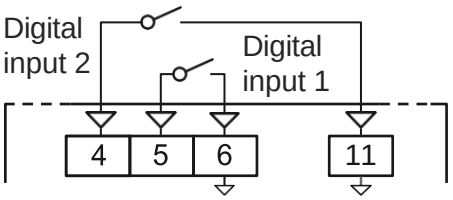
Safety notes:

– Do not run logic input wiring together with power cables;
– The instrument needs 150 ms to recognize a contact status variation;
– Logic inputs are **NOT** isolated by the measuring input. A double or reinforced isolation between logic inputs and power line must be assured by the external elements.

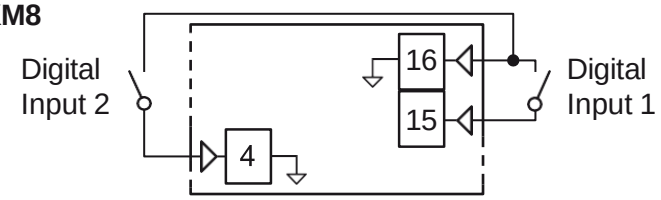
Dry contact Logic input Characteristics

Maximum contact resistance: 100 Ω;
Contact rating: DI1 = 10 V, 6 mA;
DI2 = 12 V, 30 mA.

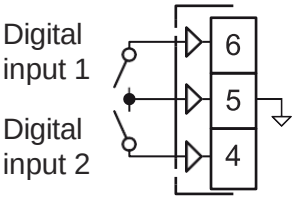
KR8



KM8



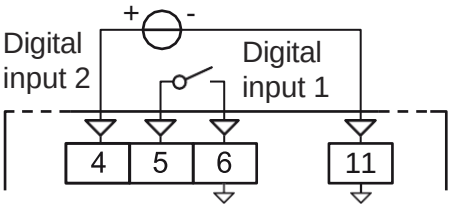
KX8



24 VDC Logic inputs Characteristics

Logic status 1: 6... 24 VDC;
Logic status 0: 0... 3 VDC.

KR8



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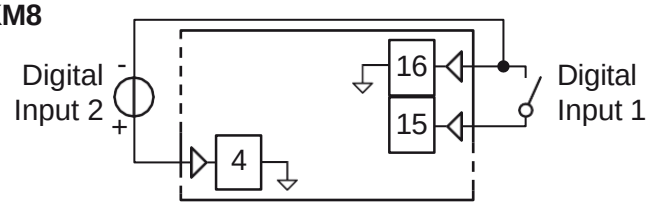

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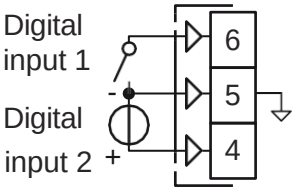


2.4 Outputs

Safety notes:

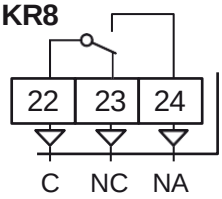
- To avoid electrical shocks, connect power line at last.
- For supply connections use No. 16 AWG or larger wires rated for at least 75°C.
- Use copper conductors only.
- SSR outputs are not isolated. A reinforced isolation must be assured by the external solid state relays.
- For SSR, mA and V outputs if the line length is longer than 30 m use a shielded wire.

Before connecting the output actuators, we recommend to configure the parameters to suit your application (e.g.: input type, Control strategy, alarms, etc.).

2.4.1 Output 1 (Out 1)

Relay output

KR8



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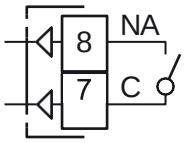

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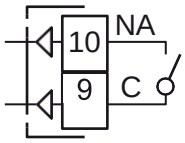
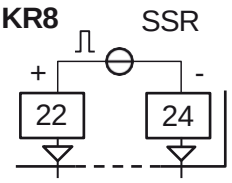


Contact load: • 4 A /250 V cosχπ = 1;
• 2 A /250 V cosχπ = 0.4.

Operation: 1 x 10^5.

SSR output

KR8



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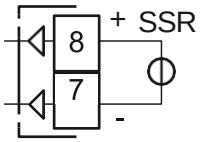
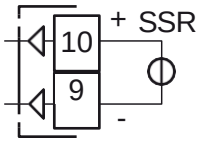


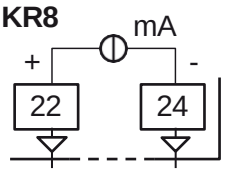
KX8



Logic level 0: Vout < 0.5 VDC;
Logic level 1: 12 V ± 20%, 15 mA max..

Current analogue output

KR8



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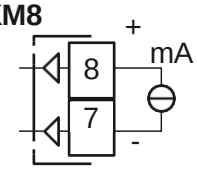

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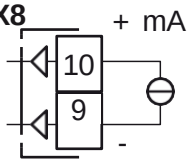
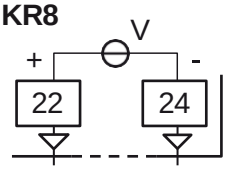


mA output: 0/4... 20 mA, galvanically isolated, RL max.: 600 Ω.

Voltage analogue output

KR8



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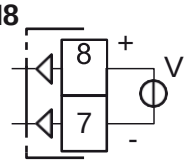

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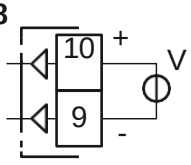
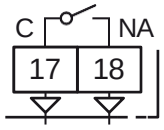


V output: 0/2... 10 V, galvanically isolated, RL min.: 500Ω.

2.4.2 Output 2 (Out 2)

KR8



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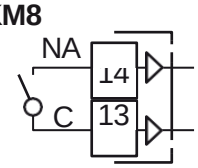

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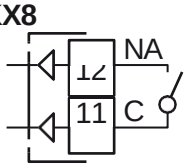
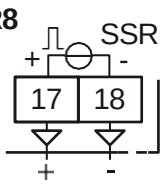


Contact rating: - 2 A /250 V cosχπ =1;
- 1 A /250 V cosχπ =0.4;

Operation: 1 x 10^5.

KR8



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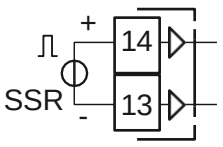

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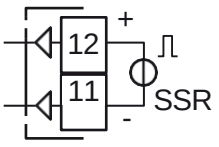
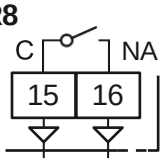


Logic level 0: Vout < 0.5 VDC;
Logic level 1: 12 V ± 20%, 15 mA max..

2.4.3 Output 3 (Out 3)

Relay Output

KR8



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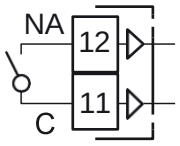

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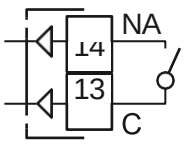
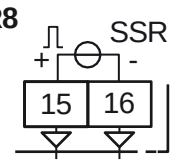


Contact rating: - 2 A /250 V cosχπ =1;
- 1 A /250 V cosχπ =0.4;

Operation: 1 x 10^5.

SSR Output

KR8



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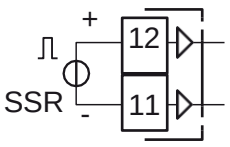

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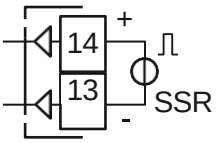
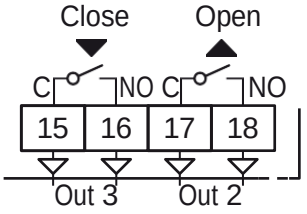


Logic level 0: Vout < 0.5 VDC;
Logic level 1: 12 V ± 20%, 15 mA max..

Output 2 (Out2) and Output 3 (Out 3) Servomotor Drive

KR8



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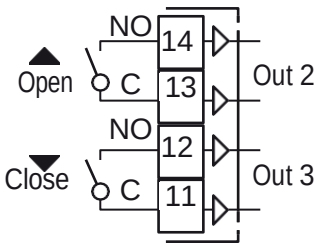

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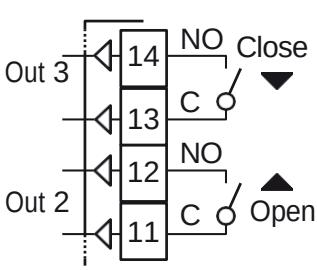
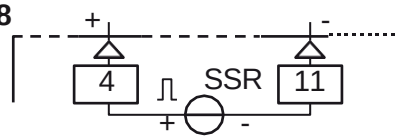


OP1/2 contact rating: - 2 A /250 V cosχπ = 1;
- 1 A /250 V cosχπ = 0.4.

Operation: 1 x 10^5.

Output 4 (Out 4)

KR8



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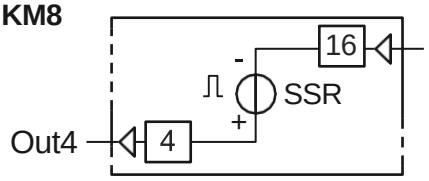
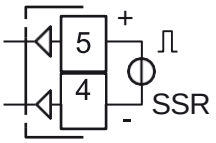


KX8



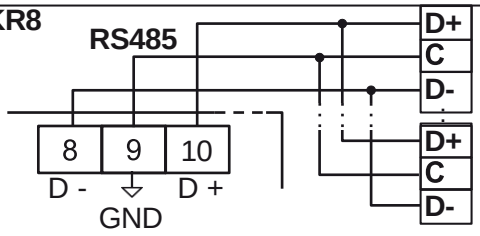
Logic level 0: Vout < 0.5 VDC;

Logic level 1: 12 V ± 20%, 20 mA max..

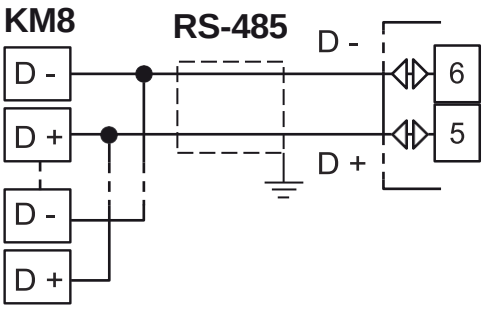
Note: Overload protected.

2.5 Serial Interface

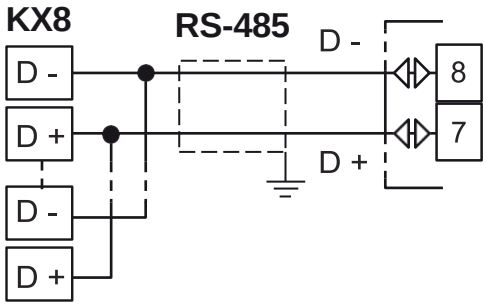
KR8



KM8



KX8



Interface type: Isolated (50 V) RS-485;

Voltage levels: According to EIA standard;

Protocol type: MODBUS RTU;

Byte format: 8 bit with no parity;

Stop bit: 1 (one);

Baud rate: Programmable between 1200... 38400 baud;

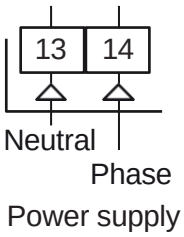
Address: Programmable between 1... 255.

Notes: **1.** RS-485 interface allows to connect up to 30 devices with one remote master unit.

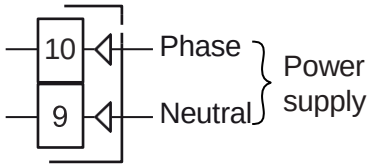
2. The cable length must not exceed 1.5 km at 9600 baud.

2.6 Power Supply

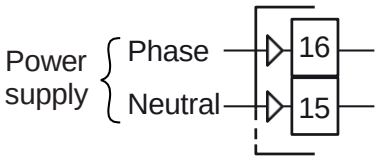
KR8



KM8



KX8



Supply Voltage: - 24 VAC/DC (±10%);
- 100... 240 VAC (-15... +10%).

Notes: **1.** Before connecting the instrument to the power line, make sure that line voltage is equal to the voltage shown on the identification label;

2. The polarity of the power supply has no importance;

3. The power supply input is NOT fuse protected. Please, provide a T type 1A, 250 V fuse externally.

4. When the instrument is powered by the **A01** key, the outputs are NOT supplied and the instrument can show the `ouLd` (Out 3 Overload) indication.

TECHNICAL CHARACTERISTICS

Case: Plastic, self-extinguishing degree: V-0 according to UL 94;

Front protection: IP65 with optional gasket for KM8/KX8 or with the optional screw-type bracket for KR8; for indoor use according to EN 60070-1;

Terminals protection: IP20 according to EN 60070-1;

Installation: Panel mounting;

Terminal blocks:

- **KR8:** 24 M3 screw terminals for cables from 0.25. .. 2.5 mm^2 (AWG 22... AWG 14),
- **KM8:** 16 M3 screw terminals for cables of 0.25.... 2.5 mm^2 (AWG22. . AWG14),
- **KX8:** 16 M3 screw terminals for cables of 0.25. .. 2.5 mm^2 (AWG22. . AWG14);

Dimensions:

- **KR8:** 78 x 35 depth 69.5 mm (3.07 x 1.37 depth 2.73 in.),
- **KM8:** 48 x 48, depth 75.5 mm, (1.77 x 1.77 x 2.97 in.),
- **KX8:** 48 x 96, depth 75.9 mm, (1.77 x 3.78 x 2.99 in.);

Panel cutout:

- **KR8:** 71(+0.6) x 29(+0.6) mm [2.79(+0.023) x 1.14(+0.023) in.],
- **KM8:** 45(+0.6) x 45(+0.6) mm [1.78(+0.023) x 1.78(+0.023) in.],
- **KR8:** 45(+0.6) x 89(+0.6) mm [1.78(+0.023) x 3.5(+0.023) in.];

Weight:

- **KM8 and KR8:** 180 g max.,
- **KX8: 160** g max.;

Power supply:

- 24 VAC/DC (±10% of the nominal value),
- 100... 240 VAC (-15... +10% of the nominal value);

Power consumption: 5 VA max.;

Insulation voltage: 2300 V rms according to EN 61010-1;

Display updating time: 500 ms;

Sampling time: 130 ms;

Resolution: 30000 counts;

Total Accuracy: ±0.5% F.S.V. ±1 digit @ 25°C of room temperature;

Display:

- **KR8:** Main: 4 digits height 10.9 mm with 3 dynamic/fixed colours, Secondary: 4 digits height 6 mm green,
- **KM8:** Main: 4 digits height 15.5 mm with 3 dynamic/fixed colours, Secondary: 4 digits height 7.6 mm green,
- **KX8:** Main: 4 digits height 15.5 mm with 3 dynamic/fixed colours, Secondary: 4 digits height 7.6 mm green, + a bargraph with 21 segments;

Electromagnetic compatibility and safety requirements

Compliance: directive EMC 2004/108/CE (EN 61326-1), directive LV 2006/95/CE (EN 61010-1);

Installation category: II;

Pollution category: 2;

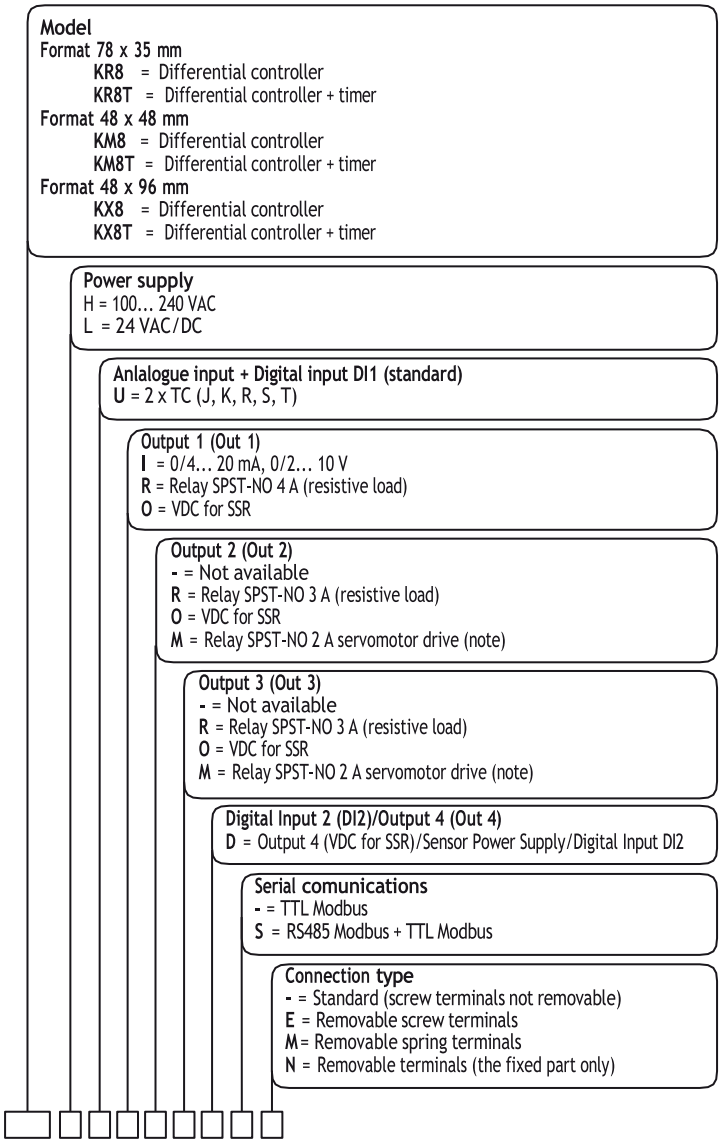
Temperature drift: It is part of the global accuracy;

Operating temperature: 0. ..50°C (32. ..122°F);

Storage temperature: -30... +70°C (-22....+158°F);

Humidity: 20... 85% RH, not condensing.

HOW TO ORDER



Notes: **1.** For servomotor drive models, both **Output 1** (Out 1) and **Output 2** (Out 2) codes must be selected as "**M**".

2. To order the gasket or the screw type bracket, necessary to obtain the IP65 protection degree, contact your Ascon Tecnologic dealer.

5.1 Introduction

When the instrument is powered, it starts immediately working in accordance with the parameters value loaded in memory.

The instrument behaviour and its performance are governed by the value of the stored parameters.

At the first start up the instrument uses a "default" parameter set (factory parameter set); this set is a generic one (e.g. a TC J input is programmed).

> **Before connecting the output actuaators**, we recommend to configure the parameters to suit your application (e.g.: input type, Control strategy, alarms, etc.).
>
> Do not change the **[7] Unit (Engineering Unit)** value during process control as the temperature values inserted by the user (thresholds, limits etc.) are not automatically rescaled by the instrument.

To change these parameters you need to enter the "Configuration mode".

5.2 Instrument behaviour at Power ON

At power ON the instrument can start in one of the following mode depending on its configuration:

Auto mode

– The upper display shows the measured value;
– The lower display shows the Set Point value;
– The decimal figure of the less significant digit of the lower display is OFF;
– The instrument is performing the standard closed loop control.

Manual mode (oPLo)

– The upper display shows the measured value;
– The lower display shows the power output [preceded by `H` (for heating) or `C` (for cooling)]. **MAN** LED is lit;
– The instrument performs no Automatic control;
– The control output is equal to 0% and can be manually modified using the ▲ and ▼ buttons.

Standby mode (St.bY)

– The upper display shows the measured value;
– The lower display alternately shows the active Set Point value and the message `St.bY` or `od`;
– The instrument performs no control (the control outputs are OFF);
– The instrument is working as an indicator.

We define all the above described conditions as "**Standard display**".

5.3 Entering the Configuration level

The configuration parameters are collected in various groups. Each group defines all the parameters related with a specific function (e.g.: control, alarms, output functions ect.).

1. Push the ↵ button for more than 5 s. The upper display start showing `PASS` while the lower display shows `0`.
2. Using ▲ and ▼ buttons set the programmed password.

Notes:
1. The factory default password to enter the configuration parameters session is equal to 30.
2. During parameter modification the instrument continue to perform the control.
   In certain conditions, when a configuration change can produce a heavy bump to the process, it is advisable to temporarily stop the controller functions during the programming procedure (control output will be OFF). In this case, insert a password equal to 2000 + the programmed value
   (e.g. 2000 + 30 = 2030).
   The control action automatically restarts when the configuration procedure is manually ended.

3. Push the ↵ button. If the password is correct the display shows the acronym of the first parameter group preceded by the symbol: ⌋ .
   In other words the upper display shows: `⌋inp`
   (**Input parameters** group).

The instrument is in configuration mode.

5.3.1 How to exit the "Configuration mode"

Press the ↩ button for more than 5 seconds, the instrument returns to the "*Standard display*".

5.4 Keyboard functions during parameter changing

↩ A short press allows to exit from the current parameter group and select a new parameter group.
A long press allows you to close the configuration parameter procedure (the instrument returns to the "*Standard display*").

↵ When the upper display is showing a group and the lower display is empty, this key allows to enter in the selected group.
When the upper display is showing a parameter and the lower display is showing its value, this key allows to store the value set for the current parameter and access the next parameter within the same group.

▲ Allows to increase the value of the selected parameter.

▼ Allows to decrease the value of the selected parameter.

↩ + ↵ These two keys allow to return to the previous group. Proceed as follows:
Press the ↩ button and maintaining the pressure, press the ↵ button, release both the buttons.

Note: The group selection is cyclic as well as the selection of the parameters in a group.

5.5 Factory Reset - Default parameters loading procedure

Sometimes, e.g. when you re-configure an instrument previously used for other works or from other people or when you have made too many errors during configuration and you decided to re-configure the instrument, it is possible to restore the factory configuration.

This action allows to put the instrument in a defined condition (the same it was at the first power ON).

The default parameters are those typical values loaded in the instrument prior to ship it from factory.

To load the factory default parameter set, proceed as follows:

1. Press the button for more than 5 seconds. The upper display will show `PASS` while the lower display shows `0`;
2. Using and buttons set the value `-481`;
3. Push button. The instrument will turn OFF all LEDs for a few seconds, then the upper display shows `dFLt` (default) and then all LEDs are turned ON for 2 seconds. At this point the instrument restarts as for a new power ON.

The procedure is complete.

Note: The complete list of the default parameters is available in Appendix A.

5.6 Configuring the parameters

In the following pages we describe all the instrument parameters. However, the instrument only shows the parameters applicable to its hardware options in accordance with the specific instrument configuration (i.e.: setting `AL1t` [Alarm 1 type] to `nonE` [not used], all parameters related to alarm 1 will be skipped).

] inP Group - Inputs configuration

[1] SEnS - Input type

Available: Always.

Range:

J	TC J	(0... +1000°C/32... +1832°F);
crAL	TC K	(0... +1370°C/32... +2498°F);
S	TC S	(0... 1760°C/32... +3200°F);
r	TC R	(0... +1760°C/32... +3200°F);
t	TC T	(0... +400°C/32... +752°F).

Notes: 1. When a a decimal figure is programmed (parameter [3] `dP`) the max. value displayable becomes 999.9°C or 999.9°F.

2. All changes to `SEnS` parameter setting forces [3] `dP` = **0** and this causes a change to all parameters related with it (e.g. Set Points, proportional band, etc.).

[2] Pr2 - Probe 2 presence

Available: Always.

Range:

YES	Probe 2 present and used;
no	Probe 2 not used or absent.

Note: All changes to `Pr2` parameter value cause the change of all parameters connected to it (process value, alarms and control, display selections, etc.).

[3] dP - Decimal point position

Available: Always.

Range: 0... 1

Note: All changes to `dP` parameter setting cause the change to all parameters related with it (e.g.: Set Points, proportional band, etc.).

[4] P2LL - Pr2 probe lower measurement limit for differential control

Available: If [2] Pr2 = YES.

Range: -1999... 9999 in Engineering Unit.

[5] P2HL - Pr2 probe higher measurement limit for differential control

Available: If [2] Pr2 = YES.

Range: -1999... 9999 in Engineering Unit.

[6] unit - Engineering unit

Available: Always.

Range:

°c	Celsius;
°F	Fahrenheit.

The instrument does not rescale the temperature values inserted by the user (thresholds, limits etc.).

[7] FiL - Digital filter on the measured value

Available: Always.

Range:

oFF	No filter;
0.1....20.0 s.	

Note: This is a first order digital filter applied on the measured value. For this reason it will affect the measured value but also the control action and the alarms behaviour.

[8] inE - Selection of the Sensor Out of Range type that enables the safety output value

Available: Always.

Range:

our	When an overrange or an underrange is detected, the controller forces the output power to the value set at [9] oPE parameter.
or	When an overrange is detected, the controller forces the output power to the value set at [9] oPE parameter.
ur	When an underrange is detected, the controller forces the output power to the value set at [9] oPE parameter.

[9] oPE - Safety output value

Available: Always.

Range: -100. ..100% (of the output).

Notes: 1. When the instrument is programmed with one control action only (heat or cool), setting a value outside of the available output range, the instrument uses 0 (zero).
E.g.: When heat action only has been programmed, and oPE is equal to -50% (cooling) the instrument uses 0 (zero).

2. When ON/OFF control is programmed and an out of range is detected, the instrument performs the safety output value using a fixed cycle time of 20 s.

[10] io4.F - I/O4 function selection

Available: Always.

Range: **on** Out4 will be ever ON (used as a transmitter power supply);
out4 Used as digital output 4;
dG2.c Digital input 2 for contact closure;
dG2.V Digital input 2 driven by 12... 24 VDC.

Notes:
1. Setting **[10] io4.F = dG2.C** or **dG2.V**, parameter [26] O4F becomes not visible while [12] diF2 parameter becomes visible.
2. Setting **[10] io4F = on** parameter [26] O4F and [12] diF2 become NOT be visible.
3. Setting **[10] io4F to vaules different from dG2.C** or **dG2.V** the instrument forces [12] diF2 = `nonE`.
4. Changing **[10] io4F** from **on** to **Out4** makes parameter [26] O4F visible and equal to `nonE`.

[11] diF1 - Digital input 1 function

Available: Always.

Range: **oFF** No function;
1 Alarm Reset [status];
2 Alarm acknowledge (ACK) [status];
3 Hold of the measured value [status];
4 Standby mode of the instrument [status]. When the contact is closed the instrument operates in standby mode;
5 Manual mode;
6 HEAt with **SP1** and CooL with **SP2** [status] (see "*Notes about digital inputs*");
7 Timer Run/Hold/Reset [transition]. A short contact closure allows to start/suspend timer execution while a long closure (longer than 10 seconds) allows to reset the timer;
8 Timer Run [transition]. A short closure starts the timer execution;
9 Timer reset [transition]. A short closure resets the timer count;
10 Timer run/hold [Status]:
- Contact close = timer RUN (count active);
- Contact open = timer Hold (count suspended).
11 Timer run/reset [status];
12 Timer run/reset with a special "lock" at the end of the time count (in order to restart the time count the instrument must detect a run command coming from serial port or digital input 2);
13 Sequential Set Point selection [transition] (see "*Notes about digital inputs*");
14 SP1/SP2 selection [status].

[12] diF2 - Digital input 2 function

Available: When **[10] Io4.F = dG2.C** or **Dig2.U**.

Range: **oFF** No function;
1 Alarm Reset [status];
2 Alarm acknowledge (ACK) [status];
3 Hold of the measured value [status];
4 Standby mode of the instrument [status]. When the contact is closed the instrument operates in standby mode;
5 Manual mode;
6 HEAt with **SP1** and CooL with **SP2** [status] (see "*Notes about digital inputs*");
7 Timer Run/Hold/Reset [transition]. A short closure allows to start/suspend timer execution while a long closure (longer than 10 seconds) allows to reset the timer;
8 Timer Run [transition]. A short closure starts the timer execution;
9 Timer reset [transition]. A short closure resets the timer count;
10 Timer run/hold [Status]:
- Contact close = timer RUN (count active);
- Contact open = timer Hold (count suspended).
11 Timer run/reset [status];
12 Timer run/reset with a special "lock" at the end of the time count (in order to restart the time count the instrument must detect a run command coming from serial port or digital input 2);
13 Sequential Set Point selection [transition] (see "*Notes about digital inputs*");
14 SP1/SP2 selection [status].

Notes:
1. When [11] diF1 or [12] diF2 (e.g. diF1) is equal to **6** the instrument operates as follows:
- When the contact is open, the control action is a heating action, the active Set Point is **SP**.
- When the contact is closed, the control action is a cooling action, the active Set Point is **SP2**.

2. When the "*Sequential Set Point selection*" is used (`diF1` or `diF2` = **13**), every closure of the logic input increases the value of `A.SP` (Active Set Point) of one step. The selection is cyclic:**SP** -> **SP2**.

[13] di.A - Digital Inputs Action

Available: Always.

Range: **0** DI1 Direct action, DI2 (if configured) Direct action;
1 DI1 Reverse action, DI2 (if configured) Direct action;
2 DI1 Direct action, DI2 (if configured) Reverse action;
3 DI1 Reverse action, DI2 (if configured) Reverse action.

] out Group - Output parameters

[14] o1.t - Out 1 type

Available: When Out 1 is a linear output.

Range: 0-20 0... 20 mA;
4-20 4... 20 mA;
0-10 0... 10 V;
2-10 2... 10 V.

[15] o1.F - Out 1 function

Available: Always.

Range: • When Out 1 is a linear output:

- **nonE** Output not used. With this setting the status of this output can be driven directly from serial link;
- **H.rEG** Heating output;
- **c.rEG** Cooling output;
- **r.Err** Analogue retransmission of the measured error (PV-SP);
- **r.SP** Analogue retransmission of the operative Set Point;
- **r.SEr** Analogue retransmission of a value coming from serial link;
- **r.in1** Probe Pr1 masure retransmission;
- **r.in2** Probe Pr2 masure retransmission;
- **r.1-2** Pr1 - Pr2 masure retransmission;
- **r.1-L** Pr1 - Pr2L (limited Pr2) masure retransmission;
- **r.inP** Measure used for temperature control retransmission.

• When the out 1 is a digital output (relay or SSR):

- **nonE** Output not used. With this setting the status of this output can be driven directly from serial link;
- **H.rEG** Heating output;
- **c.rEG** Cooling output;
- **AL** Alarm output;
- **t.out** Timer output;
- **t.HoF** Timer output - OFF if the timer is in Hold;
- **or.bo** Out-of-range or burn out indicator;
- **P.FAL** Power failure indicator;
- **bo.PF** Out-of-range, Burnout and/or Power failure indicator;
- **St.By** Standby status indicator;
- **diF1** Repeats the digital input 1 status;
- **diF2** Repeats the digital input 2 status;
- **on** Out1 always ON.

Notes:

1. When two or more outputs are programmed in the same way, these outputs will be driven in parallel.
2. The power failure indicator will be reset when the instrument detects an alarm reset command by key, digital input or serial link.
3. When no control output is programmed, all the relative alarms (when present) are forced to `nonE` (not used).

[16] A.o1L - Start of scale value of the analogue retransmission output

Available: When **Out1** is a linear output and [15] O1F different than `nonE`, `H.rEG` o `c.rEG`.

Range: -1999 to [17] Ao1H.

[17] A.o1H - Full scale value of the analogue retransmission output

Available: When **Out1** is a linear output and [15] O1F different than `nonE`, `H.rEG` o `c.rEG`.

Range: [16] Ao1L to 9999.

[18] o1.AL - Alarms linked up with Out1

Available: When [15] o1F = AL.

Range: 0... 63 with the following rules:

- **+1** Alarm 1;
- **+2** Alarm 2;
- **+4** Alarm 3;
- **+8** Reserved;
- **+16** Sensor break (burn out);
- **+32** Overload on Out4 (short circuit on the Out4).

Example 1: Setting 3 (2 + 1) the output will be driven by the alarm 1 and 2 (OR condition).

Example 2: Setting 13 (8 + 4 + 1) the output will be driven by alarm 1 + alarm 3 + loop break alarm.

[19] o1Ac - Out 1 action

Available: When [15] o1F is different from `nonE`.

Range:

- **dir** Direct action;
- **rEU** Reverse action;
- **dir.r** Direct action with revers LED indication;
- **rEU.r** Reverse action with reverse LED indication.

Notes:

1. Direct action: the output repeats the status of the driven element.
   Example: The output is an alarm output with direct action. When the alarm is ON, the relay will be energized (logic output 1).
2. Reverse action: the output status is the opposite of the status of the driven element.
   Example: the output is an alarm output with reverse action. When the alarm is **OFF**, the relay is **energized** (logic output 1). This setting is usually named “fail-safe” and it is generally used in dangerous process in order to generate an alarm when the instrument power supply goes OFF or the internal watchdog starts.

[20] o2F - Out 2 function

Available: When the instrument has the Out 2 option.

Range:

- **nonE** Output not used. With this setting the status of this output can be driven directly from serial link;
- **H.rEG** Heating output;
- **c.rEG** Cooling output;
- **AL** Alarm output;
- **t.out** Timer output;
- **t.HoF** Timer output - OFF if the timer is in Hold;
- **or.bo** Out-of-range or burn out indicator;
- **P.FAL** Power failure indicator;
- **bo.PF** Out-of-range, Burnout and Power failure indicator;
- **St.By** Standby status indicator;
- **diF1** Repeats the digital input 1 status;
- **diF2** Repeats the digital input 2 status;
- **on** Out1 always ON.

For other details see [15] O1F parameter.

When using the servomotor control, **both Out2** and **Out3** are to be selected as Heating or Cooling (**o2F** = **o3F** = `HrEG` **or o2F** = **o3F** = `crEG`);
Parameter **[57] cont** must be set as `3pt`.

[21] o2.AL - Alarms linked up with Out 2

Available: When [19] o2F = AL.
Range: 0... 63 with the following rules:

+1 Alarm 1;
+2 Alarm 2;
+4 Alarm 3;
+8 Reserved;
+16 Sensor break (burn out);
+32 Overload on Out4 (short circuit on the Out4).

For more details see [18] o1.AL parameter.

[22] o2.Ac - Out 2 action

Available: When [20] o2F is different from nonE.
Range:

dir Direct action;
rEU Reverse action;
dir.r Direct action with revers LED indication;
rEU.r Reverse action with reverse LED indication.

For more details see [19] o1Ac parameter.

[23] o3F - Out 3 function

Available: When the instrument has out 3 option.
Range:

nonE Output not used. With this setting the status of this output can be driven directly from serial link;
H.rEG Heating output;
c.rEG Cooling output;
AL Alarm output;
t.out Timer output;
t.HoF Timer output - OFF if the timer is in Hold;
or.bo Out-of-range or burn out indicator;
P.FAL Power failure indicator;
bo.PF Out-of-range, Burnout and/or Power failure indicator;
St.By Standby status indicator;
diF1 Repeats the digital input 1 status;
diF2 Repeats the digital input 2 status;
on Out1 always ON.

For other details see [15] O1F parameter.

When using the servomotor control, **both Out2** and **Out3** are to be selected as Heating or Cooling (**o2F** = **o3F** = HrEG **or o2F** = **o3F** = crEG);
Parameter **[57] cont** must be set as 3pt.

[24] o3.AL - Alarms linked up with Out 3

Available: When [23] o3F = AL.
Range: 0... 63 with the following rule:

+1 Alarm 1;
+2 Alarm 2;
+4 Alarm 3;
+8 Reserved;
+16 Sensor break (burn out);
+32 Overload on Out 4 (short circuit on Out 4).

For more details see [18] o1.AL parameter.

[25] o3Ac - Out 3 action

Available: When [23] o3F is different from nonE.
Range:

dir Direct action;
rEU Reverse action;
dir.r Direct action with reverse LED indication;
rEU.r Reverse action with reverse LED indication.

For more details see [19] o1Ac parameter.

[26] o4F - Out 4 function

Available: When the [10] io4.F = Out4.
Range:

nonE Output not used. With this setting the status of this output can be driven directly from serial link;
H.rEG Heating output;
c.rEG Cooling output;
AL Alarm output;
t.out Timer output;
t.HoF Timer output - OFF if the timer is in Hold;
or.bo Out-of-range or burn out indicator;
P.FAL Power failure indicator;
bo.PF Out-of-range, Burnout and/or Power failure indicator;
St.By Standby status indicator.

For other details see [15] O1F parameter.

[27] o4.AL - Alarms linked up with Out 4

Available: When [26] o4F = AL.
Range: 0... 63 with the following rule.

+1 Alarm 1;
+2 Alarm 2;
+4 Alarm 3;
+8 Reserved;
+16 Sensor break (burn out);
+32 Overload on Out4 (short circuit on the Out4).

For more details see [18] o1.AL parameter.

[28] o4Ac - Out 4 action

Available: When [26] o4F is different from nonE.
Range:

dir Direct action;
rEU Reverse action;
dir.r Direct action with reverse LED indication;
rEU.r Reverse action with reverse LED indication.

For more details see [19] o1Ac parameter.

] AL1 Group - Alarm 1 parameters

[29] AL1t - Alarm 1 type

Available: Always.
Range:

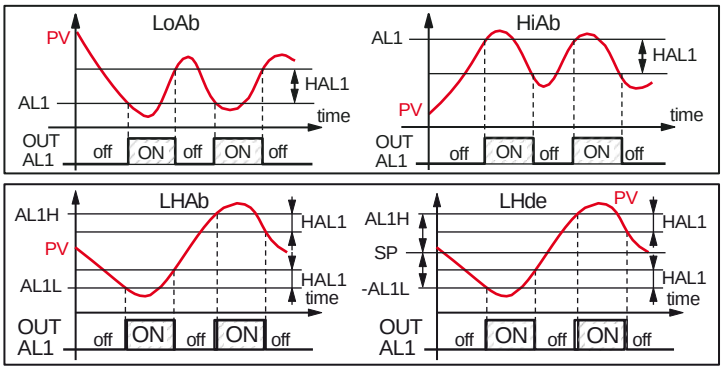
- When one or more outputs are programmed as control output:

nonE Alarm not used;
LoAb Absolute low alarm;
HiAb Absolute high alarm;
LHAo Absolute band alarm with alarm indication out of the band;
LHAi Absolute band alarm with alarm indication inside the band;
SE.br Sensor break;
LodE Deviation low alarm (relative);
HidE Deviation high alarm (relative);
LHdo Relative band alarm with alarm indication out of the band;
LHdi Relative band alarm with alarm indication inside the band;

- When no output is programmed as control output;

nonE Alarm not used;
LoAb Absolute low alarm;
HiAb Absolute high alarm;
LHAo Absolute band alarm with alarm indication out of the band;
LHAi Absolute band alarm with alarm indication inside the band;
SE.br Sensor break.

Notes: **1.** Relative and deviation alarms are "relative" to the operative Set Point value.



2. Sensor break alarm (`SE.br`) is **activated** when the display shows --------indication.

[30] Pr.A1 - Process value for Alarm 1

Available: When [29] AL1t is different from `nonE`.

Range: • If [2] Pr2 = **no**:

Pr1 Probe 1 measure.

• If [2] Pr2 = **YES**:

Pr1 Probe 1 measure;

Pr2 Probe 2 measure;

P1-2 Difference between probes (Pr1 - Pr2);

P1-L Difference between probes [Pr1- (limited Pr2)].

[31] Ab1 - Alarm 1 function

Available: When [29] AL1t is different from `nonE`.

Range: 0... 63 with the following rule:

+1 Not active at power ON;

+2 Latched alarm (manual reset);

+4 Acknowledgeable alarm;

+8 Relative alarm not active at Set Point change;

+16 When the alarm is active the instrument goes into standby (output power = 0);

Note: Setting [31] Ab1 greater than 15, [37] AL1o must be set equal to 1 or 3.

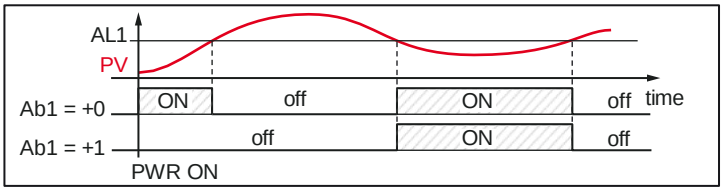
+32 Alarm used as an event (does not turn ON the **AL** LED and does not signal the alarm status on serial port).

Example: Setting **Ab1 = 33** (32 + 1) AL1 will be an event with manual reset.

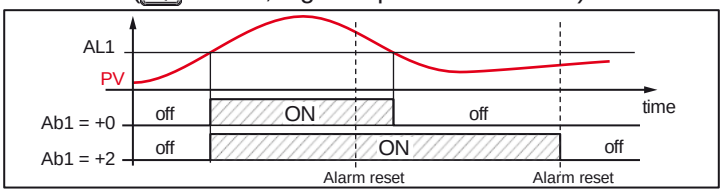
Notes: **1.** The "*Not active at power up*" selection allows to inhibit the alarm function at instrument power up or when the instrument detects a transfer from:

- Manual mode (oPLo) to auto mode;
- Standby mode to auto mode.

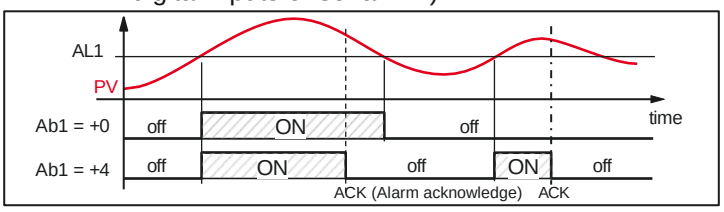
The alarm will be automatically enabled when the measured value reaches, for the first time, the alarm threshold ±hysteresis (in other words, when the initial alarm condition disappears).



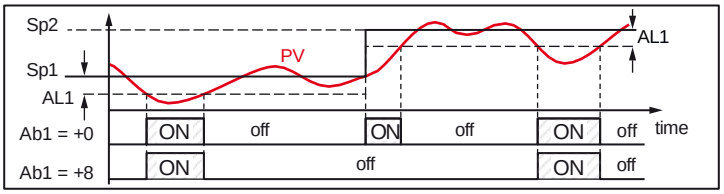
2. A "*Latched alarm*" (manual reset) is an alarm that remains active even if the conditions that generated the alarm no longer persist. Alarm reset can be done only by an external command (button, digital inputs or serial link).



3. An "*Acknowledgeable*" alarm is an alarm that can be reset even if the conditions that generated the alarm are still present. Alarm acknowledge can be done only by an external command (button, digital inputs or serial link).



A "*Relative alarm not active at Set Point change*" is an alarm that masks the alarm condition after a Set Point change until process variable reaches the alarm threshold ± hysteresis.



4. The instrument does not store in EEPROM the alarm status. For this reason, the alarm status will be lost if a power down occurs.

[32] AL1L - For High and low alarms, AL1L is the low limit of the AL1 threshold - For band alarm, AL1L is the low alarm threshold

Available: When [29] AL1t is different from `nonE` or [29] AL1t is different from `SE.br`.

Range: From -1999 to [33] AL1H in engineering units.

[33] AL1H - For High and low alarms, AL1H is the high limit of the AL1 threshold - For band alarm, AL1H is the high alarm threshold

Available: When [29] AL1t is different from `nonE` or [29] AL1t is different from `SE.br`.

Range: From [32] AL1L to 9999 in engineering units.

[34] AL1- Alarm 1 threshold

Available: When:

[29] AL1t = `LoAb` - Absolute low alarm;

[29] AL1t = `HiAb` - Absolute high alarm;

[29] AL1t = `LodE` - Deviation low alarm (relative);

[29] AL1t = `HIdE` - Deviation high alarm (relative).

Range: From [32] AL1L to [33] AL1H in engineering units.

[35] HAL1 - Alarm 1 hysteresis

Available: When [29] AL1t is different from nonE or [29] AL1t is different from SE.br.

Range: 1... 9999 in engineering units.

Notes: **1.** The hysteresis value is the difference between the Alarm threshold value and the point the Alarm automatically resets.

2. When the alarm threshold ±hysteresis is out of input range, the instrument will not be able to reset the alarm.

Example: Input range 0... 1000 (mBar).

- Set Point equal to 900 (mBar);
- Deviation low alarm equal to 50 (mBar);
- Hysteresis equal to 160 (mBar) the theoretical reset point is 900 - 50 + 160 = 1010 (mBar) but this value is out of range.

The reset can be made only by turning the instrument OFF, removing the condition that generate the alarm and then turn the instrument ON again.

3. All band alarms use the same hysteresis value for both thresholds;

4. When the hysteresis of a band alarm is larger than the programmed band, the instrument will not be able to reset the alarm.

Example: Input range 0... 500 (°C).

- Set Point equal to 250 (°C);
- Relative band alarm;
- Low threshold equal to 10 (°C);
- High threshold equal to 10 (°C);
- Hysteresis equal to 25 (°C).

[36] AL1d - Alarm 1 delay

Available: When [29] AL1t is different from nonE.

Range: 0 oFF

1. .. 9999 seconds.

Note: The alarm goes ON only when the alarm condition persists for a time longer than [36] AL1d time but the reset is immediate.

[37] AL1o - Alarm 1 enabling during Standby mode and out of range indications

Available: When [29] AL1t is different from nonE or [29] AL1t is different from SE.br.

Range: **0** Never;
1 During standby;
2 During overrange and underrange;
3 During overrange, underrange and standby.

Note: Setting [31] Ab1 greater than **15**, [37] AL1o must be set equal to **1** or **3**.

] AL2 Group - Alarm 2 parameters

[38] AL2t - Alarm 2 type

Available: Aways.

Range: • When one or more outputs are programmed as control output:

nonE Alarm not used;
LoAb Absolute low alarm;
HiAb Absolute high alarm;
LHAo Absolute band alarm with alarm indication out of the band;
LHAi Absolute band alarm with alarm indication inside the band;
SE.br Sensor break;
LodE Deviation low alarm (relative);
HidE Deviation high alarm (relative) ;
LHdo Relative band alarm with alarm indication out of the band;
LHdi Relative band alarm with alarm indication inside the band.

• When no output is programmed as control output:

nonE Alarm not used;
LoAb Absolute low alarm;
HiAb Absolute high alarm;
LHAo Absolute band alarm with alarm indication out of the band;
LHAi Absolute band alarm with alarm indication inside the band;
SE.br Sensor break.

Note: The relative alarm are “relative” to the current Set Point (this may be different from the Target Set Point if you are using the ramp to Set Point function).

[39] PR.A2 - Process value for Alarm 2

Available: When [38] AL2t is different from nonE.

Range: • If [2] Pr2 = **no**:

Pr1 Probe 1 measure.

• If [2] Pr2 = **YES**:

Pr1 Probe 1 measure;
Pr2 Probe 2 measure;
P1-2 Difference between probes (Pr1 - Pr2);
P1-L Difference between probes [Pr1- (limited Pr2)].

[40] Ab2 - Alarm 2 function

Available: When [38] AL2t is different from nonE.

Range: 0... 63 with the following rule:

+1 Not active at power ON;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Set Point change;
+16 When the alarm is active the instrument goes into standby (output power = 0);

Note: Setting [40] Ab2 greater than 15, [46] AL2o must be set equal to 1 or 3.

+32 Alarm used as an event (does not turn ON the **AL** LED and does not signal the alarm status on serial port).

Example: Setting **Ab2 = 33** (32 + 1) AL1 will be an event with manual reset.

Note: For other details see [31] Ab1 parameter.

[41] AL2L - For High and low alarms, AL2L is the low limit of the AL2 threshold - For band alarm, AL2L is the low alarm threshold

Available: When [38] AL2t is different from nonE or [38] AL2t is different from SE.br.

Range: -1999 to [42] AL2H in engineering units.

[42] AL2H - For High and low alarms, AL2H is the high limit of the AL2 threshold - For band alarm, AL2H is high alarm threshold

Available: When [38] AL2t is different from nonE or [38] AL2t is different from SE.br.

Range: From [41] AL2L to 9999 in engineering units.

[43] AL2 - Alarm 2 threshold

Available: When:
[38] AL2t = LoAb Absolute low alarm;
[38] AL2t = HiAb Absolute high alarm;
[38] AL2t = LodE Deviation low alarm (relative);
[38] AL2t = HIdE Deviation high alarm (relative).
Range: From [41] AL2L to [42] AL2H in engineering units.

[44] HAL2 - Alarm 2 hysteresis

Available: When [38] AL2t is different from nonE or [38] AL2t is different from SE.br.
Range: AL2t 1... 9999 in engineering units.
Note: For other details see [35] HAL1 parameter.

[45] AL2d - Alarm 2 delay

Available: When [38] AL2t different from nonE.
Range: 0 oFF
1... 9999 seconds.
Note: The alarm goes ON only when the alarm condition persist for a time longer than the one set at [45] AL2d parameter but the reset is immediate.

[46] AL2o - Alarm 2 enabling during Standby mode and out of range indications

Available: When [38] AL2t is different from nonE or [38] AL2t is different from SE.br.
Range: **0** Never;
1 During standby;
2 During overrange and underrange;
3 During overrange, underrange and standby.
Note: Setting [40] Ab2 greater than **15**, [46] AL2o must be set equal to **1** or **3**.

] AL3 Group - Alarm 3 parameters

[47] AL3t - Alarm 3 type

Available: Always.
Range: • When one or more outputs are programmed as control output:
nonE Alarm not used;
LoAb Absolute low alarm;
HiAb Absolute high alarm;
LHAo Absolute band alarm with alarm indication out of the band;
LHAi Absolute band alarm with alarm indication inside the band;
SE.br Sensor break;
LodE Deviation low alarm (relative);
HidE Deviation high alarm (relative) ;
LHdo Relative band alarm with alarm indication out of the band;
LHdi Relative band alarm with alarm indication inside the band.
• When no output is programmed as control output:
nonE Alarm not used;
LoAb Absolute low alarm;
HiAb Absolute high alarm;
LHAo Absolute band alarm with alarm indication out of the band;
LHAi Absolute band alarm with alarm indication inside the band;
SE.br Sensor break.
Note: The relative alarm are “relative” to the current Set Point (this may be different to the Target Set Point if you are using the ramp to Set Point function).

[48] Pr.A3 - Process value for Alarm 3

Available: When [47] AL3t is different from nonE.
Range: • If [2] Pr2 = **no**:
Pr1 Probe 1 measure.
• If [2] Pr2 = **YES**:
Pr1 Probe 1 measure;
Pr2 Probe 2 measure;
P1-2 Difference between probes (Pr1 - Pr2);
P1-L Difference between probes [Pr1- (limited Pr2)].

[49] Ab3 - Alarm 3 function

Available: When [47] AL3t is different from nonE.
Range: 0... 63 with the following rule:
+1 Not active at power ON;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Set Point change;
+16 When the alarm is active the instrument goes into standby (output power = 0);
Note: Setting [49] Ab3 greater than 15, [55] AL2o must be set equal to 1 or 3.
+32 Alarm used as an event (does not turn ON the **AL** LED and does not signal the alarm status on serial port).
Example: Setting [49] Ab3 = 5 (1 + 4) AL3 will be “*Not active at power up*” and “*Acknowledgeable*”.
Note: For other details see [31] Ab1 parameter.

[50] AL3L - For High and low alarms, AL3L is the low limit of the AL3 threshold - For band alarm, AL3L is low alarm threshold

Available: When [47] AL3t is different from nonE or [47] AL3t is different from SE.br.
Range: -1999 to [51] AL3H in engineering units.

[51] AL3H - For High and low alarms, AL3H is the high limit of the AL3 threshold - For band alarm, AL3H is high alarm threshold

Available: When [47] AL3t is different from nonE or [47] AL3t is different from SE.br.
Range: From [50] AL3L to 9999 in engineering units.

[52] AL3 - Alarm 3 threshold

Available: When:
• [47] AL3t = LoAb Absolute low alarm;
• [47] AL3t = HiAb Absolute high alarm;
• [47] AL3t = LodE Deviation low alarm (relative);
• [47] AL3t = HIdE Deviation high alarm (relative).
Range: From [50] AL3L to [51] AL3H in engineering units.

[53] HAL3 - Alarm 3 hysteresis

Available: When [47] AL3t is different from nonE or [47] AL3t is different from SE.br.
Range: 1... 9999 in engineering units.
Note: For other details see [35] HAL1 parameter.

[54] AL3d - Alarm 3 delay

Available: When [47] AL3t different from nonE.
Range: 0 oFF
1... 9999 seconds.
Note: The alarm goes ON only when the alarm condition persist for a time longer than [54] AL3d time but the reset is immediate.

[55] AL3o - Alarm 3 enabling during Standby mode and out of range indications

Available: When [47] AL3t is different from `nonE` or [47] AL3t is different from `SE.br`.

Range: **0** Never;
1 During standby;
2 During overrange and underrange;
3 During overrange, underrange and standby.

Note: Setting [49] Ab3 greater than **15**, [55] AL3o must be set equal to **1** or **3**.

] rEG group - Control parameters

The]rEG group will be available only when at least one output is programmed as control output (H.rEG or C.rEG).

[56] Pr.rG - Process value for temperature control

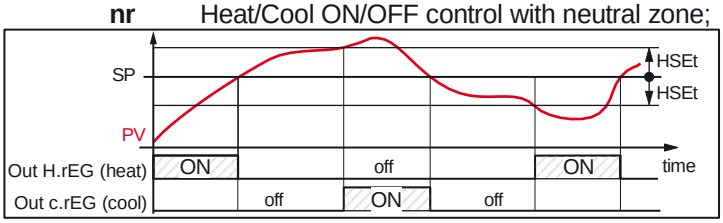
Available: Always.

Range: • Always:
Pr1 Probe 1 measure.
• If [2] Pr2 = **YES**:
Pr1 Probe 1 measure;
Pr2 Probe 2 measure;
P1-2 Difference between probes (Pr1 - Pr2);
P1-L Difference between probes [Pr1- (limited Pr2)].

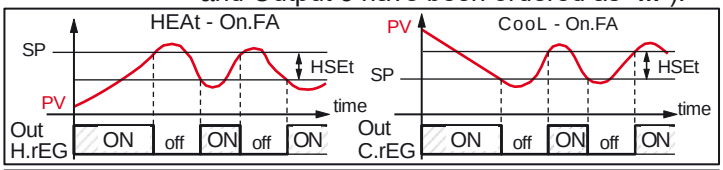
[57] cont - Control type

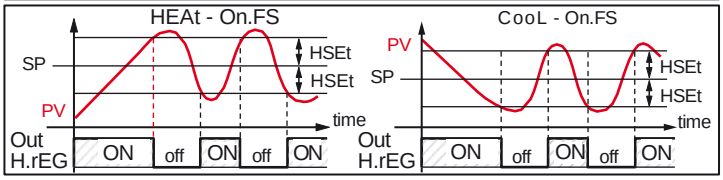
Available: When at least one output is programmed as control output (H.rEG or C.rEG).

Range: • When two control actions (heat & cool) are programmed:
Pid PID (heat and cool);
nr Heat/Cool ON/OFF control with neutral zone;



• When one control action (H or C) is programmed:
Pid PID (heat or cool);
On.FA ON/OFF asymmetric hysteresis;
On.FS ON/OFF symmetric hysteresis;
3Pt Servomotor control (available when Output 2 and Output 3 have been ordered as "**M**").





Notes: **1.** ON/OFF control with asymmetric hysteresis:
• OFF when PV ≥ SP;
• ON when PV ≤ (SP - hysteresis).
2. ON/OFF control with symmetric hysteresis:
• OFF when PV ≥ (SP + hysteresis);
• ON when PV ≤ (SP - hysteresis).

[58] Auto - Auto-tune selection

Ascon Tecnologic has developed three auto-tune algorithms:
– Oscillating auto-tune;
– Fast auto-tune;
– EvoTune.

1. Oscillating auto-tune is the usual auto-tune and:
• It is more accurate;
• Can start even if PV is close to the Set Point;
• Can be used even if the Set Point is close to the ambient temperature.

2. Fast auto-tune is suitable when:
• The process is very slow and you want to be operative in a short time;
• When an overshoot is not acceptable;
• In multi-loop machinery where the fast method reduces the calculation error due to the effect of the other loops.

3. The **EvoTune** type is suitable when:
• There are no information about the process;
• Cannot be sure about the end user skills;
• An auto-tune calculation independently from the starting conditions is necessary (e.g. Set Point change during tune execution, etc.).

Note: Fast auto-tune can start only when the measured value (PV) is lower than (SP + 1/2 SP).

Available: When [57] cont = PID.

Range: -4... 8 where:
-4 Oscillating auto-tune with automatic restart at all Set Point change;
-3 Oscillating auto-tune with manual start;
-2 Oscillating auto-tune with automatic start at the first power ON only;
-1 Oscillating auto-tune with automatic restart at all power ON;
0 Not used;
1 Fast auto-tuning, automatic restart at all power ON;
2 Fast auto-tune, automatic start at 1st power ON only;
3 FAST auto-tune, manual start;
4 FAST auto-tune, automatic restart at all Set Point change;
5 EvoTune, automatic restart at all power ON;
6 EvoTune, automatic start at first power ON only;
7 EvoTune, manual start;
8 EvoTune, automatic restart at all Set Point change.

[59] tunE - Manual start of auto-tune

Available: When [57] cont = PID.

Range: **oFF** The instrument is not performing the auto-tune;
on The instrument is performing the auto-tune.

[60] HSEt - Hysteresis of the ON/OFF control

Available: When [57] cont is different than PID.

Range: 0... 9999 in engineering units.

[61] cPdt - Time for compressor protection

Available: When [57] cont = nr.

Range: **OFF** Protection disabled;
1... 9999 seconds.

[62] Pb - Proportional band

Available: When [57] cont = PID.

Range: 1... 9999 in engineering units.

Note: Auto-tune functions calculate this value.

[63] ti - Integral time

Available: When [57] cont = PID.

Range: **OFF** Integral action excluded;
1... 9999 seconds;
inF Integral action excluded.

Note: Auto-tune functions calculate this value.

[64] td - Derivative time

Available: When [57] cont = PID.

Range: **oFF** Derivative action excluded;
1... 9999 seconds.

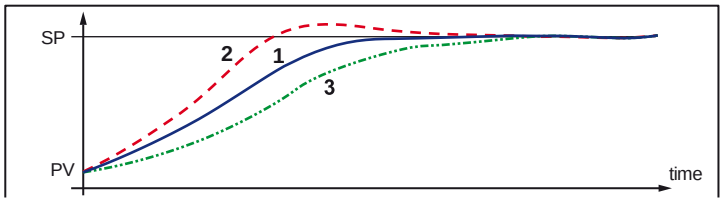
Note: Auto-tune functions calculate this value.

[65] Fuoc - Fuzzy overshoot control

This parameter reduces the overshoot usually present at instrument start up or after a Set Point change and will be active only in this two cases.

Setting a value between 0.00 and 1.00 it is possible to slow down the instrument action during Set Point approach.

Setting **Fuoc = 1** this function is disabled.



Available: When [57] cont = PID.

Range: 0... 2.00.

Note: Fast auto-tune calculates the **Fuoc** parameter while the Oscillating one sets it equal to 0.5.

[66] tcH - Cycle time of the heating output

Available: When at least one output is programmed in order to be the heating output (H.rEG) [57] cont = PID.

Range: 0.2. ..130.0 seconds.

[67] rcG - Power ratio between cooling and heating action (relative cooling gain)

The instrument uses the same PID parameters set for cool and for heat actions but the efficiency of the two actions are usually different.

rcG allows to define the ratio between the efficiency of the cooling system and the efficiency of the heating one.

An example helps to explain the rcG philosophy.

Consider one loop of a plastic extruder. The working temperature is equal to 250°C.

When you want to increase the temperature from 250 to 270°C ($\phi\iota$T = 20°C) using 100% of the heating power (resistor), are necessary 60 seconds.

On the contrary, when you want to decrease the temperature from 250 to 230°C ($\phi\iota$T = 20°C) using 100% of the cooling power (fan), only 20 seconds are necessary.

In our example the ratio is equal to 20/60 = 1/3 ([67] rcG = 0.33) and it says that the efficiency of the heating system is less efficient (1/3 = 0.33 times) than the cooling one.

Available: When two control action are programmed (H.rEG and c.rEG) and [57] cont = PID.

Range: 0.01. ..99.99

Note: Auto-tune functions calculate this value.

[68] tcc - Cycle time of the cooling output

Available: When at least one output is programmed in order to be the cooling output (c.rEG), [57] cont = PID.

Range: 1.0....130.0 seconds.

[69] rS - Manual reset (integral pre-load)

It allows to drastically reduce the undershoot caused by a hot restart. When your process is steady, the instrument operates with a steady power output (e.g.: 30%).

If a short power down occurs, the process restarts with a process variable close to the Set Point while the instrument starts with an integral action equal to zero.

Setting a manual reset equal to the average power output (in our example 30%) the instrument will start with a power output equal to the value it will use at steady state (instead of zero) and the undershoot will become very little (in theory equal to zero).

Available: When [57] cont = PID.

Range: -100.0. ..+100.0%.

[70] Str.t - Servomotor stroke time

Available: When [57] cont = 3Pt.

Range: 5. ..1000 seconds;

[71] db.S - Servomotor dead band

Available: When [57] cont = 3Pt.

Range: 0.0. ..10.0.

[72] od - Delay at power ON

Available: When at least one output is programmed as control output.

Range: **oFF** Function not used;
0.01. ..99.59 hh.mm.

Notes: **1.** This parameter defines the time during which (after a power up) the instrument remains in standby mode before to start all other functions (control action, alarms etc.).

2. When an auto-tune with automatic start at power ON and **od** function are programmed, the auto-tune starts at the end of **od** delay.

General notes about soft start function

The soft start function allows to limit the power output for a programmable time ([74] SSt) or up to a programmed threshold value ([75] SS.tH) (the first of the two).

When soft start function is running the lower display shows the label SSt alternated to the value selected by [94] dISP parameter.

[73] St.P - Maximum power output used during soft start

Available: When at least one output is programmed as control output.

Range: -100. +100%.

Notes: **1.** When St.P parameter has a positive value, the limit is applied to the heating output(s) only.

2. When St.P parameter has a negative value, the limit is applied to the cooling output(s) only.

3. The auto-tune function is performed after Soft start function.

4. The Soft start function is available also when ON/OFF control is used.

[74] SSt - Soft start time

Available: When at least one output is programmed as control output.

Range: **oFF** Function not used;
0.01... 7.59 hh.mm;
inF Soft start always active.

[75] SS.tH - Threshold for soft start disabling

Available: When at least one output is programmed as control output.

Range: -1999... 9999 in engineering units.

Notes: **1.** When the power limiter has a **positive value** (the limit is applied to the **heating action**) the soft start function will be aborted when the measured value is **greater or equal to SS.tH** parameter.
2. When the power limiter has a **negative value** (the limit is applied to the **cooling action**) the soft start function will be aborted when the measured value is **lower or equal to SS.tH** parameter.

] SP Group - Set Point parameters

The] SP group will be available only when at least one output is programmed as control output (H.rEG or C.rEG).

[76] SPLL - Minimum Set Point value

Available: When at least one output is programmed as control output.

Range: From -1999 to [77] SPHL in engineering units.

Notes: **1.** When you change the [76] SPLL value, the instrument checks all local Set Points (SP and SP2 parameters). If an SP is out of this range, the instrument forces it to the maximum acceptable value
2. A [76] SPLL change produces the following actions:
- When [81] SP.rt = SP the remote Set Point will be forced to be equal to the active Set Point.
- When [81] SP.rt = trim the remote Set Point will be forced to zero.
- When [81] SP.rt = PErc the remote Set Point will be forced to zero.

[77] SPHL - Maximum Set Point value

Available: When at least one output is programmed as control output.

Range: From [76] SPLL to 9999 in engineering units.

Note: For other details see [76] SPLL parameter.

[78] SP - Set Point 1

Available: When at least one output is programmed as control output.

Range: From [76] SPLL to [77] SPHL in engineering units.

[79] SP 2 - Set Point 2

Available: When at least one output is programmed as control output.

Range: From [76] SPLL to [77] SPHL in engineering units.

[80] A.SP - Selection of the active Set Point

Available: When at least one output is programmed as control output.

Range: 1 or 2.

Note: A [80] A.SP change produces the following actions:
- When [81] SP.rt = SP - the remote Set Point will be forced to be equal to the active Set Point;
- When [81] SP.rt = trin - the remote Set Point will be forced to zero;
- When [81] SP.rt = PErc - the remote Set Point will be forced to zero.

[81] SP.rt - Remote Set Point type

These instruments communicate with each other using RS485 serial interface without a PC. An instrument can be set to be the Master while all the others must be Slave units. The Master unit can send his operative Set Point to the slave units. In this way, for example, is possible to change simultaneously the Set Point of 20 instruments by changing the Set Point of the master unit (e.g.: hot runner application).

[81] SP.rt parameter defines how the slaves units will use the value coming from serial link.

[105] tr.SP [selection of the value to be retransmitted (Master)] parameter allows to define the value sent by master unit.

Available: When at least one output is e programmed as control output and the serial interface is present.

Range: **rSP** The value coming from serial link is used as remote Set Point (RSP).
trin The value coming from serial link will be algebraically added to the local Set Point selected by **A.SP** and the sum becomes the operative Set Point.
PErc The value coming from serial will be scaled on the input range and this calculated value will be used as remote Set Point.

Note: A [81] SPrt change produces the following actions:
- When [81] SP.rt = rSP - the remote Set Point will be forced to be equal to the active Set Point;
- When [81] SP.rt = trin - the remote Set Point will be forced to zero;
- When [81] SP.rt = PErc - the remote Set Point will be forced to zero.

Example: A 6 zone reflow-oven for PCB. The master unit sends its Set Point value to 5 other zones (slave controllers). The Slave zones use it as a “TRIM” Set Point (`trin` setting).
The first zone is the master zone and has Set Point = 210°C.
The second zone has a local Set Point = -45°C.
The third zone has a local Set Point = -45 (°C).
The fourth zone has a local Set Point = -30 (°C).
The fifth zone has a local Set Point = +40 (°C).
The sixth zone has a local Set Point = +50 (°C).
In this way, the thermal profile will be the following:
– Master SP = 210°C;
– Second zone SP = 210 - 45 = 165°C;
– Third zone SP = 210 - 45 = 165°C;
– Fourth zone SP = 210 - 30 = 180°C;
– Fifth zone SP = 210 + 40 = 250°C;
– Sixth zone SP = 210 + 50 = 260°C.
Changing the Master unit Set Point, the Set Point of the slave units changes by the same amount.

[82] SPLr - Local/remote Set Point selection

Available: When at least one output is programmed as control output.

Range: **Loc** Local Set Point selected by [80] A.SP;
rEn Remote Set Point (coming from serial link).

[83] SP.u - Rate of rise for positive Set Point change (ramp up)

Available: When at least one output is e programmed as control output.

Range: 0.01... 99.99 units per minute;
inF Ramp disabled (step transfer).

[84] SP.d - Rate of drop for negative Set Point change (ramp down)

Available: When at least one output is e programmed as control output.

Range: 0.01... 99.99 units per minute;
inF Ramp disabled (step transfer).

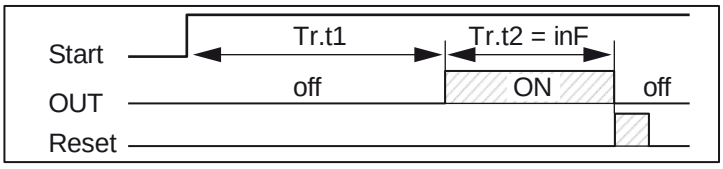
General note about remote Set Point:
When the remote Set Point (RSP) with trim action is programmed, the local Set Point range becomes: from [76] SPLL + RSP to [77] SPHL - RSP.

] tin group - Timer function parameters

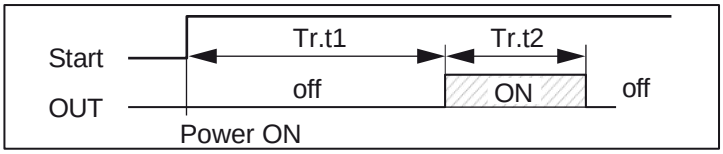
Five timer types are available:

Delayed start with a delay time and a “end of cycle” time.

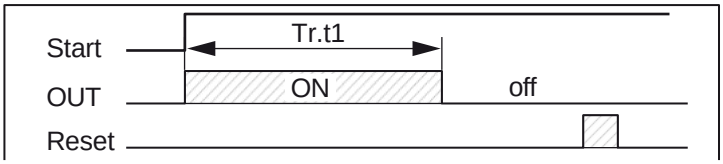
Setting **tr.t2 = Inf** the timer out remains in ON condition until a reset command is detected.



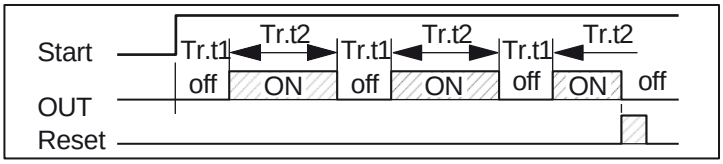
Delayed start at power ON with a delay time and a “end of cycle” time.



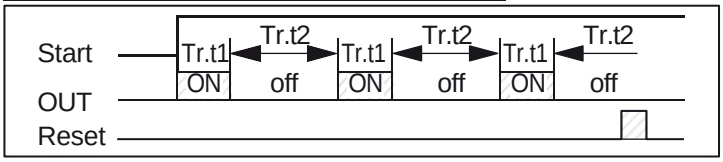
Feed-through



Asymmetrical oscillator with start in OFF



Asymmetrical oscillator with start in ON



Notes: **1.** The instrument can receive the Start, Hold and Reset commands by button, by logic inputs and/or by serial link.
2. The HOLD command suspends the time count.

[85] tr.F- Independent timer function

Available: Always.

Range: **nonE** Timer not used;
i.d.A Delayed start timer;
i.uP.d Delayed start at power up;
i.d.d Feed-through timer;
i.P.L Asymmetrical oscillator with start in OFF;
i.L.P Asymmetrical oscillator with start in ON.

[86] tr.u - Engineering unit of the time

Available: When [85] tr.F is different from `nonE`.

Range: **hh.nn** Hours and minutes;
nn.SS Minutes and seconds;
SSS.d Seconds and tenths of a second.

Note: When the timer is running, this parameter can be seen, but not modified.

[87] tr.t1 - Time 1

Available: When [85] tr.F is different from `nonE`.

Range: When [86] tr.u = hh.nn = 00.01....99.59;
When [86] tr.u = nn.SS = 00.01... 99.59;
When [86] tr.u = SSS.d = 000.1....995.9.

[88] tr.t2 - Time 2

Available: When [85] tr.F is different from `nonE`.

Range: When [86] tr.u = hh.nn = 00.01....99.59 + inF;
When [86] tr.u = nn.SS = 00.01... 99.59 + inF;
When [86] tr.u = SSS.d= 000....995.9 + inF.

Note: Setting [88] tr.t2 = inF, the second time can be stopped by a reset command only.

[89] tr.St - Timer status

Available: When [85] Tr.F is different from `nonE`.

Range: **run** Timer Run;
HoLd Timer Hold;
rES Timer reset.

Note: This parameter allows to manage the timer execution by a parameter (without digital inputs or button).

] PAn group - Operator HMI

[90] PAS2 - Level 2 password: Limited access level

Available: Always.

Range: **oFF** Level 2 not protected by password (as level 1 = Operator level);
1... 200.

[91] PAS3 - Level 3 password: Complete configuration level

Available: Always.

Range: 3....200.

Note: Setting [90] PAS2 equal to [91] PAS3, the level 2 will be masked.

[92] uSrb - button function during RUN TIME

Available: Always.

Range: **nonE** No function;
tunE Auto-tune enabling. A single press (longer than 1 s) starts the auto-tune;
oPLo Manual mode. The first pressure puts the instrument in manual mode (oPLo) while the second one puts the instrument in Auto mode;
AAc Alarm reset;
ASi Alarm acknowledge;
chSP Sequential Set Point selection (note);
St.by Standby mode. The first pression puts the instrument in standby mode while the sec-

ond one puts the instrument in Auto mode;
Str.t Timer run/hold/reset (note);
HE.co Heats using SP1/Cools using SP2.

Notes: 1. When "*Sequential Set Point selection*" is used, all pressions on the button (longer than 1 s) increases the value of A.SP (active Set Point) by one step. The selection is cyclic: **SP** -> **SP2**. When a new Set Point is selected using the key, the display shows for 2 seconds the acronym of the new Set Point (e.g.: SP2).

2. When "*Timer run/hold/reset*" is selected, a short press starts/stops (hold) timer count while a long press (longer than 10 s) resets the timer.

[93] H.diS - Primary Display Management

Available: Always.

Range: Pr1 Measurement of Pr1 probe;
Pr2 Measurement of Pr2 probe;
Pr1-2 Shows the difference between Pr1 - Pr2;
Pr1-L Shows the difference between Pr1 - Pr2L (limited Pr2);
rEG Shows the measure used by the control action.

[94] L.diS - Secondary Display Management

Available: Always.

Range: nonE Standard display;
Pou Power output;
SPF Final Set Point;
Spo Operative Set Point;
AL1 Alarm 1 threshold;
AL2 Alarm 2 threshold;
AL3 Alarm 3 threshold;
ti.uP When the timer is running, the display shows the timer counting up. At count end, the instrument alternately displays t.End and the measured value.
ti.du When the timer is running, the display will show the timer counting down. At count end, the instrument alternately displays t.End and the measured value.
PErc Percent of the power output used during soft start (when the soft start time is equal to infinite, the limit is ever active and can be used also when ON/OFF control is selected).
PoS Valve position (servomotor control);
Pr1 Measurement of Pr1 probe;
Pr2 Measurement of Pr2 probe;
Pr1-2 Shows the difference between Pr1 - Pr2;
Pr1-L Shows the difference between Pr1 - (limited Pr2).

[95] di.CL - Display colour

Available: Always.

Range: 0 The display colour is used to show the actual deviation (PV - SP);
1 Display red (fixed);
2 Display green (fixed);
3 Display orange (fixed).

[96] AdE - Deviation for display colour management

Available: When [95] di.CL = 0.

Range: 1... 9999 in engineering units.

[97] diS.t - Display time out

Available: Always.

Range: oFF The display is ever ON;
0.1....99.59 minutes and seconds.

Note: This function allows to turn OFF the display when no alarm is present and no action is made on the instrument. When **diS.t** is different from oFF and no button is pressed for more than the programmed time out, the display goes OFF and only 4 segments of the less significant digit are turned ON in sequence in order to show that the instrument is working correctly.
If an alarm occurs or a button is pressed, the display returns to the normal operation.

[98] FiLd - Filter on the displayed value

Available: Always.

Range: oFF Filter disabled;
0.1....20.0 engineering units.

Note: This is a "window filter" related to the Set Point, it is applied to the displayed value only and has no effect on the other functions of the instrument (control, alarms, etc.).

[99] dG.F - Bargraph function (KX8 only)

Available: Always.

Range: none Bargraph disabled;
Pou Output power calculated by PID (single action: 0... 100%, double action: -100...+100%);
ti.u Elapsed time of timer (T1 and T2);
ti.du Time to end of timer (T1 and T2);
PoS Valve position (servomotor control);
Pr1 Pr1 probe measure;
Pr2 Pr2 probe measure;
Pr1-2 Difference between Pr1 - Pr2;
Pr1-L Difference between Pr1 - (limited Pr2).

[100] dSPu - Status of the instrument at power ON

Available: Always.

Range: AS.Pr Starts in the same way it was prior to the power down;
Auto Starts in Auto mode;
oP.0 Starts in manual mode with a power output equal to zero.
St.bY Starts in standby mode.

Notes: 1. Changing the value of [101] oPr.E, the instrument forces [102] oPEr parameter to Auto.

2. Setting [100] dSPu equal to **AS.Pr**, if the power down occurs when the instrument is in manual mode, at power ON the instrument will re-start in manual mode with the same power used prior to the power down.

[101] oPr.E - Operative modes enabling

Available: Always.

Range: ALL All modes will be selectable by the next parameter.
Au.oP Auto and manual (oPLo) mode only are selectable by the [102] oPEr parameter;
Au.Sb Auto and Standby modes only are selectable by [102] oPEr parameter.

Note: Manual changing the value of [101] oPr.E, the instrument forces parameter [102] oPEr = Auto.

[102] oPEr - Operative mode selection

Available: Always.

Range: • When [101] oPr.E = **ALL**:

Auto Auto mode;
oPLo Manual mode;
St.bY Standby mode.

• When [101] oPr.E = **Au.oP**:

Auto Auto mode;
oPLo Manual mode.

• When [101] oPr.E = **Au.Sb**:

Auto Auto mode;
St.bY Standby mode.

] Ser group - Serial link parameters

[103] Add - Instrument address

Available: Always.

Range: **oFF** Serial interface not used;
1. .. 254.

[104] bAud - Baud rate

Available: When [103] Add different from **oFF**.

Range: **1200** 1200 baud;
2400 2400 baud;
9600 9600 baud;
19.2 19200 baud;
38.4 38400 baud.

[105] trSP - Selection of the retransmitted variable (Master)

Available: When [103] Add different from **oFF**.

Range: **nonE** Retransmission not used (the instrument is a slave);
rSP The instrument becomes a Master and it retransmits the operative Set Point;
PErc The instrument becomes a Master and it retransmits the power output.

Note: For more details see [84] SP.rt (Remote Set Point type) parameter.

] CAL group - User calibration group

This function allows to calibrate the complete measuring chain and to compensate the errors due to:

- Sensor location;
- Sensor class (sensor errors);
- Instrument accuracy.

[106] AL.P1 - Adjust Pr1 (TC1) Low Point

Available: Always.

Range: -1999... (AH.P1 - 10) in engineering units.

Note: The minimum difference between AL.P1 and AH.P1 is equal to 10 engineering units.

[107] AL.o1 - Offset applied to the lower calibration point of Pr1 (TC1)

Available: Always.

Range: -300... +300 in engineering units.

[108] AH.P1 - Higher Pr1 (TC1) calibration point

Available: Always.

Range: From (AL.P1 + 10) to 9999 in engineering units.

Note: The minimum difference between AL.P1 and AH.P1 is equal to 10 Engineering Units.

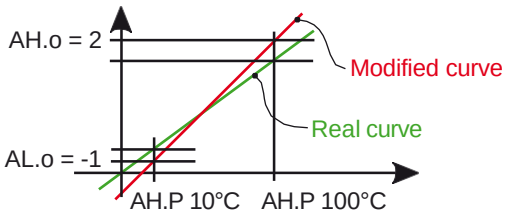
[109] AH.o1 - Offset applied to the higher calibration point of Pr1 (TC1)

Available: Always.

Range: -300... +300 In engineering units.

Example: Environmental chamber with operative range: 10... 100°C.

1. Insert in the chamber a reference sensor connected with a reference instrument (usually a calibrator).
2. Start the control of the instrument, and set a Set Point equal to the minimum value of the operative range (e.g.: 10°C). When the temperature in the chamber is steady, take note of the temperature measured by the reference system (e.g.: 9°C).
3. Set [106] AL.P = 10 (low working point) and [107] ALo = -1 (it is the difference between the reading of the instrument and the reading of the reference system). Note that after this set the measured value of the instrument is equal to the measured value of the reference system.
4. Set a Set Point equal to the maximum value of the operative range (e.g. 100°C). When the temperature in the chamber is steady, take note of the temperature measured by the reference system (e.g. 98°C).
5. Set [108] AH.P = 100 (low working point) and [109] AHo = +2 (it is the difference between the reading of the instrument and the reading of the reference system). Note that after this set the measured value of the instrument is equal to the measured value of the reference system.



[110] AL.P2 - Adjust Pr2 (TC2) Low Point

Available: Always.

Range: -1999... (AH.P2 - 10) in engineering units.

Note: The minimum difference between AL.P2 and AH.P2 is equal to 10 engineering units.

[111] AL.o2 - Offset applied to the lower calibration point of Pr2 (TC2)

Available: Always.

Range: -300... +300 in engineering units.

[112] AH.P2 - Higher Pr2 (TC2) calibration point

Available: Always.

Range: From (AL.P2 + 10) to 9999 in engineering units.

Note: The minimum difference between AL.P2 and AH.P2 is equal to 10 Engineering Units.

[113] AH.o2 - Offset applied to the higher calibration point of Pr2 (TC2)

Available: Always.

Range: -300... +300 In engineering units.

5.7 How to exit the configuration level

The most important steps of the configuration procedure are completed. In order to exit from the configuration parameter procedure, proceed as follows:

- Push button.
- Push button for more than 10 s. The instrument returns to the “Standard display”.

6 PARAMETER PROMOTION

Another important step of the instrument configuration is due to the possibility to create a custom HMI (interface) in order to make the instrument easy to use for the operator and comfortable for the assistance.

By a special procedure, named "*Promotion*", the OEM can create two parameter subsets.

The first one is the "*Limited access*" level. This subset is protected by the password programmed by [90] PAS2 parameter.

The last subset is the "*Operator*" set (Level1). This level is NOT password protected.

Notes:
1. The "*Limited access*" parameters are collected in a list.
2. The sequence of the "*Limited access*" parameters is programmable and can be made according to the user needs.
3. The parameter sequence of the operator level is the same programmed for "*Limited access*" level but only those specified as "*Operator*" parameters can be displayed and modified. This set must be create according to the user requirements.

6.1 Parameter promotion procedure

The limited access parameter set is a list, so that, before to start promotion procedure, we suggest to operate as follows:

1. Prepare the exact parameter list you want to make accessible for limited access.
2. Number the desired parameters in the same sequence you want to have in the limited access.
3. Define which of the selected parameter will be available in Operator level also.

Example: I would like to obtain the following limited access list:

- OPEr - Operative mode selection
- SP - first Set Point
- SP2 - Second Set Point
- A.SP - Set Point selection
- AL1 - Alarm 1 threshold
- AL2 - Alarm 2 threshold
- Pb - Proportional band
- ti - Integral time
- td - Derivative time
- Aut.r - Manual start of the auto-tune

But I want that the operator to be able to change: the operative mode, the SP value and the AL1 value. In this case the promotion will be the following:

Parameter	Promotion	Limited Access	Operator
- OPEr -	o 1	OPEr	OPEr
- SP -	o 2	SP	SP
- SP2 -	A 3	SP2	
- A.SP -	A 4	A.SP	
- AL1 -	o 5	AL1	AL1
- AL2 -	A 6	AL2	
- Pb -	A 7	Pb	
- ti -	A 8	ti	
- td -	A 9	td	
- Aut.r -	A 10	Aut.r	

Now, proceed as follows:

1. Push the ↵ button for more than 3 seconds. The upper display shows `PASS` while the lower display shows `0`.
2. By ▲ and ▼ buttons set a password equal to `-81`.
3. Push ↵ button.
   The instrument now shows the acronym of the first configuration parameter group `jinP`.
4. By ↵ button select the group of the first parameter of your list.
5. By ↵ button select the first parameter of your list
6. The upper display shows the acronym of the parameter while the lower display shows his current promotion level. The promotion level is defined by a letter followed by a number. The letter can be:
   - `c`: The parameter is **NOT** promoted and it is present only in configuration. In this case the number is forced to zero.
   - `A`: The parameter has been promoted to the limited access level. The number indicates the position in the limited access list.
   - `o`: The parameter has been promoted to the Operator level. The number indicates the position in the limited access list.
7. By ▲ and ▼ buttons assign to this parameter the desired position.

Note: Setting a value different from 0 the letter `c` will change automatically to `A` and the parameter is automatically promoted to the limited access level.

8. In order to modify the level from limited access to operator and vice versa, push ↵ button and, maintaining the pressure, push also the ▲ button. The letter will change from `A` to `o` and vice versa.
9. Select the second parameter that you want to add to the assistance level and repeat steps 6, 7 and 8.
10. Repeat steps 5, 6, 7, 8 until the list has been completed.
11. When you need to exit from promotion procedure, push ↵ button and maintain the pressure for more than 10 s. The instrument will show the "Standard display".

Note: When you set the same number to two parameters, the instrument uses only the last programmed parameter.

Example: In the previous example, I have set for SP2 a promotion value equal to `A3`.

If now I set for SP3 a promotion value equal to `o3`, the Limited Access list and the operator list becomes.

Parameter	Promotion	Limited Access	Operator
- OPEr -	o 1	OPEr	OPEr
- SP -	o 2	SP	SP
- SP3 -	o 3	SP3	SP3
- A.SP -	A 4	A.SP	
- AL1 -	o 5	AL1	AL1

7 OPERATIVE MODES

As we said at paragraph 5.1, when the instrument is powered, it starts immediately to work according to the stored parameter value. In other words, the instrument has one status only, the “run time” status.

During “run time” we can force the instrument to operate in three different modes: Automatic mode, Manual mode or Standby mode:

– In **Automatic mode** the instrument drives automatically the control output according to the parameter value set and the Set Point/measured value.

– In **Manual mode** the upper display shows the measured value while the lower display shows the power output The lower display shows the power output [preceded by H (for heating) or C (for cooling)], MAN is lit and the instrument allows you to set manually the control output power. No Automatic action is performed.

– In **Standby** mode the instrument operates as an indicator. It shows on the upper display the measured value and on the lower display the Set Point alternated to the “St.bY” label. Control outputs are forced to zero.

As we have seen, it is always possible to modify the value assigned to a parameter independently from the operative modes selected.

7.1 Modify a parameter during “Operator level”

The instrument is showing the “Standard display”.

1. Press the button. The upper display shows the acronym of the first parameter promoted to this level while the lower display shows its value.
2. Using the and button assign to this parameter the desired value.
3. Press the button in order to store the new value and go to the next parameter.
4. When you want to return to the “Standard display” push the button for more than 5 seconds.

Note: The parameter modification of the Operator level is subject to a time out. If no buttons are pressed for more than 10 seconds, the instrument returns to the “Standard display” and the new value of the last selected parameter will be lost.

7.2 Entering the “Limited access level”

The instrument is showing the “Standard display”.

1. Press the button for more than 5 seconds. The upper display showS PASS while the lower display shows 0;
2. By and buttons set the value assigned to [90] PAS2 (Level 2 password).

Notes:

1. The factory default password for the “limited access” level is 20.
2. All parameters changes are protected by a time out. If no button is pressed for more than 10 seconds the instrument returns automatically back to the Standard display, the new value of the last selected parameter is lost and the parameter changing procedure is closed.
   To remove the time out (e.g.: for the first configuration of an instrument) you can use a password equal to 1000 plus the programmed password (e.g. 1000 + 20 [default] = 1020).
   It is always possible to manually end the parameter configuration procedure (see below).
3. During parameter changes the instrument continues to perform the control. In certain conditions (e.g. when a parameter change can produces a heavy bump to the process) it is advisable to temporarily stop the control action during the programming procedure (the control outputs will be OFF). A password equal to 2000 + the programmed value (e.g. 2000 + 20 = 2020) switches the control out off during configuration. The control automatically restarts when the para-meter modification procedure will be manually ended.
4. Push button. The instrument shows on the upper display the acronym of the first parameter promoted to this level and its value on the lower display.
5. By and buttons assign to this parameter the desired value.
6. Press the button in order to store the new value and go to the next parameter.
7. When you want to return to the “Standard display” push the button for more than 5 s.

7.3 How to see but not modify the “limited access parameters”

Sometimes it is necessary to give to the operator the possibility to see the value assigned to the parameter promoted in the Limited Access level but it is important that all changes are made by authorized personnel only.

In this cases, proceed as follows:

1. Press the button for more than 5 seconds;
2. The upper display will show PASS while the lower display will show 0;
3. By and button set the value -181;
4. Push button;
5. The upper display will show the acronym of the first parameter promoted to the level 2 and lower display will show its value;
6. Using button it is possible to see the value assigned to all parameters present in level 2 but it will not be possible to modify it;
7. It is possible to return to the “Standard display” pushing the button for more than 3 seconds or by pushing no buttons for more than 10 seconds.

7.4 Automatic Mode

7.4.1 Keyboard function when the instrument is in Auto mode

Performs the action programmed by [92] uSrb (button function during RUN TIME) parameter.

Enters the parameter modification procedures.

Displays the "*Additional information*" (see below);

Starts the "*Direct Set Point change*" function (see below).

+ Allow to enter in **MAN**ual mode and to return to **AUTO** mode.

7.4.2 Direct Set Point modification

This function allows to modify rapidly the Set Point value selected by [80] A.SP (selection of the active Set Point).

The instrument is showing the "Standard display".

1. Push the button.
   The upper display shows the acronym of the selected Set Point (e.g. SP2) and the lower display its value.
2. By and buttons, assign to this parameter the desired value
3. Push no buttons for more than 5 second or push the button. In both cases the instrument stores the new value and returns to the "Standard display".

Note: If the selected Set Point has not been promoted to the Operator level, the instrument allows you to see the value but not to modify it.

7.4.3 Additional information

This instrument is able to show you some additional information that can help you to manage your system.

The additional information are related to how the instrument is programmed, hence in many cases, only part of this information is available.

1. When the instrument is showing the "Standard display" push button. The lower display will show `H` or `C` followed by a number. This value is the current power output applied to the process. Letter `H` indicates that the action is a Heating action while the `C` indicates that the action is a Cooling action.
2. Push button again. The upper display shows the temperature value measured by Pr1, probe while the lower display indicates `P1`.
3. If probe 2 is used ([2] Pr2 = YES), pressing the key again the upper display shows the value measured by Pr2 probe while the lower display indicates `P2`.
4. If probe 2 is used ([2] Pr2 = YES), pressing the key again the upper display shows the difference between the values measured by the probes (P1 - P2), while the lower display indicates `P1-2`.
5. If probe 2 is used ([2] Pr2 = YES), pressing the key again the upper display shows the difference between the values measured by the probes with Limited P2 (P1 - P2L), while the lower display indicates `P1-L`.
6. If the timer is running, by pressing the key again the upper display returns to show the measurement selected by [93] H.dis while the lower display shows the letter `t` followed by the counting of the timer time (T1 or T2)
7. Push button again. The instrument returns to the "Standard display".

Note: The additional information visualization is subject to a time out. If no buttons are pressed for more than 10 second the instrument automatically returns to the "Standard display".

7.4.4 Display management

This instrument allows to program (see parameter [97] diS.t the display time out.

This function allows to turn OFF the display when no alarm is present and no action is made on the instrument.

When [97] diS.t is different to OFF (display always ON) and no buttons are pressed for a time longer than the one programmed, the display goes OFF and only 4 segments of the less significant digit are turned ON in sequence in order to show that the instrument is working correctly.

If an alarm occurs or a button is pressed, the display returns to normal operation.

7.4.5 The display colour shows the deviation

This instrument allows to program the deviation (PV - SP) for colour display change (see parameter [96] AdE).

In this way the upper display will be:

– Amber when PV is lower than SP - AdE;

– Green when (SP - AdE) < PV < SP + AdE);

– Red when PV is higher than SP + AdE.

7.5 Manual mode

This operative mode allows you to deactivate automatic control and manually program the percentage power output to the process.

When the instrument is in manual mode, the upper display shows the measured value while the lower display shows the power output [preceded by `H` (for heating action) or `C` (for cooling action)]. The MAN LED is lit.

When the manual control is selected, the instrument starts to operate with the same output power as the last one supplied by automatic mode. The output power can be modified using the and buttons.

When ON/OFF control is selected, the manual mode is available and, using the and buttons, is possible to force the control output to 100% or to 0% respectively.

As in the case of visualization, the programmable values range from `H100` (100% output power with reverse action) to `C100` (100% output power with direct action).

Notes:
1. During manual mode, the alarms are operative.
2. If you set manual modes during program execution, the program will be frozen and it will restart when the instrument will come back to Auto mode.
3. If you set standby mode during auto-tune execution, the auto-tune function will be aborted.
4. During manual mode, all functions not related with the control continue to operate normally.

7.6 Standby mode

This operative mode also deactivates the automatic control and forces the control output to zero.

In this mode the instrument operates as an indicator.

When the instrument is in standby mode the upper display shows the measured value while the lower display shows alternately the Set Point and the label "St.bY".

Notes: 1. During standby mode, the relative alarms are disabled while the absolute alarms are operative or not according to the ALxo (Alarm x enabling during Standby mode) parameter setting.

2. If you set standby mode during auto-tune execution, the auto-tune function will be aborted.

3. During standby mode, all functions not related with the control continue to operate normally.

4. When the instrument is swapped from standby to auto modes, the instrument will start automatically the alarm masking, the soft start functions and the auto-tune (if programmed).

8 ERROR MESSAGES

8.1 Out of range signals

The instrument can have 2 physical probes and two calculated values (PV1 - PV2 and PV1 - PV2 L) and these four values can generate 3 error indications:

Ur**x** Underrange on element **x**;
or**x** Overrange on element **x**;
--**x** Out of range on element **x**.

Where **x** is substituted by the number if the element in error.

In this way **1** indicates a probe 1 (Pr1) error, **2** indicates a probe 2 (Pr2) error, **3** indicates an error of the difference PV1 - PV2 and **4** indicates an error of the difference PV1 - PV2L (limited Pr2).

In case of a physical probe error, regardless of what has been set as display mode, the instrument shows the relative indication.

If the display value programmed is available, the error message is alternated with the selected value.

E.g. 1 H.diS = **Pr.1** (the display shows probe 1 measure) and probe 2 breaks.
The instrument alternates --2 with the probe 1 measurement of (example 57°C).
If the selected value is not available, the instrument shows, in an alternated mode, the 2 error messages.

E.g.1 H.diS = **P1-2** (the display shows the difference between probe 1 and probe 2 measures) and probe 2 breaks.
The instrument shows --2 and --3.

Note: When an over-range/under-range is detected, the alarms operates as if the instrument is detecting the maximum or minimum measurable value respectively.

To check the out of range Error condition, proceed as follows:

1. Check the input signal source and the connecting line.

2. Make sure that the input signal is in accordance with the instrument configuration. Otherwise, modify the input configuration (see section 5).

3. If no error is detected, send the instrument to your supplier to be checked.

8.2 List of possible errors

Error	Cause/Corrective action
ErAT	Fast Auto-tune cannot start. The measure value is too close to the Set Point. Push the ↵ button in order to delete the error message.
ouLd	Overload on output 4. The message shows that a short circuit is present on Out 4 when it is used as output or transmitter power supply. When the short circuit disappears the output restarts to operate.
NoAt	Auto-tune not finished within 12 hours.
ErEP	Possible problem in the instrument memory. The message should automatically disappear, if the error persists, send the instrument to your supplier.
RonE	Possible problem of the firmware memory. If this error is detected, send the instrument to your supplier.
Errt	Possible problem of the calibration memory. If this error is detected, send the instrument to your supplier.

9 GENERAL NOTES

9.1 Firmware Revision Level and Instrument Serial number

Sometimes it may be necessary to provide to the technical assistance the Serial number of the instrument or the Firmware Revision level. To obtain these 2 information proceed as follows:

1. Power ON the instrument;

2. The controller performs the "*Lamp test*" turning ON all the LEDs on the display;

3. Once the "*Lamp test*" has been completed, the instrument displays the word "tESt" on the upper display, while the lower one shows a 3-digit code (x.y.z) preceded by "r." (revision). E.g.: "r.4.3.5" where 4.3.5 indicates the Firmware revision of the instrument;

4. To obtain the Serial number of the instrument, press the ∧ key while the instrument displays the word "tESt";

5. At this point the instrument shows on both displays the serial number composed as follows:
- On the upper display appears "n." (number), followed by **XXX** (e.g.: n.246),
- **YYYY** on the lower one (e.g.: 8795);

the serial number is: **XXXYYYY** (e.g.: 2468795).

9.2 Proper use

Every possible use not described in this manual must be consider as a improper use.

This instrument is in compliance with EN 61010-1 "Safety requirements for electrical equipment for measurement, control and laboratory use"; for this reason it could not be used as a safety equipment.

Whenever a failure or a malfunction of the control device may cause dangerous situations for persons, thing or animals, please remember that the plant has to be equipped with additional safety devices.

Ascon Tecnologic S.r.l. and its legal representatives do not assume any responsibility for any damage to people, things or animals deriving from violation, wrong or improper use or in any case not in compliance with the instrument's features.

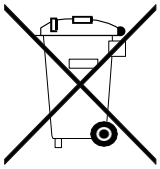
9.3 Maintenance

This instrument does not requires periodical recalibration and it have no consumable parts so that no particular maintenance is required.

Sometimes it is advisable to clean the instrument.

1. **SWITCH THE EQUIPMENT OFF** (power supply, relay output, etc.).
2. Using a vacuum cleaner or a compressed air jet (max. 3 kg/cm^2) remove all deposits of dust and dirt which may be present on the case and on the internal circuits being careful not to damage the electronic components.
3. To clean external plastic or rubber parts use only a cloth moistened with:
   - Ethyl Alcohol (pure or denatured) [C_2H_5OH] or
   - Isopropyl Alcohol (pure or denatured) [$(CH_3)_2CHOH$] or
   - Water (H_2O).
4. Make sure that there are no loose terminals.
5. Before turning ON the instrument make sure it is perfectly dry.
6. Apply the power supply to the instrument.

9.4 Disposal



The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

10 WARRANTY AND REPAIRS

This product is under warranty against manufacturing defects or faulty materials that are found within 18 months from delivery date. The warranty is limited to repairs or to the replacement of the instrument.

The tampering of the instrument or an improper use of the product will bring about the immediate withdrawal of the warranty effects.

In the event of a faulty instrument, either within the period of warranty, or further to its expiry, please contact our sales department to obtain authorisation for sending the instrument to our company.

The faulty product must be shipped to Ascon Tecnologic with a detailed description of the faults found, without any fees or charge for Ascon Tecnologic, except in the event of alternative agreements.

11 ACCESSORIES

The instrument has a lateral socket into which a special tool can be inserted.

This tool, named A01, allows:

– To store a complete instrument configuration and to use it for other instruments;

– To transfer a complete instrument configuration to a PC or from a PC to an instrument;

– To transfer from a PC to an instrument a complete instrument configuration;

– To transfer a configuration from an A01 to another one;

– To test serial interface of the instruments and to help the OEM during machine start up;

Note: When the instrument is powered by the A01 key, the outputs are NOT supplied and the instrument can show the `ouLd` (Out 4 Overload) indication.

Appendix A

] inP GROUP - Main and auxiliary input configuration

no.	Param.	Description	Dec. Point	Values	Default
1	SEnS	Model U	0	J TC J (0... +1000°C/-32... +1832°F); crAL TC K (0... +1370°C/-32... +2498°F); S TC S (0... 1760°C/-32... +3200°F); r TC R (0... +1760°C/-32... +3200°F); t TC T (0... +400°C/-32... +752°F).	J
2	Pr2	Probe 2 presence		YES Probe 2 used; no Probe 2 not used or not present.	
3	dp	Decimal Point Position	0	0/1	0
4	p2ll	Probe 2 initial scale for differential control	dp	-1999... 9999 (E.U)	-1999
5	p2hl	Probe 2 full scale for differential control	dp	-1999... 9999 (E.U)	9999
6	unit	Engineering unit		°C/°F	°C
7	Fil	Digital filter on the measured value	1	0 OFF 0.1. ...20.0 s	1.0
8	inE	Sensor error used to enable the safety output value		or Over range; ou Under range; our Over and under range.	our
9	oPE	Safety output value (% of the output)		-100... 100 %	0
10	IO4.F	I/O 4 function		on Output used as PWS for TX; out4 Output 4 (digital output 4); dG2c Digital input 2 driven by contact; dG2U Digital input 2 driven by voltage.	out4
11	diF1	Digital Input 1 function		oFF Not used; 1 Alarm reset; 2 Alarm acknowledge (ACK); 3 Hold of the measured value; 4 Standby mode; 5 Manual mode; 6 HEAt with SP1 and CooL with SP2; 7 Timer RUN/Hold/Reset (transition); 8 Timer Run (transition); 9 Timer Reset (transition); 10 Timer Run/Hold; 11 Timer Run/Reset; 12 Timer Run/Reset with lock at count end; 13 Sequential SP selection (transition); 14 SP1 - SP2 selection.	oFF
12	diF2	Digital Input 2 function			oFF
13	di.A	Digital Inputs Action (DI2 only if configured)		0 DI1 direct action, DI2 direct action; 1 DI1 reverse action, DI2 direct action; 2 DI1 direct action, DI2 reverse action; 3 DI1 reverse action, DI2 reverse action.	0

] Out group - Output parameters

no.	Param.	Description	Dec. Point	Values	Default
14	o1t	Output 1 type (when Out 1 is an analogue output)		0-20 0... 20 mA; 4-20 4... 20 mA; 0-10 0... 10 V; 2-10 2... 10 V.	0-20

no.	Param.	Description	Dec. Point	Values	Default
15	o1F	Out 1 function (when Out 1 is a linear output)	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; r.Err Error (SP - PV) retransmission; r.SP Operative Set point retransmission; r.SEr Retransmission of a value from serial port; r.in1 Probe 1 measure retransmission; r.in2 Probe 2 measure retransmission; r.1-2 Retransmission of value (Pr1 - Pr2); r.1-L Retransmission of value (Pr1 - Pr2 limited) r.inP Retransmission of the measure used for control actoin.	H.reG
		Out 1 function (when Out1 is a digital output)	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; t.out Timer output; t.HoF Timer out -OFF in hold; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, burn out and Power failure indicator; St.bY Standby status indicator; diF.1 The output repeats the digital input 1 status; diF.2 The output repeats the digital input 2 status; on Out 1 always ON.	H.reG
16	Ao1L	Analogue retransmission - Begin of scale	dP	-1999 ... Ao1H	-1999
17	Ao1H	Analogue retransmission - Full scale	dP	Ao1L ... 9999	9999
18	o1AL	Alarms linked up with the out 1	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Reserved; +16 Sensor Break; +32 Overload on output 4.	AL1
19	o1Ac	Out 1 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir
20	o2F	Out 2 function	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; t.out Timer output; t.HoF Timer output - OFF if in hold; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, burn out and Power failure indicator; St.bY Standby status indicator; diF.1 The output repeats the digital input 1 status; diF.2 The output repeats the digital input 2 status; on Out 2 always ON.	AL
21	o2AL	Alarms linked up with the out 2	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Reserved; +16 Sensor Break; +32 Overload on output 4.	AL1
22	o2Ac	Out 2 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir
23	o3F	Out 3 function	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; t.out Timer output; t.HoF Timer output - OFF if in hold; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, burn out and Power failure indicator; St.bY Standby status indicator; diF.1 The output repeats the digital input 1 status; diF.2 The output repeats the digital input 2 status; on Out 3 always ON.	AL

no.	Param.	Description	Dec. Point	Values	Default
24	o3AL	Alarms linked up with the out 3	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Reserved; +16 Sensor Break; +32 Overload on output 4.	AL2
25	o3Ac	Out 3 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir
26	o4F	Out 4 function	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; t.out Timer output; t.HoF Timer output - OFF if in hold; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, burn out and Power failure indicator; St.bY Standby status indicator.	AL
27	o4AL	Alarms linked up with the out 4	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Reserved; +16 Sensor Break; +32 Overload on output 4.	AL1+ AL2
28	o4Ac	Out 4 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir

] AL1 group - Alarm 1 parameters

no.	Param.	Description	Dec. Point	Values	Default
29	AL1t	Alarm 1 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Windows alarm in alarm outside the windows; LHAI Windows alarm in alarm inside the windows; SE.br Sensor Break; LodE Deviation low alarm (relative); HidE Deviation high alarm (relative); LHdo Relative band alarm in alarm out of the band; LHdi Relative band alarm in alarm inside the band.	HiAb
30	Pr.A1	Alarm 1 process value		Pr1 Pr1 probe measurement; Pr2 Pr2 probe measurement; P1-2 Pr1 - Pr2 (difference between the probes); P1-L Pr1 - (Pr2 limited).	Pr1
31	Ab1	Alarm 1 function	0	0... 63: +1 Not active at power ON; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change; +16 When the alarm is active the instrument goes into standby (output power = 0); +32 Alarm used as an event (AL LED not lit and no alarm status sent on serial port).	0
32	AL1L	- For High/Low alarms, AL1L is the low limit of the AL1 threshold; - For band alarm, AL1L is the low alarm threshold	dp	From -1999 to AL1H (E.U.)	-1999
33	AL1H	- For High/Low alarms, AL1H is the high limit of the AL1 threshold; - For band alarm, AL1H is the high alarm threshold	dp	From AL1L to 9999 (E.U.)	9999
34	AL1	AL1 threshold	dp	From AL1L to AL1H (E.U.)	0
35	HAL1	AL1 hysteresis	dp	1... 9999 (E.U.)	1
36	AL1d	AL1 delay	0	0 oFF 1... 9999 (s)	oFF
37	AL1o	Alarm 1 enabling during Standby mode and out of range conditions	0	0 Alarm 1 disabled during Standby and out of range; 1 Alarm 1 enabled in Standby mode; 2 Alarm 1 enabled in out of range condition; 3 Alarm 1 enabled during Standby and out of range.	0

] AL2 group - Alarm 2 parameters

no.	Param.	Description	Dec. Point	Values	Default
38	AL2t	Alarm 2 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Windows alarm in alarm outside the windows; LHAi Windows alarm in alarm inside the windows; SE.br Sensor Break; LodE Deviation low alarm (relative); HidE Deviation high alarm (relative); LHdo Relative band alarm in alarm out of the band; LHdi Relative band alarm in alarm inside the band.	Loab
39	Pr.A2	Alarm 2 process value		Pr1 Pr1 probe measurement; Pr2 Pr2 probe measurement; P1-2 Pr1 - Pr2 (difference between the probes); P1-L Pr1 - (Pr2 limited).	Pr1
40	Ab2	Alarm 2 function	0	0... 63: +1 Not active at power ON; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change; +16 When the alarm is active the instrument goes into standby (output power = 0); +32 Alarm used as an event (AL LED not lit and no alarm status sent on serial port).	0
41	AL2L	- For High/Low alarms, AL2L is the low limit of the AL2 threshold; - For band alarm, AL2L is the low alarm threshold	dp	From -1999 to AL2H (E.U.)	-1999
42	AL2H	- For High/Low alarms, AL2H is the high limit of the AL2 threshold; - For band alarm, AL2H is the high alarm threshold	dp	From AL2L to 9999 (E.U.)	9999
43	AL2	AL2 threshold	dp	From AL2L to AL2H (E.U.)	0
44	HAL2	AL2 hysteresis	dp	1... 9999 (E.U.)	1
45	AL2d	AL2 delay	0	0 oFF 1... 9999 (s)	oFF
46	AL2o	Alarm 2 enabling during Standby mode and out of range conditions	0	0 Alarm 2 disabled during Standby and out of range; 1 Alarm 2 enabled in Standby mode; 2 Alarm 2 enabled in out of range condition; 3 Alarm 2 enabled during Standby and out of range.	0

] AL3 group - Alarm 3 parameters

no.	Param.	Description	Dec. Point	Values	Default
47	AL3t	Alarm 3 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Windows alarm in alarm outside the windows; LHAI Windows alarm in alarm inside the windows; SE.br Sensor Break; LodE Deviation low alarm (relative); HidE Deviation high alarm (relative); LHdo Relative band alarm in alarm out of the band; LHdi Relative band alarm in alarm inside the band.	nonE
48	Pr.A3	Alarm 3 process value		Pr1 Pr1 probe measurement; Pr2 Pr2 probe measurement; P1-2 Pr1 - Pr2 (difference between the probes); P1-L Pr1 - (Pr2 limited).	Pr1
49	Ab3	Alarm 3 function	0	0... 63: +1 Not active at power ON; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change; +16 When the alarm is active the instrument goes into standby (output power = 0); +32 Alarm used as an event (AL LED not lit and no alarm status sent on serial port).	0
50	AL3L	- For High/Low alarms, AL3L is the low limit of the AL3 threshold; - For band alarm, AL3L is the low alarm threshold	dp	From -1999 to AL3H (E.U.)	-1999
51	AL3H	- For High/Low alarms, AL3H is the high limit of the AL3 threshold; - For band alarm, AL3H is the high alarm threshold	dp	From AL3L to 9999 (E.U.)	9999
52	AL3	AL3 threshold	dp	From AL3L to AL3H (E.U.)	0
53	HAL3	AL3 hysteresis	dp	1... 9999 (E.U.)	1
54	AL3d	AL3 delay	0	0 oFF 1... 9999 (s)	oFF
55	AL3o	Alarm 3 enabling during Standby mode and out of range conditions	0	0 Alarm 3 disabled during Standby and out of range; 1 Alarm 3 enabled in Standby mode; 2 Alarm 3 enabled in out of range condition; 3 Alarm 3 enabled during Standby and out of range	0

] rEG group - Control Parameters

no.	Param.	Description	Dec. Point	Values	Default
56	pr.rg	Control process value		Pr1 Pr1 probe measurement; Pr2 Pr2 probe measurement; P1-2 Pr1 - Pr2 (difference between the probes); P1-L Pr1 - (Pr2 limited) difference between Pr1 and limited Pr2.	Pr1
57	cont	Control type	0	Pid PID (heat and/or cool); On.FA ON/OFF asymmetric hysteresis; On.FS ON/OFF symmetric hysteresis; nr Heat/Cool ON/OFF control with neutral zone; 3Pt Servomotor control.	Pid
58	Auto	Autotuning enabling	0	-4 Oscillating auto-tune, automatic restart at power ON and after all point change; -3 Oscillating auto-tune, manual start; -2 Oscillating auto-tune, automatic start at 2st power ON only; -1 Oscillating auto-tune, automatic restart at every power ON; 0 Not used; 1 Fast auto-tune, automatic restart at every power ON; 2 Fast auto-tune, automatic start the 1st power ON only; 3 FAST auto-tune, manual start; 4 FAST auto-tune, automatic restart at power ON and after a set point change; 5 Evo-tune automatic, restart at every power ON; 6 Evo-tune automatic, start the first power ON only; 7 Evo-tune, manual start; 8 Evo-tune, automatic restart at power ON and after a set point change.	7
59	tune	Manual start of the Autotuning	0	oFF Not active; on Active	oFF
60	HSEt	Hysteresis of the ON/OFF control	dP	0... 9999 (E.U.)	1
61	cPdt	Compressor protection time	0	0 oFF 1... 9999 (s)	oFF
62	Pb	Proportional band	dP	1... 9999 (E.U.)	50
63	ti	Integral time	0	0 oFF 1... 9999 (s)	200
64	td	Derivative time	0	0 oFF 1... 9999 (s)	50
65	Fuoc	Fuzzy overshoot control	2	0.00... 2.00	0.50
66	tcH	Heating output cycle time	1	0.2...130.0 (s)	20.0
67	rcG	Power ratio between cooling and heating action	2	0.01... 99.99	1.00
68	tcc	Cooling output cycle time	1	0.2...130.0 (s)	20.0
69	rS	Manual reset (Integral pre-load)	1	-100.0... +100.0 (%)	0.0
70	Str.t	Servomotor stroke time	0	5... 1000 seconds	60
71	db.S	Servomotor dead band	1	0.0... 10.0	0.5
72	od	Delay at power ON	2	0.00 oFF; 00.01.. 99.59 (hh.mm)	oFF
73	St.P	Maximum power output used during soft start	0	-100... 100 (%)	0
74	SSt	Soft start time	2	0.00 oFF; 0.01. .7.59 (hh.mm); inF Always ON.	oFF
75	SS.tH	Threshold for soft start disabling	dP	-1999... +9999 (E.U.)	9999

] SP group - Set point parameters

no.	Param.	Description	Dec. Point	Values	Default
76	SPLL	Minimum set point value	dP	From -1999 to SPHL	-1999
77	SPHL	Maximum set point value	dP	From SPLL to 9999	9999
78	SP	Set point 1	dP	From SPLL to SPLH	0
79	SP 2	Set point 2	dP	From SPLL to SPLH	0
80	A.SP	Selection of the active set point	0	SP/SP2	1
81	SP.rt	Remote set point type	0	RSP The value coming from serial link is used as remote set point; trin The value will be added to the local set point selected by A.SP and the sum becomes the operative set point; PErc The value will be scaled on the input range and this value will be used as remote SP.	trin
82	SPLr	Local/remote set point selection	0	Loc Local; rEn Remote.	Loc
83	SP.u	Rate of rise for **POSITIVE** set point change (ramp UP)	2	0.01.. 99.99 (inF) in engineering units per minute	inF
84	SP.d	Rate of drop for **NEGATIVE** set point change (ramp DOWN)	2	0.01.. 99.99 (inF) in engineering units per minute	inF

] TIN group - Timer function parameters

no.	Param.	Description	Dec. Point	Values	Default
85	tr.F	Independent timer function	0	NonE Timer not used; i.d.A Delayed start timer; i.uP.d Delayed start at power ON; i.d.d Feed-through timer; i.P.L Asymmetrical oscillator with start OFF; i.L.P Asymmetrical oscillator with start ON.	nonE
86	tr.u	Timer unit	0	hh.nn Hours and minutes; nn.SS Minutes and seconds; SSS.d Second and tenth of seconds.	nn.SS
87	tr.t1	Time 1	2	0.01... 99.59 When tr.u < 20	1.00
			1	0.1... 995.9 When tr.u = 200	
88	tr.t2	Time 2	2	00.00 (oFF) to 99.59 (inF) When tr.u < 2	1.00
			1	000.0 (oFF) to 995.9 (inF) When tr.u = 200	
89	tr.St	Timer status	0	rES Timer reset; run Timer run; HoLd Timer hold.	rES

] PAn group - Operator HMI parameters

no.	Param.	Description	Dec. Point	Values	Default
90	PAS2	Level 2 password (limited access level)	0	oFF Level 2 not protected by password; 1... 200.	20
91	PAS3	Level 3 password (complete configuration level)	0	3... 200	30
92	uSrb	button function during RUN TIME		nonE No function; tunE Auto-tune/Self-tune enabling. A single press (longer than 1 s) starts the auto-tune; oPLo Manual mode. 1st press-> Manual mode (oPLo), 2nd one -> Auto mode; AAc Alarm reset; ASi Alarm acknowledge; chSP Sequential set point selection; St.by Standby mode. 1st press-> Standby mode, 2nd one -> Auto mode; Str.t Timer run/hold/reset; HE.co Heat using SP/Cool using SP2.	tunE
93	H.dis	Main display management		Pr1 Pr1 probe measurement; Pr2 Pr2 probe measurement; P1-2 Pr1 - Pr2 (difference between the probes); P1-L Pr1 - (Pr2 limited); rEg Measure used for process control.	
94	l.diS	Secondary display management		nonE Standard display; Pou Power output; SPF Final set point; Spo Operative set point; AL1 Alarm 1 threshold; AL2 Alarm 2 threshold; AL3 Alarm 3 threshold; ti.uP When the timer is running, the display shows the timer counting up. At count end, the instrument alternately displays t.End and the measured value; ti.du When the timer is running, the display shows the timer counting down. At count end, the instrument alternately displays t.End and the measured value; PErc Percent of the power output used during soft start (when the soft start time is equal to infinite, the limit is always active and it can also be used when ON/OFF control is selected); PoS Valve position (servomotor control); Pr1 Pr1 probe measurement; Pr2 Pr2 probe measurement; P1-2 Pr1 - Pr2 (difference between the probes); P1-L Pr1 - (Pr2 limited).	SPo
95	di.cL	Display colour		0 The display colour is used to show the actual deviation (PV - SP); 1 Display red (fix); 2 Display green (fix); 3 Display orange (fix).	0
96	AdE	Deviation for display colour management		1... 999 (E.U.)	5
97	di.St	Display Timeout	2	oFF Display always ON; 0.1. . 99.59 (mm.ss).	oFF
98	fiLd	Filter on the displayed value	1	oFF Filter disabled; 0.1. . 20.0 (E.U.).	oFF
99	dg.f	Bargraph function (KX8 only)		nonE Bargraph not lit; Pou PID Output power (single action: 0... 100%, double action: -100... +100%); ti.uP Elapsed time of timer (T1 and T2); ti.du Time to end of timer (T1 and T2); PoS Posizione valvola servomotore. Pr1 Pr1 probe measure; Pr2 Pr2 probe measure; P1-2 Probe difference Pr1 - Pr2 measure; P1-L Probe difference Pr1 - (limited Pr2).	none
100	dSPu	Instrument status at power ON		AS.Pr Starts in the same way it was prior to the power down; Auto Starts in Auto mode; oP.0 Starts in manual mode with a power output equal to zero; St.bY Starts in Standby mode.	AS.Pr
101	oPr.E	Operative modes enabling		ALL All modes will be selectable by the next parameter; Au.oP Auto and Manual (oPLo) modes only can be selected by the next parameter; Au.Sb Auto and Standby modes only can be selected by the next parameter.	ALL
102	oPEr	Operative mode selection		If oPr.E ALL: { - Auto = Auto mode; - oPLo = Manual mode; - St.bY = Standby mode; If oPr.E Au.oP: { - Auto = Auto mode; - oPLo = Manual mode; If oPr.E Au.Sb: { - Auto = Auto mode; - St.bY = Standby mode.	Auto

] Ser group - Serial link parameters

no.	Param.	Description	Dec. Point	Values	Default
103	Add	Instrument address		oFF Not used; 1... 254.	1
104	bAud	Line speed (Baud rate)		1200 1200 baud; 2400 2400 baud; 9600 9600 baud; 19.2 19200 baud; 38.4 38400 baud.	9600
105	trSP	Selection of the value to be retransmitted (Master)		nonE Retransmission is not used (the instrument is a slave); rSP The instrument becomes a Master and retransmits the operative set point; PErc The instrument becomes a Master and retransmits the power output	nonE

] CAL group - User calibration parameters

no.	Param.	Description	Dec. Point	Values	Default
106	AL.P1	Adjust Low Point for Pr1 probe		From -1999 to (AH.P1 - 10) in engineering units	0
107	AL.o1	Adjust Low Offset for Pr1 probe		-300... +300 (E.U.)	0
108	AH.P1	Adjust High Point for Pr1 probe		From (AL.P1 + 10) to 9999 in engineering units	9999
109	AH.o1	Adjust High Offset for Pr1 probe		-300... +300	0
110	AL.P2	Adjust Low Point for Pr2 probe		From -1999 to (AH.P2 - 10) in engineering units	0
111	AL.o2	Adjust Low Offset for Pr2 probe		-300... +300 (E.U.)	0
112	AH.P2	Adjust High Point for Pr2 probe		From (AL.P2 + 10) to 9999 in engineering units	9999
113	AH.o2	Adjust High Offset for Pr2 probe		-300... +300	0