K_7

CONTROLLER AND MINI-PROGRAMMER WITH SPEED CONTROL

Engineering Manual

Code : ISTR-MK_7ENG01 - Vr. 01 (ENG)

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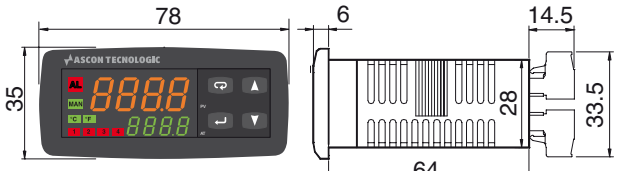
1 DIMENSIONS (mm)

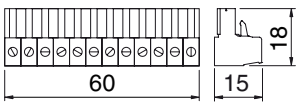
1.1 KR7

1.1.1 Outline Dimensions

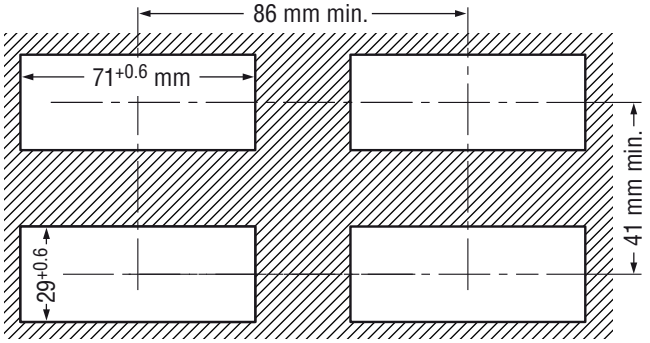
Instrument with non removable terminals



Removable terminals



1.1.2 Panel cutout

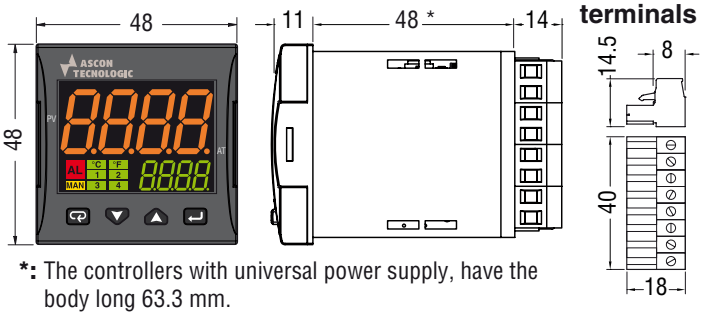


1.2 KM7

1.2.1 Outline Dimensions

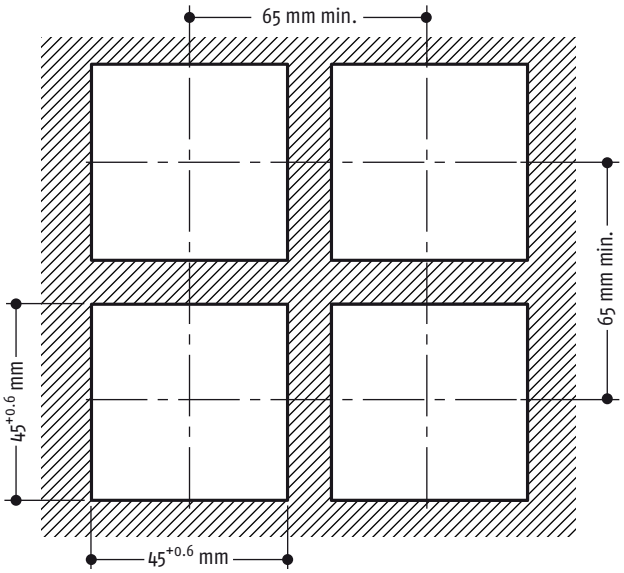
Instrument with non removable terminals

Removable terminals



***:** The controllers with universal power supply, have the body long 63.3 mm.

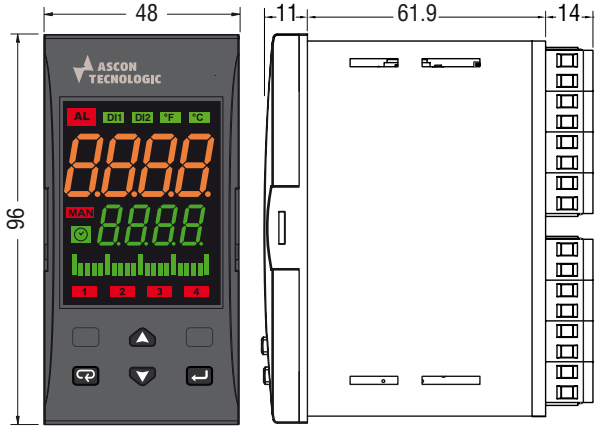
1.2.2 Panel cutout



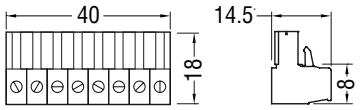
1.3 KX7

1.3.1 Outline Dimensions

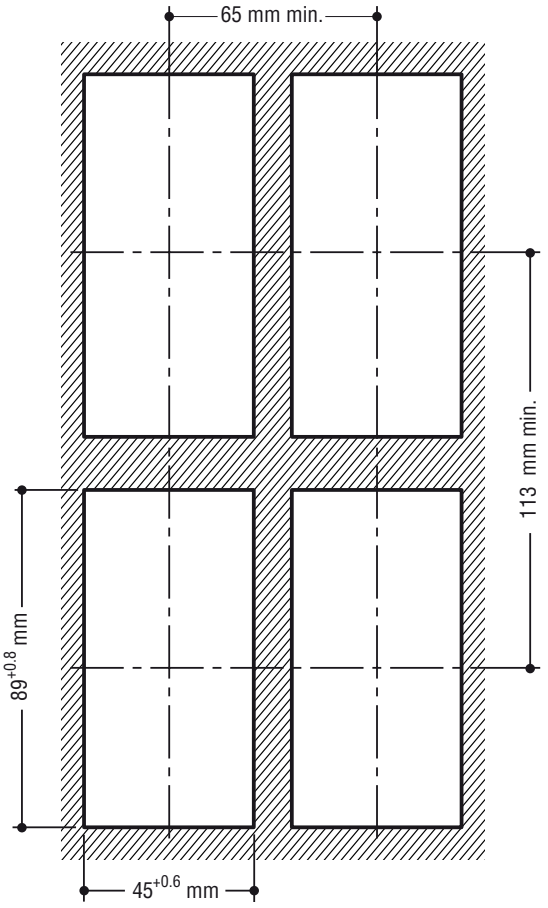
Instrument with non-removable terminals



Removable terminals



1.3.2 Panel cutout



1.4 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 KM7 and KX7 or must be used the optional screw type bracket for the KR7.

2 ELECTRICAL CONECTIONS

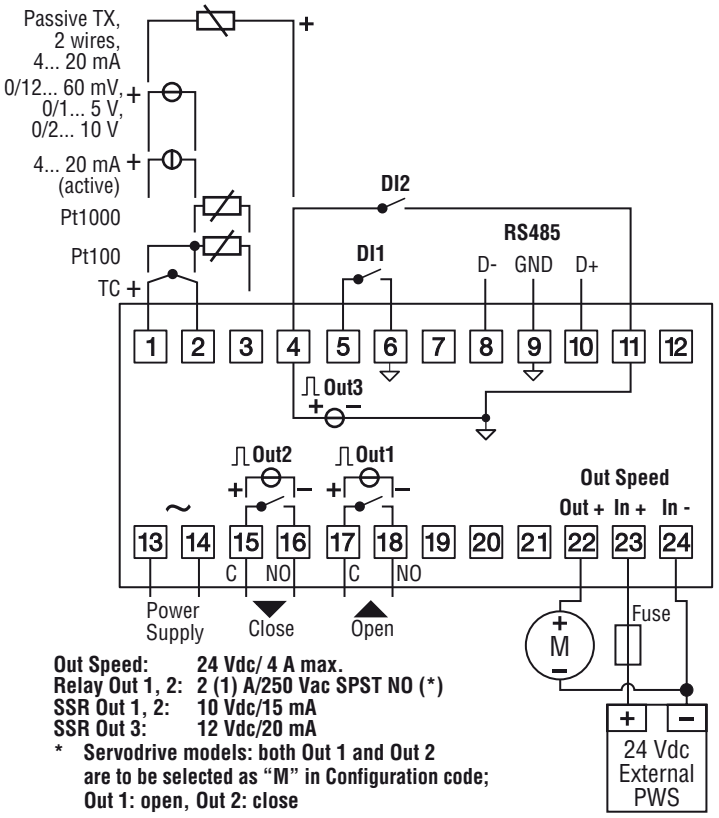
2.1 General notes about wiring

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, it should be connected at one point only.
4. Pay attention to the line resistance; a high line resistance may cause measurement errors.

2.2 Wiring diagrams

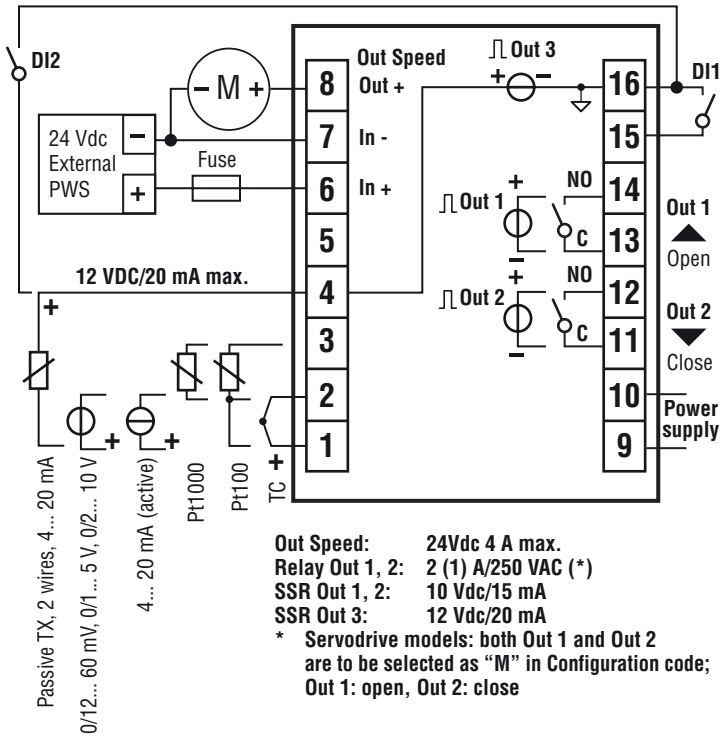
⚠ If not specifically indicated the following connecting diagrams are valid for all the models. When the connections are different, the connection of each model is illustrated.

2.2.1 KR7



Out Speed: 24 Vdc/ 4 A max.
Relay Out 1, 2: 2 (1) A/250 Vac SPST NO (*)
SSR Out 1, 2: 10 Vdc/15 mA
SSR Out 3: 12 Vdc/20 mA
*** 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 KM7



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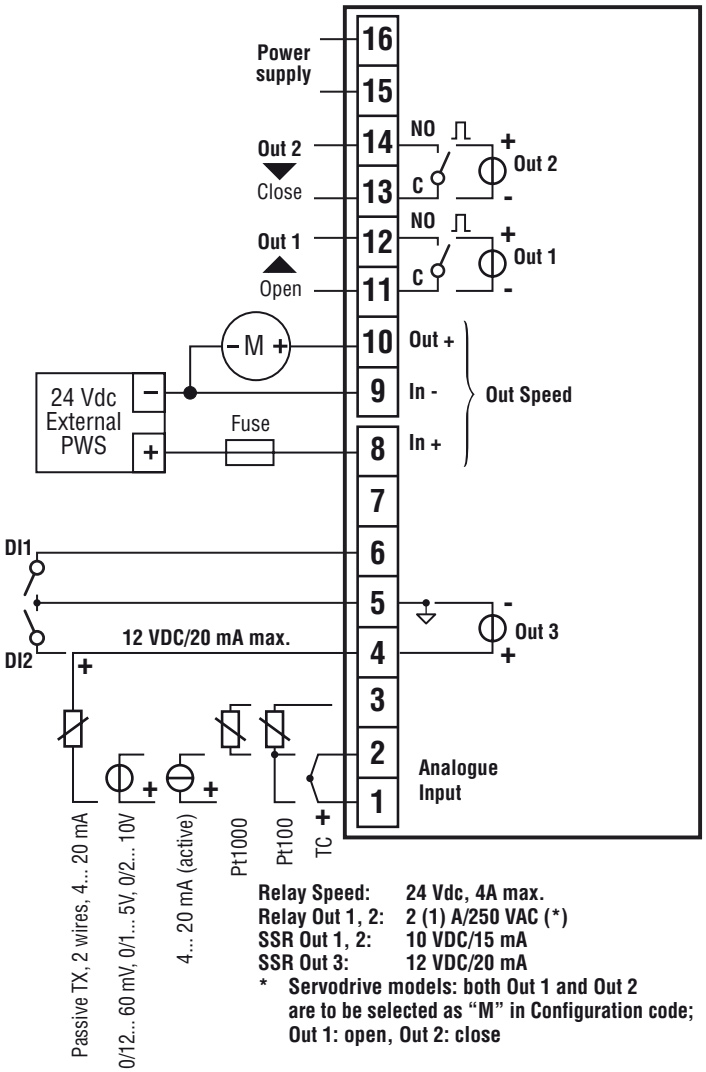
2.2.3 KX7

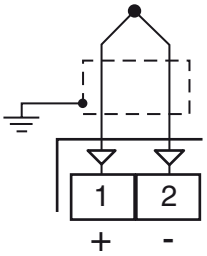


Relay Speed: 24 Vdc, 4A max.
Relay Out 1, 2: 2 (1) A/250 VAC (*)
SSR Out 1, 2: 10 VDC/15 mA
SSR Out 3: 12 VDC/20 mA

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

2.3 Inputs

2.3.1 Thermocouple Input



External resistance: 100Ω max., maximum error 25 μV;

Cold junction: automatic compensation between 0... 50°C;

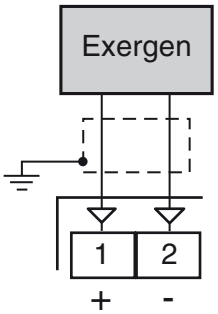
Cold junction accuracy: 0.05°C/°C after a warm-up of 20 minutes;

Input impedance: > 1 MΩ;

Calibration: According to EN 60584-1.

Note: For TC wiring use proper compensating cable preferable shielded.

2.3.2 Infrared Sensor Input



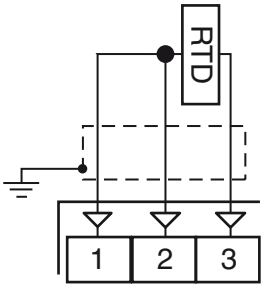
External resistance: not relevant;

Cold junction: automatic compensation between 0... 50°C;

Cold junction accuracy: 0.05°C/°C;

Input impedance: > 1 MΩ.

2.3.3 RTD Pt 100 Input



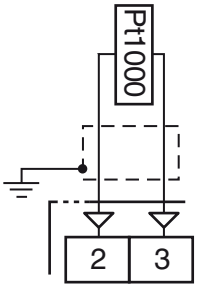
Input circuit: Current injection (150 μA);

Line resistance: Automatic compensation up to 20Ω/wire with maximum error ±0.1% of the input span;

Calibration: According to EN 60751/A2.

Note: The resistance of the 3 wires must be the same.

2.3.4 RTD Pt 1000, NTC and PTC Input

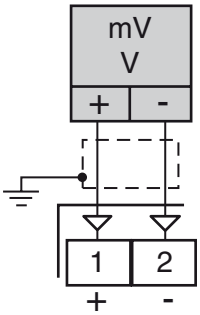


Line resistance: Not compensated;

Pt 1000 input circuit: Current injection (15 μA);

Pt 1000 calibration: According to EN 60751/A2.

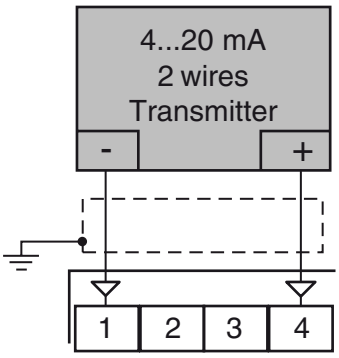
2.3.5 V and mV Input



Input impedance: > 1 MΩ for mV Input, 500 kΩ for Volt Input.

2.3.6 mA Input

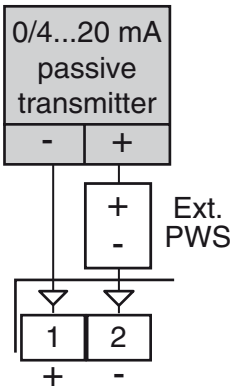
0/4... 20 mA Input wiring for passive transmitter using the auxiliary PWS



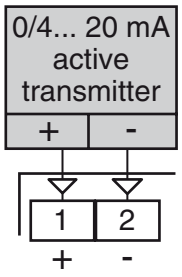
Input impedance: < 53Ω;

Internal auxiliary PWS: 12 VDC (±10%), 20 mA max..

0/4... 20 mA Input wiring for passive transmitter using an external PWS



0/4... 20 mA Input wiring for active transmitter



2.3.7 Logic Inputs

DRY CONTACT LOGIC INPUT CHARACTERISTICS

Maximum contact resistance: 100 Ω;

Contact rating: DI1 = 10 V, 6 mA;
DI2 = 12 V, 30 mA.

24 VDC LOGIC INPUTS CHARACTERISTICS

Logic status 1: 6... 24 VDC;

Logic status 0: 0... 3 VDC.

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.

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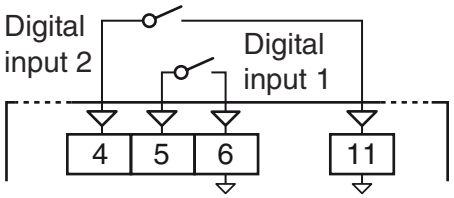
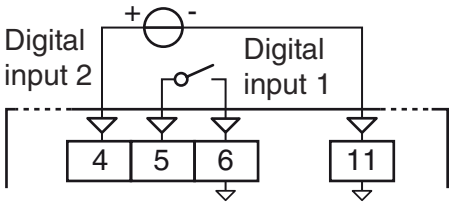
LOGIC INPUT DRIVEN BY DRY CONTACT



LOGIC INPUTS DRIVEN BY 24 VDC



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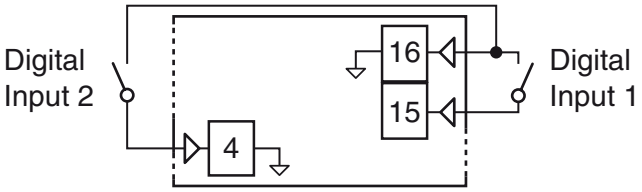
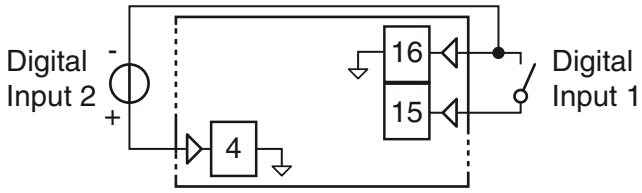
LOGIC INPUT DRIVEN BY DRY CONTACT



LOGIC INPUTS DRIVEN BY 24 VDC



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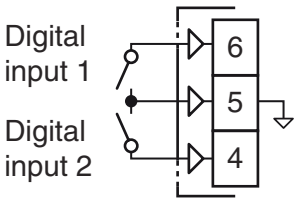
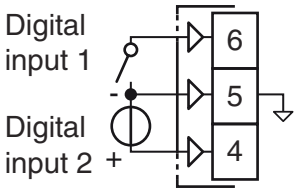
LOGIC INPUT DRIVEN BY DRY CONTACT



LOGIC INPUTS DRIVEN BY 24 VDC



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 Speed Output

SPEED OUTPUT CHARACTERISTICS

Voltage rating: 24 VDC;

Current rating: 4 A max..

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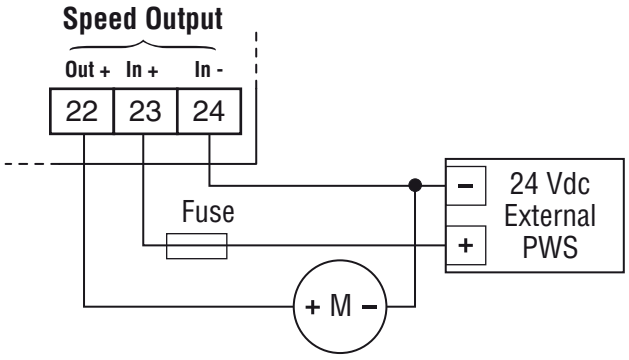

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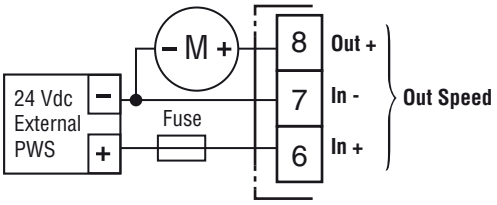

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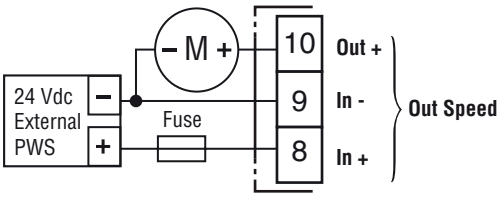

2.4.2 Output 1 (OP1)

RELAY OUTPUT CHARACTERISTICS

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

Operation: 1 x 10^5.

SSR OUTPUT CHARACTERISTICS

Logic level 0: Vout < 0.5 VDC;

Logic level 1: 12 V ± 20%, 15 mA max..

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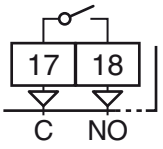
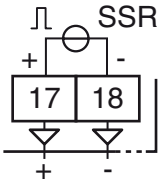
RELAY OUTPUT



SSR OUTPUT



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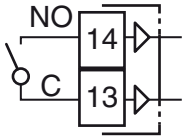
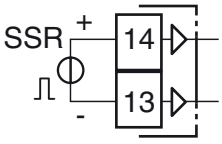
RELAY OUTPUT



SSR OUTPUT



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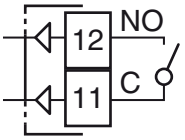
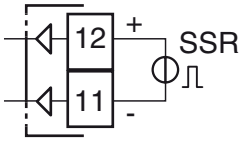
RELAY OUTPUT



SSR OUTPUT



2.4.3 Output 2 (OP2)

RELAY OUTPUT CHARACTERISTICS

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

Operation: 1 x 10^5.

SSR OUTPUT CHARACTERISTICS

Logic level 0: Vout < 0.5 VDC;

Logic level 1: 12 V ± 20%, 15 mA max..

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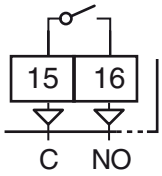
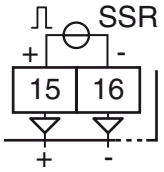
RELAY OUTPUT



SSR OUTPUT



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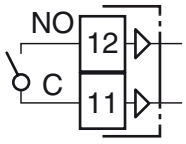
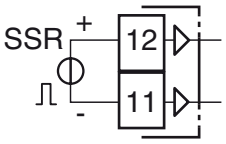
RELAY OUTPUT



SSR OUTPUT



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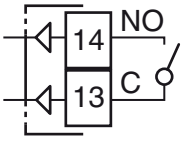
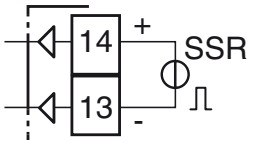
RELAY OUTPUT



SSR OUTPUT



Output 1 (OP1) and Output 2 (OP2) Servomotor Drive

SERVOMOTOR DRIVE CHARACTERISTICS

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

Operation: 1 x 10^5.

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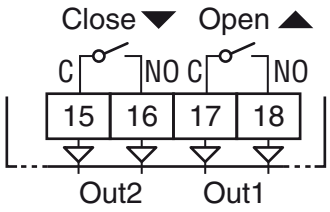

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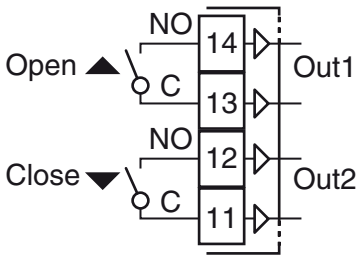

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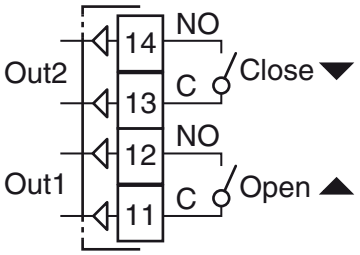

Output 3 (OP3)

SSR OUTPUT CHARACTERISTICS

Logic level 0: Vout < 0.5 VDC;

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

Note: Overload protected.

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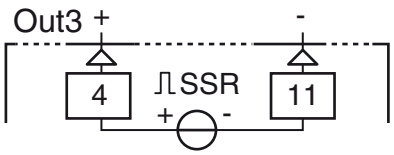

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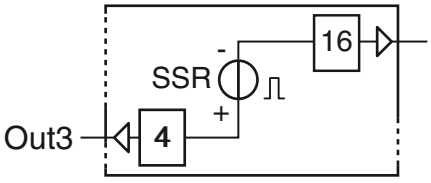
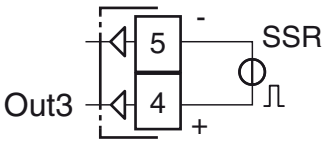


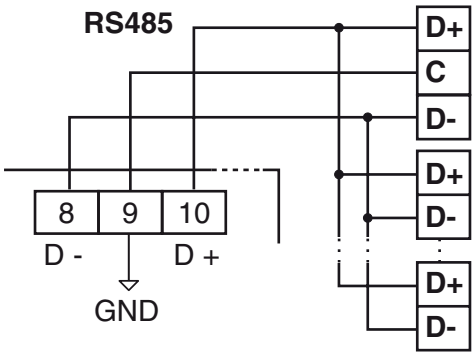
KX7



2.5 Serial Interface

Note: The serial interface is present only on the **KR7** model.

KR7



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.

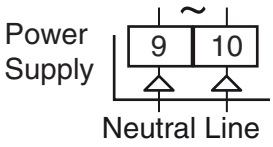
Notes: **1.** RS-485 interface allows to connect up to 30 devices with one remote master unit.
2. The cable length must not exceed 1.5 km at 9600 baud.

2.6 Power Supply

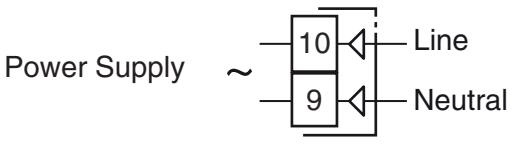
Supply Voltage: - 24 VAC/DC (±10%);
- 100... 240 VAC (-15... +10%)
- 24... 240 VAC (±10%) **KM7 only**.

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.

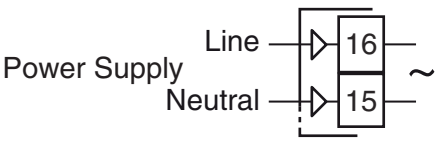
KR7



KM7



KX7



3 TECHNICAL CHARACTERISTICS

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

Front protection: IP65 with optional gasket for KM7/KX7 or with optional screw-type bracket for KR7; for indoor use according to EN 60070-1;

Terminals protection: IP20 according to EN 60070-1;

Installation: Panel mounting;

Terminal blocks:
- **KR7:** 24 M3 screw/spring terminals, for cables of 0.25... 2.5 mm² (AWG 22... AWG 14),
- **KM7 and KX7:** 16 M3 screw/spring terminals for cables of 0.25... 2.5 mm² (AWG22... AWG14);

Dimensions:
- **KR7:** 78 x 35 depth 69.5 mm (3.07 x 1.37 depth 2.73 in.),
- **KM7:** 48 x 48 (1.77 x 1.77), depth 75.5... 99 mm (2.97... 3.89 in.) depending on the model selected and the type of terminals adopted,
- **KX7:** 48 x 96, depth 75.9 mm, (1.77 x 3.78 x 2.99 in.);

Panel cutout:
- **KR7:** 71(+0.6) x 29(+0.6) mm [2.79(+0.023) x 1.14(+0.023) in.],
- **KM7:** 45(+0.6) x 45(+0.6) mm [1.78(+0.023) x 1.78(+0.023) in.],
- **KR7:** 45(+0.6) x 89(+0.6) mm [1.78(+0.023) x 3.5(+0.023) in.];

Weight:
- **KR7:** 180 g max.,
- **KM7:** 126... 151 g depending on the model selected,
- **KX7:** 160 g max.;

Power supply:
- 24 VAC/DC (±10% of the nominal value);
- 100... 240 VAC (-15... +10% of the nominal value);
- 24... 240 VAC/DC (±10% of the nominal value) **KM7 only**;

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:
- **KR7:** Main: 4 digits height 10.9 mm with 3 dynamic/fixed colours, Secondary: 4 digits height 6 mm green,
- **KM7:** Main: 4 digits height 15.5 mm with 3 dynamic/fixed colours, Secondary: 4 digits height 7.6 mm green,
- **KX7:** 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.

4 HOW TO ORDER

4.1 KR7, KM7 and KX7

Model
78 x 35 mm format
KR7 = Controller with feedback control of the belt speed
KR7T = Controller with belt speed control+ timer
KR7P = Controller with belt speed control+ timer + programmammer
48 x 48 mm format
KM7 = Controller with feedback control of the belt speed
KM7T = Controller with belt speed control+ timer
KM7P = Controller with belt speed control+ timer + programmammer
48 x 96 mm format
KX7 = Controller with feedback control of the belt speed
KX7T = Controller with belt speed control+ timer
KX7P = Controller with belt speed control+ timer + programmammer

Power supply
H = 100... 240 VAC
L = 24 VAC/DC
U = 24... 240 VAC/DC (KM7 only)

Analoue input + Digital Input DI1 (standard)
C = J, K, R, S, T, PT100, PT 1000 (2 wires), mA, mV, V
E = J, K, R, S, T, NTC, PTC, mA, mV, V

SPEED Output
S = PWM output for 24 Vdc 4A motor control

Output 1 (Out 1)
M = Relay SPST-NO 2 A (note)
O = VDC for SSR
R = Relay SPST-NO 2 A (resistive load)

Output 2 (Out 2)
- = Not available
M = Relay SPST-NO 2 A (note)
O = VDC for SSR
R = Relay SPST-NO 2 A (resistive load)

Input/Output 3 (Out 3)
D = Output 3 (VDC for SSR)/Pow. Supply/Dig. Input DI2

Serial Communications (KR7 only)
- = TTL Modbus
S = RS485 Modbus + TTL Modbus

Connection type
- = Standard (screw terminals not removable)
E = Removable screw terminals
M = Removable spring terminals
N = Removable terminals (the fixed part only)

Package + Bracket type (KR7 only)
- = Standard (AT package + "Butterfly" type brackets)
V = AT package + Screw type bracket for IP65

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

5 CONFIGURATION INFORMATION

5.1 Brief description

The K_7 is a family of products that is able to control the speed of a DC motor and a process variable (e.g. a temperature) at the same time.

The DC motor control is able to maintain the programmed speed also in presence of load or power supply variations without the necessity of an additional speed sensor.

In parallel, the device is able to perform a PID or an ON/OFF control of an independent process variable. The two actions are independent but it is also possible to create specific correlations between them.

As an example it is possible to create 4 recipes. A recipes is the relation between a Set Point and a speed.

The most common example is the conveyor pizza oven process.

A cooking is the combination of one temperature and one time so we can call it “recipes”.

In a conveyor oven the “speed” and the “time” are related but the end-users are habit to set a time (not a speed).

The K_7 is able to manage a time and set the speed in order to obtain the desired time.

The relationship between speed and time is easily programmable (by the OEM) using a semi-automatic calibration system.

The ability to manage a 3 point valve (servomotor control output) completes the applicability of this products.

5.2 Before to start

These instruments can be preset in order to operate in two different modes:

Mode 1) Full - it will perform a process control plus the speed control;

Mode 2) Speed - speed control only.

The preset can be done by loading one of the two default parameter sets.

The following chapter details the procedure used to load the desired default sets.

5.3 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 data are those typical values loaded in the instrument prior to ship it from factory.

For this instrument family only this procedure allows to select also the global operative mode performed.

As we say in paragraph 5.2 these instruments are able to operate in two way:

Mode 1) Full - it will perform a process control plus the speed control;

Mode 2) Speed - speed control only.

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:
   - Value -481 when the **FULL** mode is desired,
   - Value -418 when the **SPEED** mode is desired;
3. Push [↵] button;
4. The instrument turns 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 showing also the the selected mode (“FULL” for **Mode 1** or “SPEd” for **Mode 2**).

The procedure is complete.

Notes:
1. The corrently selected Mode is shown at all power ON.
2. The list of all parameters and corresponding default values is available in at the end of the description of each operating mode.

5.4 Introduction

When the instrument is powered ON, starts immediately to work according to the parameters values loaded in its 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” parameters set (factory parameters set); this set is a generic one (e.g. a TC J input is programmed).

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

⚠ Do not change the **[6] 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**”.

6 MODE 1 CONFIGURATION PROCEDURE

All the procedures described in ths chapter are relative to the **MODE 1 - FULL** operative mode.

6.1 Instrument behaviour at Power ON

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

Auto mode without program functions.

– 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)]. The **MAN** LED is lit;
– The instrument does not perform Automatic control;
– The control output is equal to **0%** and can be manually modified using the ▲ and ▼ buttons.

Stand by mode (StbY)

– The upper display shows the measured value;
– The lower display shows alternately the Set Point value and the message StbY or od;
– The instrument does not perform any control (the control outputs are OFF);
– The instrument is working as an indicator.

Auto mode with automatic program start up

– The upper display shows the measured value;
– The lower display shows one of the following information;
  • The operative Set Point (when it is performing a ramp);
  • The time of the segment in progress (when it is performing a soak);
  • The Set Point value alternate with the message StbY;
– In all cases, the decimal figure of the less significant digit of the lower display is lit.

The motor starts with the same speed that was set at power OFF

– The upper display shows the SPEED value;
– The lower display shows the Acronym of the active speed selected;
– The motor LED (#4) is lit.

The motor does NOT start waiting a start command

– The upper display shows the SPEED value;
– The lower display shows the Acronym of the active speed selected;
– The motor LED (#4) is not lit.

The motor starts with speed 0 until the controlled value reaches the desired value

– The upper display shows the SPEED value;
– The lower display shows the Acronym of the active speed selected;
– The motor LED (#4) flashes until the Controlled Value reaches the Set Point.

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

6.2 Configuration mode

6.2.1 Entering the "Configuration mode"

The configuration method allows to take advantage of all instrument features.

Note: The instrument only shows the parameters consistent with the specific hardware and in accordance with the value assigned to the previous parameters (e.g.: if you set an output as "*not used*" the instrument will mask all other parameters related to that output).

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

1. Push the ↵ button for more than 5 seconds. The upper display will show PASS while the lower display will show 0.

2. Using ▲ and ▼ buttons set the programmed password.

Notes: **1.** The factory default password for configuration parameters 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 from controlling during the programming procedure (control output will be OFF). A password equal to 2000 + the programmed value (e.g. 2000 + 30 = 2030). The control will restart automatically when the configuration procedure will be manually closed.

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

The instrument is in configuration mode.

6.2.2 How to exit the "Configuration mode"

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

6.3 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 blank, 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 selected value 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:
Push the ↩ button and, maintaining the pressure, push the ↵ button, then release the two buttons.

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

6.4 MODE 1 - FULL Configuration parameter list

In the following pages we will describe all the parameters of the instrument when it is preset in Mode 1 (FULL).

⚠ However, the instrument will only show the parameters applicable to its hardware options in accordance with the specific instrument configuration (i.e.: Setting AL 1t [Alarm 1 type] to nonE [not used], all parameters related to alarm 1 will be skipped).

inP Group - Main and auxiliary input configuration

[1] SEnS - Input type

Available: Always.

- When the code of the input type is equal to **C** (see paragraph "*How to order*").

J	TC J	(-50... 1000°C/-58... 1832°F);
crAL	TC K	(-50... 1370°C/-58... 2498°F);
S	TC S	(-50... 1760°C/-58... 3200°F);
r	TC R	(-50... 1760°C/-58... 3200°F);
t	TC T	(-70... 400°C/-94... 752°F);
ir.J	Exergen IRS J	(0... 1000°C/32... 1832°F);
ir.cA	Exergen IRS K	(0... 1370°C/32... 2498°F);
Pt1	RTD Pt 100	(-200... 850°C/-328... 1562°F);
Pt10	RTD Pt 1000	(-200... 850°C/-328... 1562°F);
0.60	0... 60 mV linear	
12.60	12... 60 mV linear	
0.20	0... 20 mA linear	
4.20	4... 20 mA linear	
0.5	0... 5 V linear	
1.5	1... 5 V linear	
0.10	0... 10 V linear	
2.10	2... 10 V linear	

- When the code of the input type is equal to **E** (see "How to order" paragraph).

J	TC J	(-50... 1000°C/-58... 1832°F);
crAL	TC K	(-50... 1370°C/-58... 2498°F);
S	TC S	(-50... 1760°C/-58... 3200°F);
r	TC R	(-50... 1760°C/-58... 3200°F);
t	TC T	(-70... 400°C/-94... 752°F);
ir.J	Exergen IRS J	(0... 1000°C/32... 1832°F);
ir.cA	Exergen IRS K	(0... 1370°C/32... 2498°F);
Ptc	PTC	(-55... 150°C/-67... 302°F);
ntc	NTC	(-50... 110°C/-58... 230°F);
0.60	0... 60 mV linear	
12.60	12... 60 mV linear	
0.20	0... 20 mA linear	
4.20	4... 20 mA linear	
0.5	0... 5 V linear	
1.5	1... 5 V linear	
0.10	0... 10 V linear	
2.10	2... 10 V linear	

Notes: **1.** When a TC input is selected and a decimal figure is programmed (see the next parameter) the max. displayed value becomes 999.9°C or 999.9°F.

2. Every change of the SEnS parameter setting forces the [2] dP = 0 and it changes also all parameters related with dP (e.g. Set Points, proportional band, etc.).

[2] dP - Decimal point position

Available: Always.

Range: When [1] SenS = Linear input: 0... 3.
When [1] SenS different from linear input: 0 or 1.

Note: Every change of the [2] dP parameter setting produces a change of all parameters related with it (e.g.: Set Points, proportional band, etc.).

[3] SSc - Initial scale read-out for linear inputs

Available: When a linear input is selected by [1] SenS.

Range: -1999... 9999.

Notes: **1.** SSC allows to set the readout value assigned to the lower value of the input range sected.
e.g. SEnS = **12.60** and SSC = **15** (l/m) means: when the instrument reads 12 mV it shows 15 (l/m). The instrument is able to display the measured value until it reaches a value of 5% lower than SSc, below which shows the Underrange message.

2. It is possible to set a initial scale read-out higher then the full scale read-out in order to obtain a reverse read-out scaling
E.g.: 0 mA = 0 mBar, 20 mA = -1000 mBar (vacuum).

[4] FSc - Full scale read-out for linear input

Available: When a linear input is selected by [1] SenS.

Range: -1999... 9999

Notes: **1.** FSC allows to set the readout value assigned to the highest value of the input range sected.
E.g.: SEnS = **12.60** and FSC = **500** (l/m) means: when the instrument reads 60 mV it shows 500 (l/m). The instrument is able to display the measured value until it reaches a value of 5% higher than [4] FSc, above which shows the Overrange message.

2. It is possible to set a full scale read-out lower than the initial scale read-out in order to obtain a reverse read-out scaling.
E.g.: 0 mA = 0 mBar, 20 mA = -1000 mBar (vacuum).

[5] unit - Engineering unit

Available: When a temperature sensor is selected by [1] SenS parameter.

Range: °c Centigrade;
°F Fahrenheit.

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

[6] 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 affects the measured value but also the control action and the alarms behaviour.

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

Available: Always.

Range: **our** When an overrange or an underrange is detected, the power output will be forced to the value of [8] oPE parameter.
or When an overrange is detected, the power output will be forced to the value of [8] oPE parameter.
ur When an underrange is detected, the power output will be forced to the value of [8] oPE parameter.

[8] 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 will use 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 will perform the safety output value using a fixed cycle time equal to 20 seconds.

[9] io3.F - I/O3 function selection

Available: Always.

Range:
- **dG2.c** Digital input 2 for contact closure;
- **dG2.U** Digital input 2 driven by 12... 24 VDC.
- **on** Out 3 is always ON as is used to power a 2/3 wires transmitter;
- **out3** Used as digital Out 3;

Notes: **1.** Setting [9] io3.F = dG2.C or dG2.U, the [20] O3F parameter becomes not visible while [12] diF2 parameter will become visible.
2. Setting [9] io3F = on the [20] O3F parameter and the [12] diF2 parameter will NOT be visible.
3. Setting [9] io3F different from dG2.c or dG2.U, the instrument will force [12] diF2 parameter equal to nonE. If [11] diF1 was equal to SP4 or UPDN it will be forced to nonE.
4. The transfer from [9] io3F = on to [9] io3F = Out3 will make the [20] O3F parameter visible equal to nonE.

[10] rEcS - Enable Recipes (control + speed coupling)

Available: Always.

Range:
- **no** Control and speed are independent;
- **YES** A Control and speed are related;

Note: When [10] rEcS is equal to YES the selection of a Set Point automatically selects also a speed with the following role: SP1 + Sd.t1 (speed or time 1), SP2 + Sd.t2 (speed or time 2), SP3 + Sd.t3 (speed or time 3), SP4 + Sd.t4 (speed or time 4).

[11] diF1 - Digital input 1 function

Available: Always.

Range:
- **nonE** No function;
- **AAC** Alarm Reset [status];
- **ASi** Alarm acknowledge (ACK) [status];
- **HoLd** Hold of the measured value [status];
- **St.bY** Stand by mode of the instrument [status]. When the contact is closed the instrument operates in stand by mode;
- **oPLo** Manual mode;
- **HE.Co** Heat with SP1 and CooL with SP2 [status] (see “Note about digital inputs”);
- **Str.t** Timer Run/Hold/Reset [transition]. A short closure allows to start timer execution and to suspend it while a long closure (more than 10 seconds) allows to reset the timer;
- **t.run** Timer Run [transition]. A short closure allows to start timer execution;
- **t.rES** Timer reset [transition]. A short closure allows to reset timer count;
- **t.r.H** Timer run/hold [Status]:
  - Contact close = timer RUN,
  - Contact open = timer Hold;
- **t.r.r** Timer run/reset [status];
- **t.r.rb** 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 link, keyboard or digital input 2);
- **P.run** Program Run [transition]. The first closure allows to start program execution, the second closure restarts the program execution from the beginning;
- **P.rES** Program Reset [transition]. A contact closure allows to reset program execution;
- **P.r.h.t** Program Hold [transition]. The first closure allows to hold program execution and a second closure continue program execution;
- **P.r.h.S** Program Run/Hold [status]. When the contact is closed the program is running;
- **P.r.r** Program Run/Reset [status]:
  - Contact closed - Program run,
  - Contact open - Program reset;
- **Sd.r.S** SPEED/TIME run/stop [status]:
  - Contact closed = Run,
  - Contact open = Stop;
- **Sd.r.t** SPEED/TIME run/stop [transition];
- **ch.SP** Sequential Set Point selection [transition] (see “Note about digital inputs”);
- **ch.Sd** Sequential SPEED selection [transition];
- **SP.1.4** Binary selection of the Set Point made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status];
- **Sd.1.4** Binary selection of the SPEED made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status].

Notes: **1.** When [12] diF2 is not available, items SP.1.4 and Sd.1.4 are not visible.
2. When [10] rEcS = YES (recipes are used):
- ch.SP, ch.Sd, SP.1.4 or Sd.1.4 selections select the recipe (recipe 1 = SP1 + Sd.t1 (speed or time 1), recipe 2 = SP2 + Sd.t2 (speed or time 2), recipe 3 = SP3 + Sd.t3 (speed or time3), SP4 + Sd.t4 (speed or time 4);
- [52] n.SPd = Number of used speed - parameter will define the number of used recipes and it will force also the value of the [84] nSP (number of Set Point available) parameter;
- [84] nSP - Number of used Set Points - parameter will define the number of used recipes and it will force also the value of the [52] n.SPd (number os speed available) parameter;
- [57] A. Sd.t - Active speed/time selection - parameter will define the recipe actually used and it will force the value of [91] A.SP - Active Set Point selection - parameter;
- [91] A.SP - Active Set Point selection - parameter will define the recipe actually used and it will force the value of [57] A. Sd.t - Active speed/time selection - parameter.

[12] diF2 - Digital input 2 function

Available: When [9] Io3.F = diG2.

Range:
- **nonE** No function;
- **AAC** Alarm Reset [status];
- **ASi** Alarm acknowledge (ACK) [status];
- **HoLd** Hold of the measured value [status];
- **St.bY** Stand by mode of the instrument [status]. When the contact is closed the instrument operates in stand by mode;
- **oPLo** Manual mode;
- **HE.Co** HEAt with SP1 and CooL with SP2 [status] (see "Note about digital inputs");
- **Str.t** Timer Run/Hold/Reset [transition]. A short closure allows to start timer execution and to suspend it while a long closure (more than 10 seconds) allows to reset the timer;
- **t.run** Timer Run [transition]. A short closure allows to start timer execution;
- **t.rES** Timer reset [transition]. A short closure allows to reset timer count;
- **t.r.H** Timer run/hold [Status]:
  - Contact close = timer RUN;
  - Contact open = timer Hold;
- **t.r.r** Timer run/reset [status];
- **t.r.rb** 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 link keyboard or digital input 2);
- **P.run** Program Run [transition]. The first closure allows to start program execution but a second closure restart the program execution from the beginning;
- **P.rES** Program Reset [transition]. A contact closure allows to reset program execution;
- **P.r.h.t** Program Hold [transition]. The first closure allows to hold program execution and a second closure continue program execution;
- **P.r.h.S** Program Run/Hold [status]. When the contact is closed the program is running;
- **P.r.r** Program Run/Reset [status].
  - Contact closed - Program run,
  - Contact open - Program reset;
- **Sd.r.S** SPEED/TIME run/stop [status]:
  - Contact closed = Run,
  - Contact open = Stop;
- **Sd.r.t** SPEED/TIME run/stop [transition]
- **ch.SP** Sequential Set Point selection [transition] (see "Note about digital inputs");
- **ch.Sd** Sequential SPEED selection [transition].
- **SP.1.4** Binary selection of the Set Point made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status];
- **Sd.1.4** Binary selection of the SPEED made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status];

Notes:

1. When [10] diF1 or [11] diF2 (e.g. diF1) are equal to HE.Co the instrument operates as follows:
   - When the contact is open, the control action is **Heating** and the active Set Point is SP.
   - When the contact is closed, the control action is **Cooling** and the active Set Point is SP2.
2. When [10] diF1 = SP.1.4, [11] diF2 is forced to SP.1.4 and cannot perform another function.
3. When [10] diF1 = SP.1.4 and [11] diF2 = SP.1.4, the SP selection will be in accordance with:

Digital Input 1	Digital Input 2	Operative Set Point
Off	Off	Set Point 1
On	Off	Set Point 2
Off	On	Set Point 3
On	On	Set Point 4

4. When [10] diF1 is equal to Sd.1.4, [11] diF2 is forced to Sd.1.4 and cannot perform another function.
5. When a "Sequential Set Point selection" is used (diF1 or diF2 = ch.SP), every closure of the logic input increases the value of SPAT (active Set Point) of one step. The selection is cyclic: **SP** -> **SP2** -> **SP3** -> **SP4**.

Note: When [10] rEcS = YES (recipes are used):

- ch.SP, ch.Sd, SP.1.4 or Sd.1.4 selections will select the recipe (recipe 1 = SP1 + Sd.t1 (speed or time 1), recipe 2 = SP2 + Sd.t2 (speed or time 2), recipe 3 = SP3 + Sd.t3 (speed or time3), SP4 + Sd.t4 (speed or time 4).
- [52] n.SPd = Number of used speed - parameter will define the number of used recipes and it will force also the value of the [84] nSP - number of Set Point available - parameter.
- [84] nSP - Number of used Set Points - parameter will define the number of used recipes and it will force also the value of the [52] n.SPd - number os speed available - parameter.
- [57] A. Sd.t - Active speed/time selection - parameter will define the recipe actually used and it will force the value of [91] A.SP - Active Set Point selection - parameter.
- [91] A.SP - Active Set Point selection - parameter will define the recipe actually used and it will force the value of [57] A. Sd.t - Active speed/time selection - parameter.

[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.F - Out 1 function

Available: Always.

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 out - OFF in Hold;
- **P.End** Program end indicator;
- **P.HLd** Program hold indicator;
- **P.uit** Program wait indicator;
- **P.run** Program run indicator;
- **P.Et1** Program Event 1;
- **P.Et2** Program Event 2;

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 Stand By status indicator;
diF1 Repeats the digital input 1 status;
diF2 Repeats the digital input 2 status;
on Out1 always ON;
riSP Inspection request.

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 detect an alarm reset command by key, digital input or serial link.
3. When no control output is programmed, all the relative alarm (when present) will be forced to nonE (not used).

[15] o1.AL - Alarms linked up with the out 1

Available: When [14] o1F = AL.
Range: 0... 63 with the following rules:
+1 Alarm 1;
+2 Alarm 2;
+4 Alarm 3;
+8 Loop break alarm;
+16 Sensor break (burn out);
+32 Overload on Out 3 (short circuit on Out 3).

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.

[16] o1.Ac - Out 1 action

Available: When [14] 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 will be 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.

[17] o2F - Out 2 function

Available: When the instrument has 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 out - OFF in Hold;
P.End Program end indicator;
P.HLd Program hold indicator;
P.uit Program wait indicator;
P.run Program run indicator;
P.Et1 Program Event 1;
P.Et2 Program Event 2;
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 Stand By status indicator;
diF1 Repeats the digital input 1 status;
diF2 Repeats the digital input 2 status;
on Out2 always ON;
riSP Inspection request.

For other details see [14] O1F parameter.

⚠ When using the servomotor control, **both** **Out1** and **Out2** are to be selected as Heating or Cooling (o1F = o2F = H.rEG **or** o1F = o2F = c.rEG); Parameter **[56] cont** must be set as **3pt**.

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

Available: When [17] o2F = AL.
Range: 0... 63 with the following rule:
+1 Alarm 1;
+2 Alarm 2;
+4 Alarm 3;
+8 Loop break alarm;
+16 Sensor break (burn out);
+32 Overload on Out 3 (short circuit on Out 3).

For more details see [15] o1.AL parameter.

[19] o2.Ac - Out 2 action

Available: When [17] 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 [16] o1.Ac parameter.

[20] o3F - Out 3 function

Available: When [9] Io3F = Out 3.
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 out - OFF in Hold;
P.End Program end indicator;
P.HLd Program hold indicator;
P.uit Program wait indicator;
P.run Program run indicator;
P.Et1 Program Event 1;
P.Et2 Program Event 2;
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 Stand By status indicator.

For other details see [14] O1F parameter.

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

Available: When [9] Io3F = Out3 and [20] o3F = AL.
Range: 0... 63 with the following rule:

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

For more details see [15] o1.AL parameter.

[22] o3Ac - Out 3 action

Available: When [9] Io3F = Out3 and [20] o3F 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 [16] o1.Ac parameter.

AL1 Group - Alarm 1 parameters

[23] AL1t - Alarm 1 type

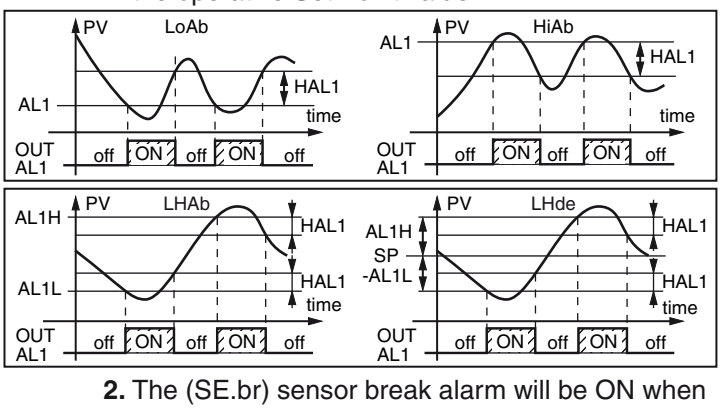
Available: Always.
Range: • When one or more outputs are programmed as control output:

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.** The relative and deviation alarms are “relative” to the operative Set Point value.



2. The (SE.br) sensor break alarm will be ON when the display shows - - - - indication.

[24] Ab1 - Alarm 1 function

Available: When [23] AL1t is different from nonE.
Range: 0... 15 with the following rule:

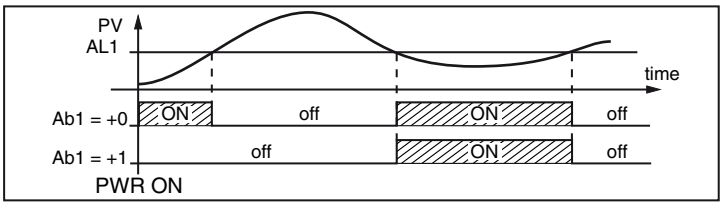
+1 Not active at power ON;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Set Point change.

Example: Setting Ab1 equal to 5 (1+4) the alarm 1 will be “Not active at power ON” and “Acknowledgeable”.

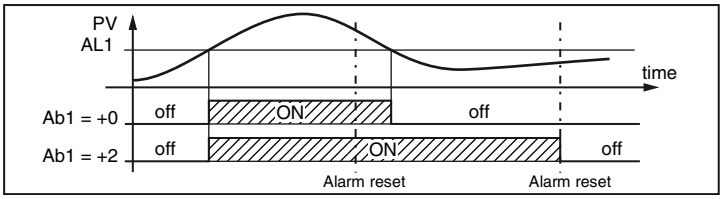
Notes: **1.** The “Not active at power ON” selection allows to inhibit the alarm function at instrument power ON or when the instrument detects a transfer from:

- Manual mode (oplo) to auto mode;
- Stand-by mode to auto mode.

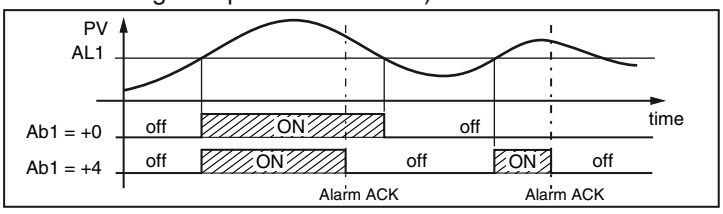
The alarm will be automatically enabled when the measured value reaches, for the first time, the alarm threshold ±hysteresis (in other words, when the initial alarm condition disappears).



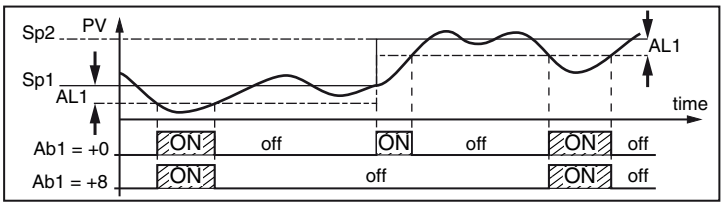
2. A “Latched alarm” (manual reset) is an alarm that will remain active even if the conditions that generated the alarm no longer persist. Alarm reset can be done only by an external command (button, digital inputs or serial link).



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.

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

Available: When [23] AL1t is different from nonE or [23] AL1t is different from SE.br.

Range: From -1999 to [26] AL1H engineering units.

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

Available: When [23] AL1t is different from nonE or [23] AL1t is different from SE.br.

Range: From [25] AL1L to 9999 engineering units.

[27] AL1- Alarm 1 threshold

Available: When:
[23] AL1t = LoAb - Absolute low alarm;
[23] AL1t = HiAb - Absolute high alarm;
[23] AL1t = LodE - Deviation low alarm (relative);
[23] AL1t = LidE - Deviation high alarm (relative).

Range: From [25] AL1L to [26] AL1H engineering units.

[28] HAL1 - Alarm 1 hysteresis

Available: When [23] AL1t is different from nonE or [23] AL1t is different from SE.br.

Range: 1... 9999 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 plus or minus the 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 generated 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 bigger 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).

[29] AL1d - Alarm 1 delay

Available: When [23] AL1t is different from nonE.

Range: From oFF (0) to 9999 seconds.

Note: The alarm goes ON only when the alarm condition persists for a time longer than [29] AL1d time but the reset is immediate.

[30] AL1o - Alarm 1 enabling during Stand-by mode and out of range indications

Available: When [23] AL1t is different from nonE.

Range: **0** Never;
1 During stand by;
2 During overrange and underrange;
3 During overrange, underrange and stand-by.

AL2 Group - Alarm 2 parameters

[31] 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).

[32] Ab2 - Alarm 2 function

Available: When [31] AL2t is different from nonE.

Range: 0... 15 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.

Example: Setting Ad2 equal to 5 (1+4) the alarm 2 will be “Not active at power ON” and “Acknowledgeable”.

Note: For other details see [24] Ab1 parameter.

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

Available: When [31] AL2t is different from nonE or [31] AL2t is different from SE.br.

Range: -1999 to [34] AL2H engineering units.

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

Available: When [31] AL2t is different from nonE or [31] AL2t is different from SE.br.

Range: From [33] AL2L to 9999 engineering units.

[35] AL2 - Alarm 2 threshold

Available: When:
[31] AL2t = LoAb Absolute low alarm;
[31] AL2t = HiAb Absolute high alarm;
[31] AL2t = LodE Deviation low alarm (relative);
[31] AL2t = LidE Deviation high alarm (relative).

Range: From [33] AL2L to [34] AL2H engineering units.

[36] HAL2 - Alarm 2 hysteresis

Available: When [31] AL2t is different to nonE or [31] AL2t is different from SE.br.

Range: 1... 9999 engineering units.

Note: For other details see [28] HAL1 parameter.

[37] AL2d - Alarm 2 delay

Available: When [31] 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 [37] AL2d time but the reset is immediate.

[38] AL2o - Alarm 2 enabling during Stand-by mode and out of range indications

Available: When [31] AL2t different from nonE.

Range: **0** Never;
1 During stand by;
2 During overrange and underrange;
3 During overrange, underrange and stand-by.

AL3 Group - Alarm 3 parameters

[39] 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).

[40] Ab3 - Alarm 3 function

Available: When [39] AL3t is different from nonE.

Range: 0... 15 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.

Example: Setting Ad3 equal to 5 (1+4) the alarm 3 will be “Not active at power ON” and “Acknowledgeable”.

Note: For other details see [24] Ab1 parameter.

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

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SE.br.

Range: -1999 to [42] AL3H engineering units.

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

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SE.br.

Range: From [41] AL3L to 9999 engineering units.

[43] AL3 - Alarm 3 threshold

Available: When:
- [39] AL3t = LoAb Absolute low alarm;
- [39] AL3t = HiAb Absolute high alarm;
- [39] AL3t = LodE Deviation low alarm (relative);
- [39] AL3t = LidE Deviation high alarm (relative).

Range: From [41] AL3L to [42] AL3H engineering units.

[44] HAL3 - Alarm 3 hysteresis

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SE.br.

Range: 1... 9999 engineering units.

Note: For other details see [28] HAL1 parameter.

[45] AL3d - Alarm 3 delay

Available: When [39] AL3t different from nonE.

Range: From oFF (0) to 9999 seconds.

Note: The alarm goes ON only when the alarm condition persist for a time longer than [45] AL3d time but the reset is immediate.

[46] AL3o - Alarm 3 enabling during Stand-by mode and out of range indications

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SE.br.

Range: **0** Never;
1 During stand by;
2 During overrange and underrange;
3 During overrange, underrange and stand-by.

SPEd group - Speed control

[47] SPd.P - Behaviour of the speed output at Power ON (Speed at Power ON)

Available: Always.

Range: **AS.Pr** Starts with the same speed that was set at power OFF.

OFF.A Starts with speed equal to zero and waits for a start command (from keyboard, logic contact or serial link).

OFF.b Starts with speed equal to zero and waits until the controlled value reaches SP + SPd.b (see the next parameter).

[48] SPd.b - Band to enable speed control (Speed band)

Available: When [47] SPd.P is equal to OFF.A.

Range: 1... 9999 engineering units.

Note: When [47] SPd.P = OFF.A the enabling band is always active. In other words, if the masured value goes out of the programmed band, the speed output will go to zero until the measured value returns inside the programmed band.

[49] SPd.t - Define the Engineering Units of the speed/time variable

Available: Always.

Range: PErc Shown as an output %;

tinE Shown as a time;

E.U. Shown in engineering units (km/h , m/s, l/min).

[50] Sd.dF - Speed decimal figure

Available: When [49] SPd.t is different PErc.

Range: 0... 3.

[51] SPd.r - Speed reference - Set the time or the speed detected when the output is 100%

Available: When [49] SPd.t is different than PErc.

Range:
- When [49] Spd.t = Perc this parameter is masked;
- When [49] Spd.t = tinE 00.01...99.59 (mm.ss);
- When [49] Spd.t = E.U., 0... 9999 E.U..

Notes: **1.** The difference between a time indication and a speed (speed, flow, other) indication is:

Time The value assigned to [51] SPd.r is the minimum time and the values assigned to [53] Sd.t1, [54]Sd.t2, [55]Sd.t3 and [56] Sd.t4 must be **HIGHER** than [51] SPd.r.

E.U. The value assigned to [51] SPd.r is the maximum speed and the [53] Sd.t1, [54] Sd.t2, [55]Sd.t3 and [56]Sd.t4 must be **LOWER** than [51] SPd.r;

2. This output can be considered as a linear output where the initial scale is ever 0 (engine stopped) while the full scale is the maximum speed (in engineering units) or the minimum time (detected when the engine operate at 100%). The decimal figure allows to the OEM to define the E.U.;

3. When the self-calibration is used ([58] Sd.cA parameter) the time measured by the instrument will be memorized in this parameter ([51] SPd.r).

[52] n.SPd - Number of used speed/time

Available: Always

Range: 1... 4.

Note: When [10] rEcS = YES (the recipes are used), the [52] n.SPd (= number of used speed/time) will define the number of used recipe and it will force the value of [84] nSP - number of used SP.

[53] Sd.t1 - Speed/time 1

Available: Always.

Range:
- When [49] Spd.t = Perc, 0... 100%;
- When [49] Spd.t = tinE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = E.U., 0... 9999 E.U..

[54] Sd.t2 - Speed/time 2

Available: Always.

Range:
- When [49] Spd.t = Perc, 0... 100%;
- When [49] Spd.t = tinE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = E.U., 0... 9999 E.U..

[55] Sd.t3 - Speed/time 3

Available: Always.

Range:
- When [49] Spd.t = Perc, 0... 100%;
- When [49] Spd.t = tinE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = E.U., 0... 9999 E.U..

[56] Sd.t4 - Speed/time 4

Available: Always.

Range:
- When [49] Spd.t = Perc, 0... 100%;
- When [49] Spd.t = tinE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = E.U., 0... 9999 E.U..

[57] A.Sd.t - Active speed/time

Available: Always

Range:
- Sd.t1;
- Sd.t2;
- Sd.t3;
- Sd.t4.

Note: When [10] rEcS = YES (the recipes are used):
- The [57] A.Sd.t (= active speed/time) will define the recipe in use and it will force the value of [91] A.SP - Active Set Point;
- The [91] A.SP (= active Set Point) will define the recipe in use and it will forced the value of [57] A. Sd.t (active speed/time).

[58] Sd.cA - Speed calibration - Minimum time self-calibration

Available: When [49] SPd.t is equal to tinE.

Range: YES/no.

How to use the "*Speed calibration*" system.

1. Selet [58] Sd.cA, the lower display shows no;

2. Push the ▲ button, the lower display shows YES (if the conveyor belt is running, it will be stopped and the control loop enters, automatically, in stand-by mode);

3. Put an object (used for reference) at the beginning of the "*hot area*";

4. Push ↵ button; the conveyor belt starts at 50% of the speed and the lower display shows On;

5. When the reference object exits from the "*hot area*", push again the ↵ button. The lower display shows End and the double of the detected time is stored in [51] SPd.r - Speed reference - parameter;

6. If, during the calibration procedure, should be necessary to abort the speed calibration, push the ↩ button; the [51] SPd.r - Speed reference - parameter will not be modified and the instrument returns showing SPEd group.

LbA group - Loop break alarm

General note about LBA alarm

The LBA operate as follows: applying the 100% of the power output to a process, the process variable, after some time due to the process inertia, begins to change in a known direction (increases for an heating action or decreases for a cooling action).

Example: If I apply 100% of the power output to a furnace,

the temperature must go up unless one of the component in the loop is faulty (heater, sensor, power supply, fuse, etc.).

The same philosophy can be applied to the minimum power. In our example, when I turn OFF the power to a furnace, the temperature must go down, if not the SSR is in short circuit, the valve is jammed, etc..

LBA function is automatically enabled when the PID requires the maximum or the minimum power.

When the process response is slower than the programmed limit the instrument generates an alarm.

Notes: **1.** When the instrument is in manual mode, the LBA function is disabled.

2. When LBA alarm is ON the instrument continues to perform the standard control. If the process response comes back into the programmed limit, the instrument automatically resets the LBA alarm.

3. This function is available only when the programmed control algorithm is equal to PID (Cont = PID).

[59] LbAt - LBA time

Available: When [63] Cont = PID.

Range: oFF LBA not used;
1... 9999 seconds.

[60] LbSt - Delta measure used by LBA during Soft start

Available: When [59] LbAt is different from oFF.

Range: oFF Loop break alarm is inhibited during soft start;
1... 9999 engineering units.

[61] LbAS - Delta measure used by loop break alarm (loop break alarm step)

Available: When [59] LbAt is different from oFF.

Range: 1... 9999 engineering units.

[62] LbcA - Condition for LBA enabling

Available: When [59] LbAt is different from oFF.

Range: **uP** Enabled when the PID requires the maximum power only;
dn Enabled when the PID requires the minimum power only;
both Enabled in both condition (when the PID requires the maximum or the minimum power).

LBA application example:

LbAt (LBA time) = 120 seconds (2 minutes);
LbAS (delta LBA) = 5°C.

The machine has been designed in order to reach 200°C in 20 minutes (20°C/min).

When the PID demands the 100% power, the instrument starts the time count.

During time count if the measured value increases more than 5°C, the instrument restarts the time count. Otherwise, if the measured value does not reach the programmed delta (5°C in 2 minutes), the instrument activates the alarm.

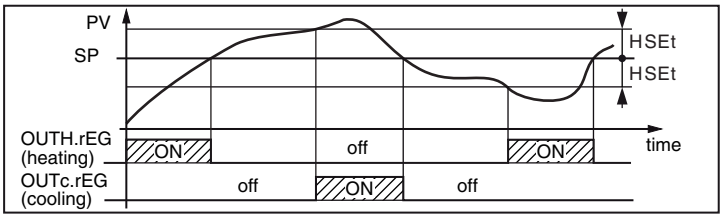
rEG group - Control parameters

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

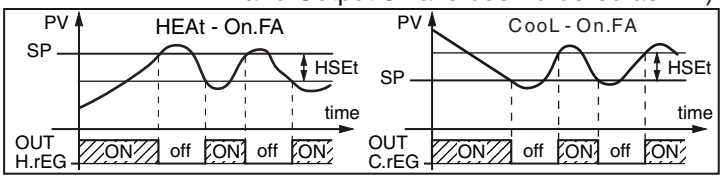
[63] cont - Control type:

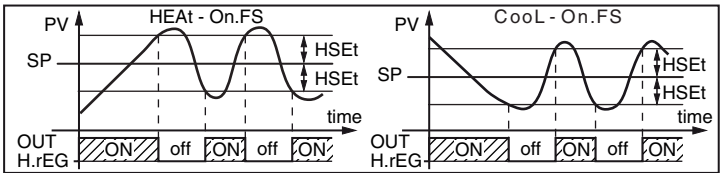
Available: When at least one output is programmed as control output (H.rEG or C.rEG).

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 (heat or cool) 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).

[64] Auto - Auto tune selection

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

1. The **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. The **fast type** 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:
• You have no information about your process;
• You can not be sure about the end user skills;
• You desire an auto tune calculation independently from the starting conditions (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 + 1/2SP).

Available: When [56] 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 with automatic restart at all power ON;
2 Fast auto-tune with automatic start at the first power ON only;
3 FAST auto-tune with manual start;
4 FAST auto-tune with automatic restart at all Set Point changes.
5 EvoTune with automatic restart at all power ON;
6 EvoTune with automatic start at the first power ON only;
7 EvoTune with manual start;
8 EvoTune with automatic restart at all Set Point changes.

Note: All auto-tunes are inhibited during program execution.

[65] tunE - Manual start of the auto-tune

Available: When [63] cont = PID.
Range: oFF The instrument is not performing the auto-tune;
on The instrument is performing the auto-tune.

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

Available: When [63] cont is different from PID.
Range: 0... 9999 engineering units.

[67] cPdt - Time for compressor protection

Available: When [63] cont = nr.
Range: OFF Protection disabled;
1... 9999 seconds.

[68] Pb - Proportional band

Available: When [63] cont = PID.
Range: 1... 9999 engineering units.
Note: Auto-tune functions calculate this value.

[69] ti - Integral time

Available: When [63] cont = PID.
Range: OFF Integral action excluded;
1... 9999 seconds;
inF Integral action excluded.
Note: Auto-tune functions calculate this value.

[70] td - Derivative time

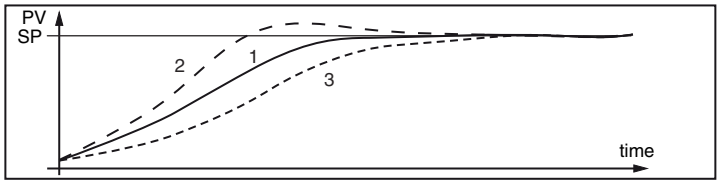
Available: When [63] cont = PID.
Range: oFF Derivative action excluded;
1... 9999 seconds.
Note: Auto-tune functions calculate this value.

[71] Fuoc - Fuzzy overshoot control

This parameter reduces the overshoot usually present at instrument start up or after a Set Point change and it 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 [63] cont = PID.
Range: 0... 2.00.
Note: Fast auto-tune calculates the Fuoc parameter while the oscillating one sets it equal to 0.5.

[72] tcH - Cycle time of the heating output

Available: When at least one output is programmed in order to be the heating output (H.rEG), [63] cont = PID.
Range: 1.0... 130.0 seconds.

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

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

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

An example will help us to explain you the 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 (ΔT = 20°C) using 100% of the heating power (resistor), you will need 60 seconds.

On the contrary, when you want to decrease the temperature from 250 to 230°C (ΔT = 20°C) using 100% of the cooling power (fan), you will need 20 seconds only.

In our example the ratio is equal to 60/20 = 3 ([67] rcG = 3) and it say that the efficiency of the cooling system is 3 time more efficient of the heating one.

Available: When two control action are programmed (H.rEG and c.rEG) and [63] cont = PID
Range: 0.01... 99.99
Note: Auto-tune functions calculate this value.

[74] tcc - Cycle time of the cooling output

Available: When at least one output is programmed in order to be the cooling output (c.rEG), [63] cont = PID
Range: 1.0... 130.0 seconds.

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

It allows to drastically reduce the undershoot due to 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 [63] cont = PID.
Range: -100.0... +100.0%.

[76] Str.t - Servomotor stroke time (servo mode only)

Available: When [63] cont = 3Pt.
Range: 5... 1000 seconds;

[77] db.S - Servomotor dead band (servo mode only)

Available: When [63] cont = 3Pt.
Range: 0... 100%.

[78] oP.L - Minimum power output

Available: When [63] cont = PID.
Range: -100 to oP.H %.

[79] oP.H - Maximum power output

Available: When [63] cont = PID.
Range: oP.L to 100 %.

[80] 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 ON) the instrument remains in stand by mode before to start all other function (control, alarms, program, etc.).
2. When a program with automatic start at power ON and od function are programmed, the instrument performs od function before to start the program execution.
3. When an auto-tune with automatic start at power ON and od function are programmed, the auto-tune will start at the end of od delay.

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

Available: When at list one output is programmed as control output.
Range: -100... +100%.
Notes: **1.** When St.P parameter have a positive value, the limit will be applied to the heating output(s) only.
2. When St.P parameter have a negative value, the limit will be applied to the cooling output(s) only.
3. When a program with automatic start at power ON and soft start function are programmed, the instrument performs the soft start and than the program function.
4. The auto-tune function will be performed after soft start function.
5. The Soft start function is available also when ON/OFF control is used.

[82] SSt - Soft start time

Available: When at list one output is programmed as control output.
Range: **oFF** Function not used;
0.01... 7.59 hh.mm;
inF Soft start always active.

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

Available: When at list one output is programmed as control output.
Range: -1999... 9999 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).

[84] nSP - Number of used Set Points

Available: When at least one output is programmed as control output.
Range: 1... 4.
Notes: **1.** When you change the value of this parameter, the instrument operates as follows:
- [83] A.SP parameter will be forced to SP.
- The instrument verifies that all used Set Point are within the limits programmed by [77] SPLL and [78] SPHL. If an SP is out of this range, the instrument forces it to the maximum acceptable value.

2. When [10] rEcS = YES (the recipes are used), the [84] nSP - number of used SP -parameter will define the number of used recipe and it will force the value of [84] n.SPd - number of used speed/time- parameter.

[85] SPLL - Minimum Set Point value

Available: When at least one output is programmed as control output.
Range: From -1999 to [86] SPHL engineering units.
Notes: **1.** When you change the [85] SPLL value, the inst.rument checks all local Set Points (SP, SP2, SP3 and SP4 parameters) and all Set Points of the program ([105] Pr.S1, [110] Pr.S2, [115] Pr.S3, [120] Pr.S4 parameters). If an SP is out of this range, the instrument forces it to the maximum acceptable value
2. A [85] SPLL change produces the following actions:
- When [92] SP.rt = SP the remote Set Point is forced to be equal to the active Set Point.
- When [92] SP.rt = trim the remote Set Point is forced to zero.
- When [92] SP.rt = PErc the remote Set Point is forced to zero.

[86] SPHL - Maximum Set Point value

Available: When at least one output is programmed as control output.
Range: From [85] SPLL to 9999 engineering units.
Note: For other details see [85] SPLL parameter.

[87] SP - Set Point 1

Available: When at least one output is programmed as control output.
Range: From [85] SPLL to [86] SPHL engineering units.

[88] SP 2 - Set Point 2

Available: When at least one output is programmed as control output and [84] nSP ≥ 2.
Range: From [85] SPLL to [86] SPHL engineering units.

[89] SP 3 - Set Point 3

Available: When at least one output is programmed as control output and [84] nSP ≥ 3.
Range: From [85] SPLL to [86] SPHL engineering units.

[90] SP 4 - Set Point 4

Available: When at least one output is programmed as control output and [84] nSP =4.
Range: From [85] SPLL to [86] SPHL engineering units.

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

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

Range: From “SP” to [84] nSP.

Notes: **1.** A [91] A.SP change produces the following actions:
- When [92] SP.rt = SP - the remote Set Point will be forced to be equal to the active set poin;
- When [92] SP.rt = trin - the remote Set Point will be forced to zero;
- When [92] SP.rt = PErc - the remote Set Point will be forced to zero.

2. SP2, SP3 and SP4 selection will be shown only when the relative Set Point is enabled (see [84] nSP parameter).

3. When [10] rEcS = YES (the recipes are used), the [91] A.SP - active Set Point- will define the recipe in use and it will forced the value of [57] A. Sd.t -active speed/time- paramter.

4. When [10] rEcS = YES (the recipes are used), the [57] A.Sd.t (= active speed/time) will define the recipe in use and it will force the value of [91] A.SP - Active Set Point.

[92] SP.rt - Remote Set Point type

These instruments will communicate with each other, using RS 485 serial interface without a PC. An instrument can be set as a Master while the other are (as usual) Slave units. The Master unit can send his operative Set Point to the slave units.

In this way, for example, it 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).

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

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 value will be used as remote Set Point.

Note: A [92] SPrt change produces the following actions:
- When [92] SP.rt = rSP - the remote Set Point is forced to be equal to the active Set Point;
- When [92] SP.rt = trin - the remote Set Point is forced to zero;
- When [92] SP.rt = PErc - the remote Set Point is 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 Set Point trim.

The first zone is the master zone and it uses a Set Point equal to 210°C.

The second zone has a local Set Point equal to -45°C.

The third zone has a local Set Point equal to -45 (°C).

The fourth zone has a local Set Point equal to -30.

The fifth zone has a local Set Point equal to +40.

The sixth zone has a local Set Point equal to +50.

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 SP of the master unit, all the other slave units will immediately change their operative Set Point.

[93] SP.Lr - Local/remote Set Point selection

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

Range: **Loc** Local Set Point selected by [91] A.SP;
rEn Remote Set Point (coming from serial link).

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

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

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

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

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

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

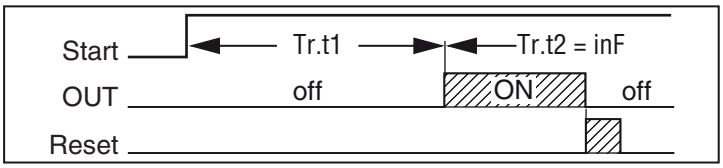
General note about remote Set Point:
When the remote Set Point (RSP) with trim action is programmed, the local Set Point range becomes:
from [85] SPLL + RSP to [86] SPHL - RSP.

]tin group - Timer function parameters

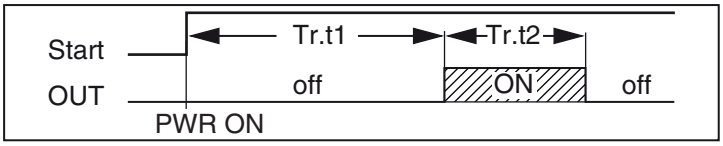
Five timer types are available:

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

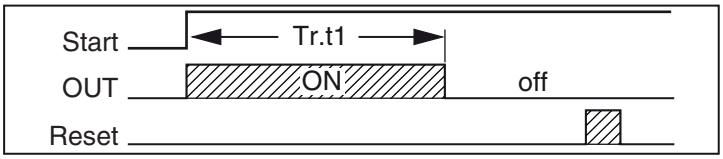
– Setting tr.t2 = Inf the timer out remains in ON condition until a reset command is detected.



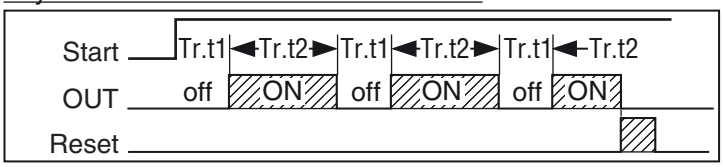
Delayed start at power ON with a delay time and a “end of cycle” time.



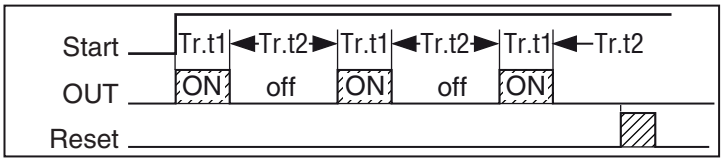
Feed-through.



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. An HOLD command can suspend the time count.

[96] 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 ON;
i.d.d Feed-through timer;
i.P.L Asymmetrical oscillator with start in OFF;
i.L.P Asymmetrical oscillator with start in ON.

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

Available: When [96] tr.F is different from nonE.

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

Note: When the timer is running, you can see the value of this parameter but you can NOT modify it.

[98] tr.t1 - Time 1

Available: When [96] tr.F is different from nonE.

Range: When [97] tr.u = hh.nn = 00.01... 99.59;
When [97] tr.u = nn.SS = 00.01... 99.59;
When [97] tr.u = SSS.d = 000.1... 995.9.

[99] tr.t2 - Time 2

Available: When [96] tr.F is different from nonE.

Range: When [97] tr.u = hh.nn = 00.01... 99.59 + inF;
When [97] tr.u = nn.SS = 00.01... 99.59 + inF;
When [97] tr.u = SSS.d= 000... 995.9 + inF.

Note: Setting [99] tr.t2 = inF, the second time can be stopped by a reset command only.

[100] tr.St - Timer status

Available: When [96] Tr.F is different from nonE.

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

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

PrG Group - Programmer function parameters

These instruments are able to perform a Set Point profile compounded of 4 groups of 2 steps (8 step total).

The first step is a ramp (used to reach the desired Set Point), the second is a soak (on the desired Set Point).

When a RUN command is detected the instrument aligns the operative Set Point to the measured value and starts to execute the first ramp.

In addition, each soak is equipped with a wait band which suspends the time count when the measured value goes out of the defined band (guaranteed soak).

Moreover, for each segment it is possible to define the status of two events. An event can drive an output and make an action during one or more specific program steps.

Some additional parameters allow to define the time scale, the automatic RUN conditions and the instrument behaviour at the end of the program.

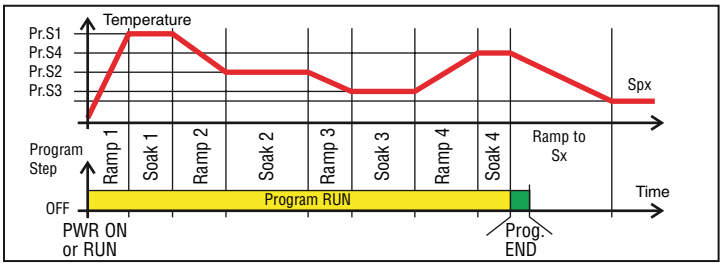
Notes: **1.** All steps can be modified during program execution.

2. During program execution the instrument stores the segment currently in use and, by a 30 minutes interval, stores also the elapsed time of the soaks.

If a power down occurs during program execution, at the next power ON the instrument is able to continue the program execution starting from the segment in progress at power down and, if the segment was a soak, it is also capable to restart from the soak time minus the stored elapsed time.

In order to obtain this features, the [128] dSPu "Status of the instrument at power ON" parameter must be set to "AS.Pr".

If [128] dSPu value is different from "AS.Pr", the memorization function will be inhibited.



[101] Pr.F = Programmer action at Power ON

Available: Always.

Range: **nonE** Program not used;
S.uP.d Start at power ON with a first step in stand by;
S.uP.S Start at power ON;
u.diG Start at RUN command detection only;
U.dG.d Start at RUN command detection with a first step in stand by.

[102] Pr.u - Engineering units of the soaks

Available: When [101] Pr.F is different from nonE:

Range: **hh.nn** Hours and minutes;
nn.SS Minutes and seconds.

Note: During program execution, this parameter can not be modified.

[103] Pr.E - Instrument behaviour at the End of the program execution

Available: When [101] Pr.F is different from nonE.

Range: **cnt** Continue (the instrument will use the Set Point of the last soak until a reset command is detected);
SPAt Go to the Set Point selected by [91] A.SP parameter;
St.bY Go in stand by mode.

Notes: **1.** Setting [96] Pr.E = cnt the instrument operates as follows: at program end, it will use the Set Point of the last soak.

2. When a reset command is detected, it goes to the

Set Point selected by [91] A.SP parameter. The transfer will be a step transfer or a ramp according to the [94] SP.u (maximum rate of rise for positive Set Point change) and [95] SPd (maximum rate of rise for negative Set Point change).

3. Setting [103] Pr.E = SPAt the instrument goes immediately to the Set Point selected by [91] A.SP parameter. The transfer will be a step transfer or a ramp according to the [94] SP.u (maximum rate of rise for positive Set Point change) and [95] SPd (maximum rate of rise for negative Set Point change).

[104] Pr.Et - Time of the End program indication

Available: When [101] Pr.F is different from nonE.
Range: **oFF** Function not used;
00.01... 99.59 minutes and seconds;
inF Forced to ON.
Note: Setting [104] Pr.Et = inF the end program indication will go OFF only when a reset command or a new RUN command is detected.

[105] Pr.S1 - Set Point of the first soak

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.
Range: From [85] SPLL to [86] SPHL.

[106] Pr.G1 - Gradient of the first ramp

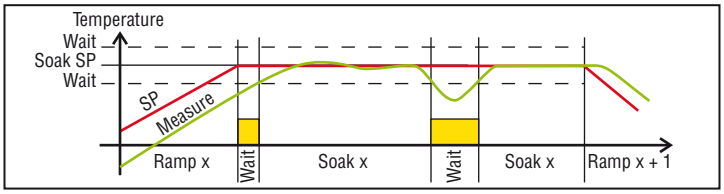
Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.
Range: 0.1... 999.9 engineering units per minute;
inF Step transfer.

[107] Pr.t1 - Time of the first soak

Available: When [101] Pr.F is different from nonE.
Range: 0.00... 99.59 Time units.

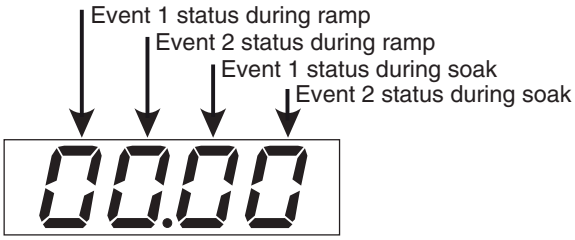
[108] Pr.b1 - Wait band of the first soak

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.
Range: OFF... 9999 engineering units.
Note: The wait band suspends the time counting when the measured value goes out of the defined band (guaranteed soak).



[109] Pr.E1 - Events of the first group

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SUPd.
Range: 00.00... 11.11 where:
0 Event OFF;
1 Event ON.



Display	Ramp		Soak	
	Event 1	Event 2	Event 1	Event 2
00.00	off	off	off	off
10.00	on	off	off	off
01.00	off	on	off	off
11.00	on	on	off	off
00.10	off	off	on	off
10.10	on	off	on	off
01.10	off	on	on	off
11.10	on	on	on	off
00.01	off	off	off	on
10.01	on	off	off	on
01.01	off	on	off	on
11.01	on	on	off	on
00.11	off	off	on	on
10.11	on	off	on	on
01.11	off	on	on	on
11.11	on	on	on	on

[110] Pr.S2 - Set Point of the second soak

Available: When [101] Pr.F is different from nonE.
Range: From [85] SPLL to [86] SPHL;
oFF Program end.
Note: It is not necessary to configure all steps.
When you use for example 2 groups only, it is sufficient to set the Set Point of the third group equal to OFF. The instrument will mask all the following parameters of the programmer.

[111] Pr.G2 - Gradient of the second ramp

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.
Range: 0.1... 999.9 engineering units per minute;
inF Step transfer.

[112] Pr.t2 - Time of the second soak

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.
Range: 0.00... 99.59 time units.

[113] Pr.b2 - Wait band of the second soak

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.
Range: OFF... 9999 engineering units.
Note: For more details see [108] Pr.b1 parameter.

[114] Pr.E2 - Events of the second group

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.
Range: 00.00... 11.11 where:
0 Event OFF;
1 Event ON.
Note: For more details see [109]Pr.E1 parameter.

[115] Pr.S3 - Set Point of the third soak

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.
Range: From [85] SPLL to [86] SPHL;
oFF Program end.
Note: For more details see [101] Pr.S1 parameter.

[116] Pr.G3 - Gradient of the third ramp

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: 0.1... 999.9 engineering units per minute;
inF Step transfer.

[117] Pr.t3 - Time of the third soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: 0.00... 99.59 time units.

[118] Pr.b3 - Wait band of the third soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: OFF... 9999 engineering units.

Note: For more details see [108] Pr.b1 parameter.

[119] Pr.E3 - Events of the third group

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: 00.00 to... 11.11 where:
0 Event OFF;
1 Event ON.

Note: For more details see [109] Pr.E1 parameter.

[120] Pr.S4 - Set Point of the fourth soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: From [85] SPLL to [86] SPHL;
oFF Program end.

Note: For more details see [101]Pr.S1 parameter.

[121] Pr.G4 - Gradient of the fourth ramp

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFFand [120] Pr.S4 is different from oFF.

Range: 0.1... 999.9 enginering units per minute;
inF Step transfer.

[122] Pr.t4 - Time of the fourth soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF, [1115] Pr.S3 is different from oFFand [120] Pr.S4 is different from oFF.

Range: 0.00... 99.59 time units.

[123] Pr.b4 - Wait band of the fourth soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF, [115] Pr.S3 is different from oFFand [120] Pr.S4 is different from oFF.

Range: From OFF to 9999 engineering units.

Note: For more details see [108] Pr.b1 parameter.

[124] Pr.E4 - Event of the fourth segment

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF, [115] Pr.S3 is different from oFFand [120] Pr.S4 is different from oFF.

Range: 00.00... 11.11 where:
0 Event OFF;
1 Event ON.

Note: For more details see [109]Pr.E1 parameter.

[125] Pr.St - Program status

Available: When [101] Pr.F is different from nonE.

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

Note: This parameter allows to manage program execution by a parameter.

PAn group - Operator HMI

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

Available: Always.

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

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

Available: Always.

Range: 3... 200.

Note: Setting [126] PAS2 equal to [127] PAS3, the level 2 will be masked.

[128] uSrb - button function during RUN TIME

Available: Always.

Range: **nonE** No function;
Sd.St Run/stop of the SPEED output;
SPd.S Sequential speed selection (note);
tunE Auto-tune/self-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 Stand by mode. The first pressure puts the instrument in stand by mode while a second one puts the instrument in Auto mode;
Str.t Timer run/hold/reset (note);
P.run Program run (note);
P.rES Program reset (note);
P.r.H.r Program run/hold/reset (note).

Notes:
1. When the SP.dS (or ch.SP) option is selected, each pressure on the button (longer than 1 second) increases the value of A.Sd.t (speed/time active) or A.SP (Set Point active) of one unit. The selection is cyclic: **Sd.t1 -> Sd.t2 -> Sd.t3 -> Sd.t4** (**SP -> SP2 -> SP3 -> SP4**).
   When a new speed/time or Set Point is selected using the key, the display shows for 2 s the acronym of the selection made (e.g.: Sd.t3 or SP2).
2. When using the SP.dS or ch.SP option, the number of selectable speeds/set points is limited by parameters [52] n.SPd and [84] nSP.
3. When [10] rEcS = YES (the recipes are used) and [128] uSrb = chSP or [128] uSrb = SPd.S, the button sequentially select the active recipe.
4. When “Timer run/hold/reset” is selected, a short press starts/stops(hold) timer count while a long press (longer than 10 second) resets the timer.
5. When “Program run” is selected, the first pressure

starts the program execution but a second pressure (during program execution) restarts the program execution from the beginning.

6. When “Program reset” is selected, a short press allows it to reset the program execution.
7. When “Program run/hold/reset” is selected, a short press starts/stop (Hold) program execution while a long press (longer than 10 s) resets the program.

[129] H.diS - Main Display Management

Available: Always.

Range: **SPED** Current speed (E.U.);
Sd.nA Speed name (the name of the speed currently selected Sd.t1, Sd.t2, Sd.t3 or Sd.t4);
PV measured value.

[130] L.diS - Secondary Display Management

Available: Always.

Range: **nonE** Standard display;
SPED Current speed (E.U.);
Sd.nA Speed name (the name of the speed);
Pou Power output;
SPF Final Set Point;
Spo Operative Set Point;
AL1 Alarm 1 threshold;
AL2 Alarm 2 threshold;
AL3 Alarm 3 threshold;
Pr.tu During a soak, the instrument shows the elapsed time of the soak;
- During a ramp the display shows the operative Set Point. At program end, the instrument alternately displays PEnd and the measured value.
- When no program is running, the instrument shows the standard display.

Pr.td During a soak, the instrument shows the remaining time of the soak (count down);
- During a ramp the display shows the operative Set Point. At program end, the instrument alternately displays PEnd and the measured value.
- When no program is running, the instrument shows the standard display.

P.t.tu When the programmer is running, the display shows the total elapsed time. At program end, the instrument alternately displays PEnd and the measured value:
P.t.td When the programmer is running, the display shows the total remaining time (count down). At program end, the instrument alternately displays PEnd and the measured value;
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).

[131] di.CL - Display colour

Available: Always.

Range: **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).

[132] AdE - Deviation for display colour management

Available: When [131] di.CL = 0.

Range: 1... 9999 engineering units.

[133] 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 will come back to the normal operation.

[134] 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.).

[135] bG.F - Bargraph function (KX7 only)

Available: Always.

Range: **nonE** Bargraph not lit;
Po.h Speed in use (in %).
Pou Output power calculated by PID (single action: 0... 100%, double action: -100... +100%);
Pr.tu Elapsed time of the program in execution;
Pr.td Time to end of the program in execution;
Pr.tS Time to end of the program segment in execution;
ti.uP Elapsed time of timer (T1 and T2);
ti.du Time to end of timer (T1 and T2);
r.iSP Time to preventive maintenance;
PoS Valve position (servomotor only).

Note: Displaying values using the bar graph will be possible only if the variables involved are configured.
If it has been chosen to display the time of the program or time of the timer, the bargraph will be off if the option is not configured, it will have the first LED lit if the option is configured but not running.

[136] 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 stand-by mode.

Notes:
1. When you change the value of [137] oPr.E, the instrument forces [138] oPEr parameter equal to Auto.
2. During program execution the instrument stores the segment currently in use and, by a 30 minutes interval, it stores also the elapsed time of the soaks.

   If a power down occurs during program execution, at the next power ON the instrument is able to continue the program execution starting from the segment in progress at power down and, if the segment was a soak, it is also capable to restart from the soak time minus the stored elapsed time.

   In order to obtain this features, the "[136] dSPu - Status of the instrument at power ON" parameter must be set to "AS.Pr".

   If the "[136] dSPu" parameter is different from "AS.Pr" The memorization function is inhibited.

[137] 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 will be selectable by the next parameter;
- **Au.Sb** Auto and Stand-by modes only will be selectable by the next parameter.

Note: Manual changing the value of [137] oPr.E, the instrument forces parameter [138] oPEr = Auto.

[138] oPEr - Operative mode selection

Available: Always.

Range:
- When [137] oPr.E = ALL:
  - **Auto** Auto mode;
  - **oPLo** Manual mode;
  - **St.bY** Stand by mode.
- When [137] oPr.E = Au.oP:
  - **Auto** Auto mode;
  - **oPLo** Manual mode.
- When [137] oPr.E = Au.Sb:
  - **Auto** Auto mode;
  - **St.bY** Stand by mode.

Ser group - Serial link parameter

[139] Add - Instrument address

Available: Always.

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

[140] bAud - Baud rate

Available: When [139] Add different from oFF.

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

COn Group - Consumption parameters

[141] Co.tY - Count type

Available: Always.

Range:
- **oFF** Not used;
- **1** Total worked days: Number of hours the instrument is turned ON divided by 24.
- **2** Total worked hours: Number of hours that the instrument is turned ON.
- **3** Total worked days with threshold: Number of hours the instrument is turned ON divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job.
- **4** Total worked hours with threshold: number of hours that the instrument is turned ON, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job.
- **5** Totalizer of control relay worked days: Number of hours the control relay has been in ON condition, divided by 24.
- **6** Totalizer of control relay worked hours: Number of hours the control relay has been in ON condition.
- **7** Totalizer of control relay worked days with threshold: Number of hours the control relay has been in ON condition divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job.
- **8** Totalizer of control relay worked hours with threshold: Number of hours the control relay has been in ON condition, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job.

Note: Selections 1 to 8 represent an internal count: these modes calculate the instrument work in hours or days. When the count reaches the threshold set with parameter [142] h.Job the display shows r. iSP (Inspection Requested). The count reset (with r.iSP cancellation) can be done only by changing the threshold value - parameter [142] h.Job.

Using counting methods 6, 7, 10, 11, the count reset causes the controller to exit the stand-by status returning to the control status.

[142] h.Job - Threshold of the working period

Available: When [140] Co.tY = tot.d or [140] Co.tY = tot.H.

Range:
- **oFF** Threshold not used;
- 1... 9999 days when [141] Co.tY = 4;
- 1... 9999 hours when [141] Co.tY = 5.

[143] t.Job - Worked time (not resettable)

Available: Always.

Range: 1... 9999 days.

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.

[144] AL.P - Adjust Low Point

Available: Always.
Range: -1999... (AH.P - 10) engineering units.
Note: The minimum difference between AL.P and AH.P is equal to 10 Engineering Units.

[145] AL.o - Adjust Low Offset

Available: Always.
Range: -300... +300 engineering units.

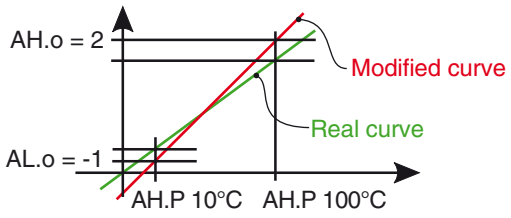
[146] AH.P - Adjust High Point

Available: Always.
Range: From (AL.P + 10) to 9999 engineering units.
Note: The minimum difference between AL.P and AH.P is equal to 10 Engineering Units.

[147] AH.o - Adjust High Offset

Available: Always.
Range: -300... +300 Engineering Units.
Example: Environmental chamber with an 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 [144] AL.P = 10 (low working point) and [145] 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 [146] AH.P = 100 (low working point) and [147] 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.



The most important step of the configuration procedure is completed.

In order to exit from configuration parameter procedure, proceed as follows:

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

7 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 [126] PAS2 parameter.

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

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

7.1 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.
2. The upper display will show PASS while the lower display will show 0.
3. By and buttons set a password equal to -81.
4. Push button.
   The instrument will show the acronym of the first configuration parameter group inP.
5. By button select the group of the first parameter of your list.
6. By button select the first parameter of your list
7. The upper display will show the acronym of the parameter while the lower display will show his current promotion level. The promotion level is defined by a letter followed by a number.
   The letter can be:
   - c: It shows that this parameter is **NOT** promoted and it is present only in configuration. In this case the number is forced to zero.
   - A: It shows that this parameter has been promoted to the limited access level. The number will show the position in the limited access list.
   - o: It shows that the parameter has been promoted to the Operator level. The number will show the position in the limited access list.
8. 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.

9. In order to modify the level from limited access to operator and vice versa, push button and, maintaining the pressure, push button. The letter will change from A to o and vice versa.
10. Select the second parameter that you want to add to the protected level and repeat step 6, 7 and 8.
11. Repeat steps 5, 6, 7, 8 until the list has been completed.
12. 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 parameter, the instrument will use 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

8 OPERATIVE MODES

As we said at paragraph 4.1, when the instrument is powered ON, it starts immediately working in accordancewith thestored parameters 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, Manual or Stand by 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 will be made.
– In **Stand by** mode the instrument operates as an indicator. It will show on the upper display the measured value and on the lower display the Set Point alternately to the "St.bY" messages and forces the control outputs to zero.

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

8.1 Modify a parameter during "Operator level"

The instrument is showing the "Standard display".

1. Press the button.
2. The upper display will show the acronym of the first parameter promoted to this level while the lower display will show its value.
3. By and button assign to this parameter the desired value.
4. Press the button in order to memorize the new value and go to the next parameter.
5. When you want to come back 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 button is pressed for more than 10 seconds, the instrument goes back to the "Standard display" and the new value of the last selected parameter will be lost.

8.2 Enter the "Limited access level"

The instrument is showing the "Standard display".

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 buttons set the value assigned to [126] PAS2 (Level 2 password).

Notes: 1. The factory default password for configuration parameters is equal to 20.
2. All parameter modification are protected by a time out. If no button is pressed for more than 10 second the instrument comes automatically back to the Standard display, the new value of the last selected parameter is lost and the parameter

modification procedure is closed.

When you desire 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 modification 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 controller from controlling during the programming procedure (its control output will be Off). A password equal to 2000 + the programmed value (e.g. 2000 + 20 = 2020) will switch the control out off during configuration. The control will restart automatically when the para-meter modification procedure will be manually ended.
4. Push button.
5. The instrument will show on the upper display the acronym of the first parameter promoted to this level and on the lower display its value.
6. By and buttons assign to this parameter the desired value.
7. Press the button in order to memorize the new value and go to the next parameter.
8. When you want to come back to the "Standard display" push the button for more than 5 s.

8.3 How to see but not modify the "limited access parameters"

Sometime 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 shows 0;
3. By and button set the value -19 ;
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 parameter present in level 2 but it will not be possible to modify it;
7. It is possible to come back to the "Standard display" by pushing the button for more than 3 seconds or by pushing no buttons for more than 10 seconds.

8.4 Automatic Mode

8.4.1 Keyboard function when the instrument is in Auto mode

- Performs the action programmed by [128] uSrb (button function during RUN TIME) parameter.
- Enters the parameter modification procedures.
- **A short pressure (less than 2 seconds)** displays the "additional information" (see below);
  A pressure longer than 2 second starts the "*Direct set point modification*" function (see below).
- Starts the "*Direct set point modification*" function (see below).

8.4.2 Direct Set Point modification

This function allows to modify rapidly the Set Point value selected by [91] A.SP (selection of the active Set Point) or to the Set Point of the segment group (of the programmer) currently in progress.

The instrument is showing the "*Standard display*".

1. Push or the button for more than 2 seconds. The upper display shows the acronym of the selected Set Point (e.g. SP2) and the lower display will show its value.

Note: When the programmer is running, the instrument will show the Set Point of the group currently in use (e.g. if the instrument is performing the soak 3 the instrument will show [115] Pr.S3).

2. By and buttons, assign to this parameter the desired value
3. Do not push any button 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.

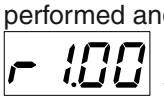
8.4.3 Additional information

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

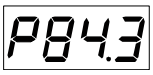
The additional information are related to how the instrument is programmed, hence in many cases, only part of this information is available.

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. The H show you that the action is a Heating action while the c show you that the action is a Cooling action.
2. Push button again. When the programmer is running the lower display will show the segment currently performed and the Event status as shown below:

   where the first character can be r for a ramp or S for a soak, the next digit show the number of the segment (e.g. S3 means Soak number 3) and the two less significant digits (LSD) show you the status of the two event (the LSD is the Event 2).
3. Push button again. When the programmer is running the lower display will show the theoretical remaining time to the end of the program preceded by a P letter:



4. Push button again. When the wattmeter function is running the lower display will show *U* followed by the measured energy.

Note: The energy calculation will be in accordance with the [134] Co.tY parameter setting.

5. Push button again. When the “Worked time count” is running the lower display will show *d* for days or *h* for hours followed by the measured time.
6. Push button again. The instrument returns to the “Standard display”.

Note: The additional information visualization is subject to a time out. If no button is pressed for more than 10 second the instrument comes automatically back to the Standard display.

8.4.4 The programmer function

In paragraph 4 we have described all parameters related with the programmer and their action during program execution.

In this paragraph we will give you some additional information and some application examples.

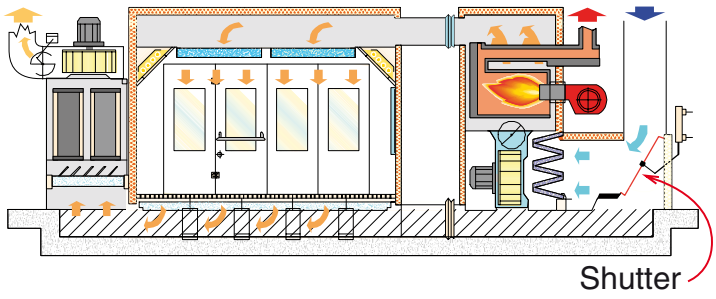
Note: The decimal point of the LSD of the lower display is used to show the programmer status independently from the displayed value selected by [129] diSP (Display management).

The relation between the programmer status and the LED are the following:

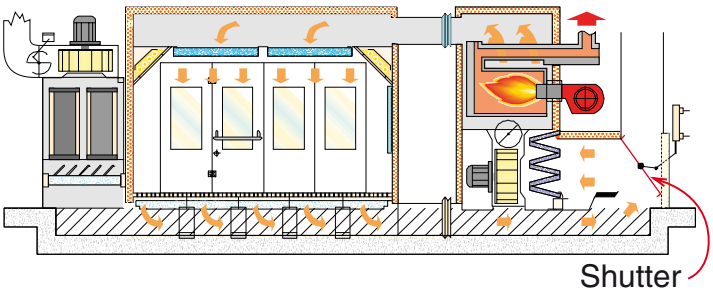
- Program in RUN - the LED is ON;
- Program in Hold - The LED is flashing fast;
- Program in wait - The LED is flashing slow;
- Program in end or reset - The LED is OFF.

Application Example 1: Spray Paint Drying Booth

When the operator is in the booth and painting the car, the internal temperature must be 20°C and the air, used for booth ventilation, comes from outside.



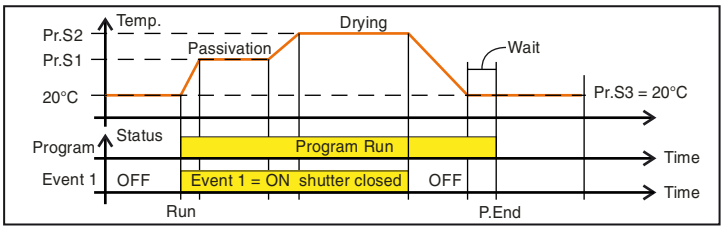
During the passivation and drying phases, the operator is out of the booth and the system closes the air shutter and recycles the internal air in order to reduce the power consumption.



When the drying time is finished, before the operator is allowed to enter into the boot, you must be sure that:

1. The air in the booth has been refreshed. The temperature is lower than a limit.

So that you need a profile like the one that follows:



Out 1 = H.rEG (heating output)
Out 2 = P.Et1 (program event 1)
Out 3 = P.run (program running)
Pr.E1and Pr.E2 = 10.10
(event 1 goes ON during ramp 1, soak 1, ramp 2 and soak 2)

When the program is running the door is locked

Application Example 2: edge bending machine with glue tank (for wood)

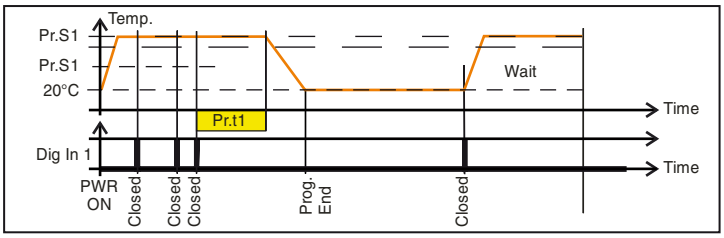
At the working temperature the hot melt rapidly oxidizes and runs down from the “dispenser”.

For this reason, when the machine does not work for a certain time, it is suitable to move the temperature of the dispenser to a lower value to idle.

In this cases the configuration is the following:

Out 1 = h.reg (heating output)
Out 2 = AL (alarm used to enable the dragger)
diF.1 = P.run (digital input 1 used for Program run/restart)
Pr.F = S.uP.S (start at power ON)
Pr.E = cnt (Instrument behaviour at the end of the program execution = continue).

Connect a proximity switch to Dig. In 1 for panel detection.



When a new panel is detected before the end of the first soak time, the program restarts and the Set Point remains equal to Pr.S1.

If no panel is detected, the instrument goes to Pr.S2 (idle temp) and remain there until a new panel arrives.

8.4.5 Display management

This instrument allows you to program (see parameter [125] diS.t the time out of the display.

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

When [133] diS.t is different to OFF (display ever ON) 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.

8.4.6 The display colour shows the Deviation

This instrument allows to program the deviation (PV - SP) for colour display change (see parameter [124] 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.

8.5 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 manual control is selected, the instrument will start to operate with the same power output as the last one supplied by automatic mode and can be modified using the ▲ and ▼ buttons.

In case of ON/OFF control, 0% corresponds to the deactivated output while any value different from 0 corresponds to the activated output.

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 manual modes during self-tune execution, the self- tune function will be aborted.
4. During manual mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.

8.6 Stand by mode

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

In this mode the instrument operates as an indicator.

When the instrument is in stand by mode the upper display will show the measured value while the lower display will show alternately the Set Point and the message “StbY”.

Notes:
1. During stand by mode, the relative alarms are disabled while the absolute alarms are operative or not according to the ALxo (Alarm x enabling during Stand-by mode) parameter setting.
2. If you set stand by mode during program execution, the program will be aborted.
3. If you set stand by mode during self-tune execution, the self- tune function will be aborted.
4. During stand by mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.
5. When the instrument is swapped from stand by to auto modes, the instrument will start automatically the alarm masking, the soft start functions and the auto-tune (if programmed).

9 ERROR MESSAGES

9.1 Out of range signals

The upper display shows the OVER-RANGE and UNDER-RANGE conditions with the following indications:

Over-range	Under-range
0000	U.U.U.U.

The sensor break will be signalled as an out of range

Note: When an over-range or an under-range is detected, the alarms operate as in presence of the maximum or the minimum measurable value respectively.

To check the out of span 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 chapter 5).
3. If no error is detected, send the instrument to your supplier to be checked.

9.2 List of possible errors

Message	Error
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 3. The message shows that a short circuit is present on Out 3 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

Mode 1 FULL parameters list

inP GROUP - Main and auxiliary input configuration

no.	Param.	Description	Dec. Point	Values	Default
1	SEnS	Sensor selection (according to the HW)			
		Model C	0	J TC J (-50... 1000°C/-58... 1832°F); crAL TC K (-50... 1370°C/-58... 2498°F); S TC S (-50... 1760°C/-58... 3200°F); r TC R (-50... 1760°C/-58... 3200°F); t TC T (-70... 400°C/-94... 752°F); ir.J Exergen IRS J (0... 1000°C/32... 1832°F); ir.cA Exergen IRS K (0... 1370°C/32... 2498°F); Pt1 RTD Pt 100 (-200... 850°C/-328... 1562°F); Pt10 RTD Pt 1000 (-200... 850°C/-328... 1562°F); 0.60 0... 60 mV; 12.60 12... 60 mV; 0.20 0... 20 mA; 4.20 4... 20 mA; 0.5 0... 5 V; 1.5 1... 5 V, ; 0.10 0... 10 V; 2.10 2... 10 V.	J
		Model E		J TC J (-50... 1000°C/-58... 1832°F); crAL TC K (-50... 1370°C/-58... 2498°F); S TC S (-50... 1760°C/-58... 3200°F); r TC R (-50... 1760°C/-58... 3200°F); t TC T (-70... 400°C/-94... 752°F); ir.J Exergen IRS J (0... 1000°C/32... 1832°F); ir.cA Exergen IRS K (0... 1370°C/32... 2498°F); Ptc PTC KTY81-121 (-55... 150°C/-67... 302°F); ntc NTC 103-AT2 (-50... 110°C/-58... 230°F); 0.60 0... 60 mV; 12.60 12... 60 mV; 0.20 0... 20 mA; 4.20 4... 20 mA; 0.5 0... 5 V; 1.5 1... 5 V, ; 0.10 0... 10 V; 2.10 2... 10 V.	
2	dp	Decimal Point Position (linear inputs)	0	0... 3	0
		Decimal Point Position (different than linear inputs)		0/1	
3	SSC	Initial scale read-out for linear inputs	dp	-1999... 9999	0
4	FSc	Full Scale Readout for linear inputs	dp	-1999... 9999	1000
5	unit	Engineer unit		°C/°F	°C
6	Fil	Digital filter on the measured value	1	0 OFF; 0.1... 20.0 s	1.0
7	inE	Sensor error used to enable the safety output value		our Over and under range; or Over range; ou Under range.	our
8	oPE	Safety output value (% of the output)		-100... 100	0
9	IO3.F	I/O 3 function		dG2c Digital input 2 driven by contact; dG2U Digital input 2 driven by 12... 24 VDC; on Output used as PWS for TX; out3 Output 3 (digital output 3).	out3
10	rEcS	Enable Recipes (control + speed coupling)		No Control and speed are independent; Yes Control and speed are related.	

no.	Param.	Description	Dec. Point	Values	Default
11	diF1	Digital Input 1 function		nonE Not used; AAC Alarm acknowledge (ACK); ASi Alarm reset; HoLd Hold of the measured value; St.by Stand by mode; oPLo Manual mode; HE.co HEAt with SP1 and CooL with SP2; Str.t Timer RUN/Hold/Reset; t.run Timer Run; t.rES Timer Reset; t.r.H Timer Run/Hold; t.r.r Timer Run/Reset; t.r.rb Timer Run/Reset with lock; P.run Program Start; P.rES Program Reset; P.r.h.t Program Hold; P.r.h.S Program Run/Hold; P.r.r Program Run/Reset; Sd.r.S SPEED/TIME run/stop [stauts]; Sd.r.t SPEED/TIME run/stop [transition]; ch.SP Sequential SP selection; ch.Sd Sequential SPEED selection [transition]; SP.1.4 SP1... SP4 binary selection; Sd.1.4 Speed binary 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	o1F	Out 1 function	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; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; 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 Stand by 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; riSP Inspection request.	H.reG
15	o1.AL	Alarms linked up with the out 1	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 3.	AL1
16	o1.Ac	Out 1 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; rEU.r Reverse with reversed LED	dir

no.	Param.	Description	Dec. Point	Values	Default
17	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 out -OFF in hold; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; 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 Stand by 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; riSP Inspection request.	AL
18	o2.AL	Alarms linked up with the out 2	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 4.	AL1
19	o2.Ac	Out 2 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir
20	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 out -OFF in hold; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; 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 Stand by status indicator.	AL
21	o3.AL	Alarms linked up with the out 3	0	0... 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 3.	AL2
22	o3.Ac	Out 3 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
23	AL1t	Alarm 1 type when one or more outputs are programmed as control output	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
		When no output is programmed as control output;	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.	
24	Ab1	Alarm 1 function	0	0... 15: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change.	0
25	AL1L	- AL1 threshold low limit (high/low alarms); - Low alarm threshold (band alarm).	dp	From -1999 to AL1H (E.U.)	-1999
26	AL1H	- AL1 threshold high limit (high/low alarms); - High alarm threshold (band alarm).	dp	From AL1L to 9999 (E.U.)	9999
27	AL1	AL1 threshold	dp	From AL1L to AL1H (E.U.)	0
28	HAL1	AL1 hysteresis	dp	1... 9999 (E.U.)	1
29	AL1d	AL1 delay	0	From 0 (oFF) to 9999 (s)	oFF
30	AL1o	Alarm 1 enabling during Stand-by mode and out of range conditions	0	0 Alarm 1 disabled during Stand by and out of range; 1 Alarm 1 enabled in stand by mode; 2 Alarm 1 enabled in out of range condition; 3 Alarm 1 enabled in stand by mode and in overrange condition.	0

AL2 group - Alarm 2 parameters

no.	Param.	Description	Dec. Point	Values	Default
31	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
32	Ab2	Alarm 2 function	0	0... 15: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change	0
33	AL2L	- AL2 threshold low limit (high/low alarms); - Low alarm threshold (band alarm).	dp	From -1999 to AL2H (E.U.)	-1999
34	AL2H	- AL2 threshold high limit (high/low alarms); - High alarm threshold (band alarm).	dp	From AL2L to 9999 (E.U.)	9999
35	AL2	AL2 threshold	dp	From AL2L to AL2H (E.U.)	0
36	HAL2	AL2 hysteresis	dp	1... 9999 (E.U.)	1
37	AL2d	AL2 delay	0	From 0 (oFF) to 9999 (s)	oFF
38	AL2o	Alarm 2 enabling during Stand-by mode and out of range conditions	0	0 Alarm 2 disabled during Stand by and out of range; 1 Alarm 2 enabled in stand by mode; 2 Alarm 2 enabled in out of range condition; 3 Alarm 2 enabled in stand by mode and in overrange condition.	0

AL3 group - Alarm 3 parameters

no.	Param.	Description	Dec. Point	Values	Default
39	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
40	Ab3	Alarm 3 function	0	0... 15: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change.	0
41	AL3L	- AL3 threshold low limit (high/low alarms); - Low alarm threshold (band alarm).	dp	From -1999 to AL3H (E.U.)	-1999
42	AL3H	- AL3 threshold high limit (high/low alarms); - High alarm threshold (band alarm).	dp	From AL3L to 9999 (E.U.)	9999
43	AL3	AL3 threshold	dp	From AL3L to AL3H (E.U.)	0
44	HAL3	AL3 hysteresis	dp	1... 9999 (E.U.)	1
45	AL3d	AL3 delay	0	From 0 (oFF) to 9999 (s)	oFF
46	AL3o	Alarm 3 enabling during Stand-by mode and out of range conditions	0	0 Alarm 3 disabled during Stand by and out of range; 1 Alarm 3 enabled in stand by mode; 2 Alarm 3 enabled in out of range condition; 3 Alarm 3 enabled in stand by mode and in overrange condition.	0

SPEd group - Speed control

no.	Param.	Description	Dec. Point	Values	Default
47	SPd.P	Start speed at Power ON		AS.Pr Same speed was set at power OFF; OFF.A Starts with speed 0 and waits a start command; OFF.b Starts with speed 0 and waits until the controlled value reaches SP + SPd.b.	
48	SPd.b	Band to enable speed control		1... 9999 E.U.	
49	SPd.t	Engineering Units of the Speed/Time variable		PErc Shown as an output %; tinE Shown as a time; E.U. shown in engineering units (km/h, m/s, l/min).	
50	Sd.dF	Speed decimal figure		0... 3	
51	SPd.r	Speed reference		Parameter masked if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
52	n.SPd	Number of used speed/time		1... 4	
53	Sd.t1	Speed/time 1		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
54	Sd.t2	Speed/time 2		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
55	Sd.t3	Speed/time 3		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
56	Sd.t4	Speed/time 4		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
57	A.Sd.t	Active speed/time		Sd.t1, Sd.t2; Sd.t3; Sd.t4;	
58	Sd.cA	Speed calibration		YES/no	

LBA group - Loop Break Alarm Parameters

no.	Param.	Description	Dec. Point	Values	Default
59	LbAt	LBA time	0	0 LBA not used; 1... 9999 (s)	oFF

no.	Param.	Description	Dec. Point	Values	Default
60	LbSt	Delta measure used by LBA during Soft start	dP	oFF Loop break alarm is inhibited during soft start; 1... 9999 (E.U.).	10
61	LbAS	Delta measure used by LBA	dP	1...9999 (E.U.)	20
62	LbcA	Condition for LBA enabling	0	uP Active when Pout = 100%; dn Active when Pout = -100%; both Active in both cases.	both

rEG group - Control Parameters

no.	Param.	Description	Dec. Point	Values	Default
63	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
64	Auto	Auto tune selection	0	-4 Oscillating auto-tune with automatic restart at power up and after all point change; -3 Oscillating auto-tune with manual start; -2 Oscillating -tune with automatic start at the first power up only; -1 Oscillating auto-tune with automatic restart at every power up; 0 Not used; 1 Fast auto tuning with automatic restart at every power up; 2 Fast auto-tune with automatic start the 1st power up only; 3 FAST auto-tune with manual start; 4 FAST auto-tune with automatic restart at power up and after a set point change; 5 Evo-tune with automatic restart at every power up; 6 Evo-tune with automatic start the first power up only; 7 Evo-tune with manual start; 8 Evo-tune with automatic restart at power up and after a set point change.	7
65	tunE	Manual start of Auto tune	0	oFF Not active; on Active.	oFF
66	HSEt	Hysteresis of the ON/OFF control	dP	0... 9999 (E.U.)	1
67	cPdt	Time for compressor protection	0	oFF Protection disabled; 1... 9999 (s).	oFF
68	Pb	Proportional band	dP	1... 9999 (E.U.)	50
69	ti	Integral time	0	oFF Integral action excluded; 1... 9999 seconds; inF Integral action excluded.	200
70	td	Derivative time	0	oFF Derivative action excluded; 1... 9999 seconds.	50
71	Fuoc	Fuzzy overshoot control	2	0.00... 2.00	0.50
72	tcH	Heating output cycle time	1	1.0... 130.0 (s)	20.0
73	rcG	Power ratio between heating and cooling action	2	0.01... 99.99	1.00
74	tcc	Cooling output cycle time	1	1.0... 130.0 (s)	20.0
75	rS	Manual reset (Integral pre-load)	1	-100.0... +100.0 (%)	0.0
76	Str.t	Servomotor stroke time (servo mode)	0	5...1000 seconds	60
77	db.S	Servomotor dead band (servo mode)	0	0...100 %	50
78	oP.L	Minimum output power		-100 to oP.H (%)	
79	oP.H	Maximum output power		oP.L to 100 (%)	
80	od	Delay at power up	2	oFF Function not used; 0.01... 99.59 hh.mm.	oFF
81	St.P	Max. output power during soft start	0	-100... 100 (%)	0
82	SSt	Soft start time	2	0.00 Soft start time not used; 0.01... 7.59 (hh.mm); inF Always ON.	oFF
83	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
84	nSP	Number of used Set Points	0	1... 4	1
85	SPLL	Minimum set point value	dP	From -1999 to SPHL	-1999
86	SPHL	Maximum set point value	dP	From SPLL to 9999	9999
87	SP	Set point 1	dP	From SPLL to SPLH	0
88	SP 2	Set point 2	dP	From SPLL to SPLH	0
89	SP 3	Set point 3	dP	From SPLL to SPLH	0
90	SP 4	Set point 4	dP	From SPLL to SPLH	0
91	A.SP	Selection of the active Set Point	0	From 1 (SP 1) to nSP	1
92	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
93	SPLr	Local/remote set point selection	0	Loc Local Set Point; rEn Remote Set Point.	Loc
94	SP.u	Rate of rise for **POSITIVE** set point change (ramp UP)	2	0.01... 99.99 (inF) engineering units per minute; inF Ramp disabled (step transfer).	inF
95	SP.d	Rate of rise for **NEGATIVE** set point change (ramp DOWN)	2	0.01... 99.99 (inF) engineering units per minute; inF Ramp disabled (step transfer).	inF

tin group - Timer function parameters

no.	Param.	Description	Dec. Point	Values	Default
96	tr.F	Independent timer function	0	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 OFF; i.L.P Asymmetrical oscillator with start ON.	nonE
97	tr.u	Timer unit	0	hh.nn Hours and minutes; nn.SS Minutes and seconds; SSS.d Second and tenth of seconds.	nn.SS
98	tr.t1	Time 1	2	0.01... 99.59 hh.nn when [97] tr.u = hh.nn; 0.01... 99.59 nn.ss when [97] tr.u = nn.SS; 000.1... 995.9. SSS.d when [97] tr.u = SSS.d.	
99	tr.t2	Time 2	2	inf The timer can be stopped by a reset command only; 0.01... 99.59 hh.nn when [97] tr.u = hh.nn; 0.01... 99.59 nn.ss when [97] tr.u = nn.SS; 000.1... 995.9. SSS.d when [97] tr.u = SSS.d.	
100	tr.St	Timer status	0	rES Timer reset; run Timer run; HoLd Timer hold.	rES

PRG group - Programmer function parameters

no.	Param.	Description	Dec. Point	Values	Default
101	Pr.F	Program action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
102	Pr.u	Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds	hh.nn
103	Pr.E	Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the set point selected by A.SP; St.bY Go to stand-by mode	A.SP
104	Pr.Et	Time of the end program indication	2	oFF Function not used; 00.01... 99.59 minutes and seconds; inF Forced to ON.	oFF
105	Pr.S1	Set point of the first soak	dP	From SPLL to SPHL	0
106	Pr.G1	Gradient of the first ramp	1	0.1... 999.9 Engineering Unit/minute inF Step transfer	inF
107	Pr.t1	Time of the 1st soak	2	0.00... 99.59 time units	0.10

no.	Param.	Description	Dec. Point	Values	Default
108	Pr.b1	Wait band of the 1st soak	dP	oFF... 9999 (E.U.)	oFF
109	Pr.E1	Events of the 1st group	2	00.00... 11.11 (0 Event OFF, 1 Event ON)	00.00
110	Pr.S2	Set point of the 2nd soak	dP	oFF (program end) or from SPLL to SPHL	0
111	Pr.G2	Gradient of the 2nd ramp	1	0.1... 999.9 (inF = Step transfer) Engineering Unit/minute	inF
112	Pr.t2	Time of the 2nd soak	2	0.00... 99.59	0.10
113	Pr.b2	Wait band of the 2nd soak	dP	oFF... 9999 (E.U.)	oFF
114	Pr.E2	Events of the 2nd group	2	00.00... 11.11 (0 Event OFF, 1 Event ON)	00.00
115	Pr.S3	Set point of the 3rd soak	dP	oFF (program end) or from SPLL to SPHL	0
116	Pr.G3	Gradient of the 3rd ramp	1	0.1... 999.9 (inF = Step transfer) Engineering Unit/minute	inF
117	Pr.t3	Time of the 3rd soak	2	0.00... 99.59	0.10
118	Pr.b3	Wait band of the 3rd soak	dP	oFF... 9999 (E.U.)	oFF
119	Pr.E3	Events of the 3rd group	0	00.00... 11.11 (0 Event OFF, 1 Event ON)	00.00
120	Pr.S4	Set point of the 4th soak	dP	oFF (program end) or from SPLL to SPHL	0
121	Pr.G4	Gradient of the 4th ramp	1	0.1... 999.9 (inF = Step transfer) Engineering Unit/minute	inF
122	Pr.t4	Time of the 4th soak	2	0.00... 99.59	0.10
123	Pr.b4	Wait band of the 4th soak	dP	oFF... 9999 (E.U.)	oFF
124	Pr.E4	Events of the 4th group	0	00.00... 11.11 (0 Event OFF, 1 Event ON)	00.00
125	Pr.St	Program status	0	rES Program reset; run Program start; HoLd Program hold.	rES

PAn group - Operator HMI parameters

no.	Param.	Description	Dec. Point	Values	Default
126	PAS2	Level 2 password (limited access level)	0	oFF (Level 2 not protected by password); 1... 200.	20
127	PAS3	Level 3 password (complete configuration level)	0	3... 200	30
128	uSrb	button function during RUN TIME		nonE No function; Sd.St Run /stop of the SPEED output; SPd.S Sequential speed selection; 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) the second in Auto mode; AAc Alarm reset; ASi Alarm acknowledge; chSP Sequential set point selection; St.by Stand by mode. The first pressure puts the instrument in stand by mode the second in Auto mode; Str.t Timer run/hold/reset; P.run Program run; P.rES Program reset; P.r.H.r Program run/hold/reset.	SPd.S
129	H.diS	Main display management		SPED Current speed (E.U.); Sd.nA Speed name (the name of the speed currently selected Sd.t1, Sd.t2, Sd.t3 or Sd.t4); PV Measured value.	0

no.	Param.	Description	Dec. Point	Values	Default
130	L.diS	Secondary display management		nonE Standard display; SPEd Current speed (E.U.); Sd.nA Speed name (the name of the speed); Pou Power output; SPF Final Set Point; Spo Operative Set Point; AL1 Alarm 1 threshold; AL2 Alarm 2 threshold; AL3 Alarm 3 threshold; Pr.tu During a soak, it shows the elapsed time of the soak; Pr.td During a soak, shows the soak remaining time (count down); P.t.tu When the programmer is running, shows the total elapsed time. At program end, alternately displays P.End and the PV: P.t.td When the programmer is running, the display shows the total remaining time (count down). At program end alternately displays P.End and the PV; ti.uP When the timer is running, the display shows the timer counting up. At count end, alternately displays t.End and the PV; ti.du When the timer is running, shows the timer count down. At count end, alternately displays t.End and the PV; 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).	SPEd
131	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
132	AdE	Deviation for display colour management		1... 999 (E.U.)	10
133	di.St	Display Timeout	2	oFF Display always ON; 0.1... 99.59 (mm.ss).	oFF
134	FiLd	Filter on the displayed value	1	oFF Filter disabled; 0.1... 20.0 (E.U.).	oFF
135	bG.F	Bargraph function (KX7 only)		nonE Bargraph not lit; Po.h Speed in use (in %). Pou Output power calculated by PID (single action: 0... 100%, double action: -100... +100%); Pr.tu Elapsed time of the program in execution; Pr.td Time to end of the program in execution; Pr.tS Time to end of the program segment in execution; ti.uP Elapsed time of timer (T1 and T2); ti.du Time to end of timer (T1 and T2); r.iSP Time to preventive maintenance; PoS Valve position (servomotor only).	nonE
136	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 stand-by mode.	AS.Pr
137	oPr.E	Operative modes enabling		ALL All modes will be selectable by the next parameter; Au.oP Auto and manual (oPLo) mode only will be selectable by the next parameter; Au.Sb Auto and Stand-by modes selectable only by the next parameter	ALL
138	oPEr	Operative mode selection		If oPr.E ALL: - Auto = Auto mode; - oPLo = Manual mode; - St.bY = Stand by mode. If oPr.E Au.oP: - Auto = Auto mode; - oPLo = Manual mode. If oPr.E Au.Sb: - Auto = Auto mode; - St.bY = Stand by mode.	Auto

Ser group - Serial link parameters

no.	Param.	Description	Dec. Point	Values	Default
139	Add	Instrument address		oFF Serial interface not used; 1... 254.	1
140	bAud	baud rate		1200 1200 baud; 2400 2400 baud; 9600 9600 baud; 19.2 19200 baud; 38.4 38400 baud.	9600

COn group - Consumption parameters

no.	Param.	Description	Dec. Point	Values	Default
141	Co.tY	Count type		oFF Not used; 1 Total worked days: number of hours the instrument is turned ON divided by 24; 2 Total worked hours: number of hours that the instrument is turned ON; 3 Total worked days with threshold: number of hours the instrument is turned ON divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job; 4 Total worked hours with threshold: number of hours that the instrument is turned ON, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job; 5 Totalizer of control relay worked days: number of hours the control relay has been in ON condition, divided by 24; 6 Totalizer of control relay worked hours: number of hours the control relay has been in ON condition; 7 Totalizer of control relay worked days with threshold: number of hours the control relay has been in ON condition divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job; 8 Totalizer of control relay worked hours with threshold: number of hours the control relay has been in ON condition, the controller is forced in stand-by when Co.ty value reaches the threshold set in [142] h.Job.	oFF
142	h.Job	Threshold of the working period		oFF Threshold not used; 1... 9999 days (when [141] cotY = 4); 1... 9999 hours (when [141] cotY = 5).	0
143	t.Job	Worked time (not resettable)		1... 9999 days	0

CAL group - User calibration parameters

no.	Param.	Description	Dec. Point	Values	Default
144	AL.P	Adjust Low Point		From -1999 to (AH.P - 10) in engineering units	0
145	AL.o	Adjust Low Offset		-300... +300 (E.U.)	0
146	AH.P	Adjust High Point		From (AL.P + 10) to 9999 engineering units	9999
147	AH.o	Adjust High Offset		-300... +300	0

10 MODE 2 CONFIGURATION PROCEDURE

All the procedures described in ths chapter are relative to the **MODE 2 - SPEED** operative mode.

10.1 Instrument behaviour at Power ON

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

The motor starts with the same speed that was set at power OFF

– The upper display shows the SPEED value;
– The lower display shows the Acronym of the active speed selected;
– The motor LED (#4) is lit.

– The motor does NOT start waiting a start command

– The upper display will show the SPEED value;
– The lower display will show the Acronym of the active speed selected;
– The motor LED (#4) is not lit.

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

10.2 Configuration modes

10.2.1 Entering the configuration modes

The configuration method allows to take advantage of all instrument features.

Note: The instrument will show only the parameters consistent with the specific hardware and in accordance with the value assigned to the previous parameters (e.g.: if you set an output as "not used" the instrument will mask all other parameters related to this output).

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

1. Push the ↵ button for more than 5 seconds. The upper display will show PASS while the lower display will show 0.
2. Using ▲ and ▼ buttons set the programmed password.

Notes: 1. The factory default password for configuration parameters 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 from controlling during the programming procedure (control output will be OFF). A password equal to 2000 + the programmed value (e.g. 2000 + 30 = 2030). The control will restart automatically when the configuration procedure will be manually closed.

3. Push the ↵ button
If the password is correct the display will show the acronym of the first parameter group preceded by the symbol: ⁻ⁱ.
In other words the upper display shows: ⁻ⁱ inP
(group of the **Input parameters**).

The instrument is in configuration mode.

10.2.2 How to exit the "Configuration mode"

Push ↩ button for more than 5 seconds, the instrument will come back to the "Standard display".

10.3 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 will come back to the "Standard display").

↵ When the upper display is showing a group and the lower display is blank, 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 selected value 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:
Push the ↩ button and maintaining the pressure, then push the ↵ button; release both the buttons.

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

10.4 MODE 2 - SPEED - Configuration parameter list

In the following pages we will describe all the parameters of the instrument when it is preset in Mode 1 (FULL). However, the instrument will only show the parameters applicable to its hardware options in accordance with the specific instrument configuration (i.e. setting AL 1t [Alarm 1 type] to nonE [not used], all parameters related to alarm 1 will be skipped).

⁻ⁱ inP Group - Main and auxiliary input configuration

[9] io3.F - I/O3 function selection

Available: Always.

Range: **dG2.c** Digital input 2 for contact closure;
dG2.U Digital input 2 driven by 12... 24 VDC.

Note: Setting [9] io3.F = dG2.C or dG2V, the [20] O3F parameter becomes not visible while [12] diF2 parameter will become visible.

[11] diF1 - Digital input 1 function

Available: Always.

Range: **nonE** No function;
Sd.r.S SPEED/TIME run/stop [status]:
- Contact closed = Run;
- Contact open = Stop;
Sd.r.t SPEED/TIME run/stop [transition];
ch.Sd Sequential SPEED selection [transition];
Sd.1.4 Binary selection of the SPEED made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status].

Note: When [12] diF2 is not available, items Sd.1.4 is not visible.

[12] diF2 - Digital input 2 function

Available: When [9] Io4.F = diG2.

Range: **nonE** No function;
Sd.r.S SPEED/TIME run/stop [status]:
- Contact closed = Run;
- Contact open = Stop;
Sd.r.t SPEED/TIME run/stop [transition];

ch.Sd Sequential SPEED selection [transition];
Sd.1.4 Binary selection of the SPEED made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status];

Notes: **1.** When [10] diF1 = Sd.1.4, [11] diF2 is forced to Sd.1.4 and cannot perform another function.

2. When [10] diF1 = SP.1.4 and [11] diF2 = Sd.1.4, the SP selection will be in accordance with the following table:

Digital Input 1	Digital Input 2	Operative Set Point
Off	Off	Speed 1
On	Off	Speed 2
Off	On	Speed 3
On	On	Speed 4

3. When a "*Sequential speed selection*" is used (diF1 or diF2 = ch.Sd), every closure of the logic input increases the value of A.Sd.t (active speed/ time) of one step. The selection is cyclic: **Sd.t1** -> **Sd.t2** -> **Sd.t3** -> **Sd.t4**.

[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.

SPEd group - Speed control

[47] SPd.P- Behaviour of the speed output at power ON

Available: Always.
Range: AS.Pr Starts with the same speed that was set at power OFF.
OFF.A Starts with speed equal to zero and waits for a start command (from keyboard, logic contact or serial link).

[49] SPd.t - Define the engineering units of the speed/tim

Available: Always.
Range: PErc The display shows a % output;
tinE The display shows a time;
E.U. The display shows an engineering unit value (e.g.: km/h, m/s, l/min).

[50] Sd.dF - Speed decimal figure

Available: When [49] SPd.t is different PErc.
Range: 0... 3.

[51] SPd.r - Speed reference - Set the time or the speed detected at 100% of the output

Available: When [49] SPd.t is different PErc.
Range:
- When [49]Spd.t = Perc. This parameter will be masked.
- When [49]Spd.t = tinE From 00.01 (mm.ss) to 99.59 (mm.ss).
- when [49]Spd.t = E.U. from 0 to 9999 E.U.

Notes: **1.** The difference between a time indication and a speed (speed, flow, other) indication is:
- Time - the value assigned to [51] SPd.r is the minimum time and the values assigned to [53] Sd.t1, [54]Sd.t2, [55]Sd.t3 and [56]Sd.t4 must be HIGHER than [51] SPd.r;
- E.U. - the value assigned to [51] SPd.r is the maximum speed and the [53] Sd.t1, [54]Sd.t2, [55]Sd.t3 and [56]Sd.t4 must be LOWER than [51] SPd.r.

2. This output can be considered as a linear output where the initial scale is ever 0 (engine stopped) while the full scale is the maximum speed (in engineering units) or the minimum time (detected when the engine operate at 100%). The decimal figure allows to the OEM to define the E.U.

3. When the self-calibration is used ([58] Sd.cA parameter) the time measured by the instrument will be memorized in this parameter ([51] SPd.r).

[52] n.SPd - Number of used speed/time

Available: Always
Range: 1 to 4.

[53] Sd.t1 - Speed/time 1

Available: Always
Range:
- When [49]Spd.t = Perc, from 0 to 100%;
- When [49]Spd.t = tinE, 0.01... 99.59 (mm.ss);
- when [49]Spd.t = E.U., 0... 9999 E.U..

[54] Sd.t2 - Speed/time 2

Available: Always
Range:
- When [49]Spd.t = Perc, from 0 to 100%;
- When [49]Spd.t = tinE, 0.01... 99.59 (mm.ss);
- when [49]Spd.t = E.U., 0... 9999 E.U..

[55] Sd.t3 - Speed/time 3

Available: Always
Range:
- When [49]Spd.t = Perc, from 0 to 100%;
- When [49]Spd.t = tinE, 0.01... 99.59 (mm.ss);
- when [49]Spd.t = E.U., 0... 9999 E.U..

[56] Sd.t4 - Speed/time 4

Available: Always
Range:
- When [49]Spd.t = Perc, from 0 to 100%;
- When [49]Spd.t = tinE, 0.01... 99.59 (mm.ss);
- when [49]Spd.t = E.U., 0... 9999 E.U..

[57] A.Sd.t - Active speed/ time

Available: Always
Range:
- Sd.t1;
- Sd.t2;
- Sd.t3;
- Sd.t4.

[58] Sd.cA - Speed calibration - minimum time self-calibration.

Available: When [49] SPd.t is equal to tinE.
Range: YES or no.

How to use the "*Speed calibration*" system.

1. Selet [58] Sd.cA, the lower display shows no;
2. Push the ▲ button, the lower display shows YES (if the conveyor belt is running, it will be stopped and the control loop enters, automatically, in stand-by mode);
3. Put an object (used for reference) at the beginning of the "*hot area*";
4. Push ↵ button; the conveyor belt starts at 50% of the speed and the lower display shows On;
5. When the reference object exits from the "*hot area*", push

again the ↵ button. The lower display shows End and the double of the detected time is stored in [51] SPd.r - Speed reference - parameter;

6. If, during the calibration procedure, should be necessary to abort the speed calibration, push the ⮌ button; the [51] SPd.r - Speed reference - parameter will not be modified and the instrument returns showing SPEd group.

PAn group - Operator HMI

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

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

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

Available: Always.
Range: 3... 200.
Note: Setting [126] PAS2 equal to [127] PAS3, the level 2 will be masked.

[128] uSrb - ⮌ button function during RUN TIME

Available: Always.
Range: nonE No function;
Sd.St Run /stop of the SPEED output;
SPd.S Sequential speed selection (see notes).
Notes: 1. When "*Sequential speed selection*" is used, each pressure of the ⮌ button longer than 1 s increases of one step the value of A.Sd.t (active speed). The selection is cyclic:
Sd.t1 -> **Sd.t2** -> **Sd.t3** -> **Sd.t4.**
When a new speed/time is selected using the ⮌ key, the display shows for 2 s the acronym of the selection made (e.g.: Sd.t3).
2. When the "*Sequential speed selection*" is used, the number of Speeds selectable is limited by [52] n.SPd.

[129] H.diS - Main Display Management

Available: Always.
Range: SPED Current speed (E.U.);
Sd.nA Speed name (the name of the speed currently selected (Sd.t1, Sd.t2, Sd.t3 or Sd.t4).

[130] L.diS - Secondary Display Management

Available: Always.
Range: nonE Standard display;
SPED current speed (E.U.);
Sd.nA Speed name (the name of the speed).

[131] di.CL - Display colour

Available: Always.
Range: 1 Display red (fix);
2 Display green (fix);
3 Display orange (fix).

[133] 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.

[135] bG.F - Bargraph function (KX7 only)

Available: Always.
Range: nonE Bargraph not lit;
Po.h Speed in use (in %).

Ser group - Serial link parameter

[139] Add - Instrument address

Available: Always.
Range: oFF Serial interface not used;
1... 254.

[140] bAud - Baud rate

Available: When [139] Add different from oFF.
Range: 1200 1200 baud;
2400 2400 baud;
9600 9600 baud;
19.2 19200 baud;
38.4 38400 baud.

COn Group - Consumption parameters

[141] Co.tY - Count type

Available: Always.
Range: oFF Not used;
1 Total worked days: Number of hours the instrument is turned ON divided by 24.
2 Total worked hours: Number of hours that the instrument is turned ON.
Note: Selections 1 and 2 represent an internal count: these modes calculate the instrument work in hours or days. When the count reaches the threshold set with parameter [142] h.Job the display shows "r. iSP" (Inspection Requested). The count reset (with r.iSP cancellation) can be done only by changing the threshold value - parameter [142] h.Job.

[142] h.Job - Threshold of the working period

Available: When [140] Co.tY = tot.d or [140] Co.tY = tot.H.
Range: oFF Threshold not used;
1... 9999 days when [141] Co.tY = 1;
1... 9999 hours when [141] Co.tY = 2.

[143] t.Job - Worked time (not resettable)

Available: Always.
Range: 1... 9999 days.

11 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 [126] PAS2 parameter.

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

Notes: 1. The "*Limited access*" parameter 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 specified parameters can be displayed and modified. This set must be create according to your requirements.

11.1 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: You want the following limited access list:

- Sd.t1 - First speed
- Sd.t2 - Second speed
- A.SPd - Speed selection
- SPd.P - Speed at Power ON

But you also need that the operator can manage the speed selection only. In this case the promotion will be the following:

Parameter	Promotion	Limited Access	Operator
- Sd.t1 -	A 2	Sd.t1	
- Sd.t2 -	A 3	Sd.t2	
- A.SPd -	o 4	A.SPd	A.SPd
- SPd.P -	A 5	SPd.P	

Now, proceed as follows:

1. Push the ↵ button for more than 3 seconds;

2. The upper display will show PASS while the lower display shows 0;

3. By ▲ and ▼ buttons set a password equal to -81;

4. Push ↵ button.
The instrument will show the acronym of the first configuration parameter group ConF;

5. By ↵ button select the group of the first parameter of your list;

6. By ↵ button select the first parameter of your list;

7. The upper display will show the acronym of the parameter while the lower display will show his current promotion level. The promotion level is defined by a letter followed by a number.
The letter can be:
c: It shows that this parameter is **NOT** promoted and it is present only in configuration.
In this case the number is forced to zero.
A: It shows that this parameter has been promoted to the limited access level.
The number will show the position in the limited access list.
o: It shows that the parameter has been promoted to the Operator level.
The number will show the position in the limited access list.

8. 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.

9. In order to modify the level from limited access to operator and vice versa, push ↩ button and, maintaining the pressure, push ▲ button.
The letter will change from A to o and vice versa.

10. Select the second parameter that you want to add to the assistance level and repeat step 6, 7 and 8.

11. Repeat steps 5, 6, 7, 8 until the list has been completed.

12. 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 parameter, the instrument will use only the last programmed parameter.

12 OPERATIVE MODES

As we said at paragraph xx.1, when the instrument is powered ON, it starts immediately working in accordance to the stored parameters value.

In other words, the instrument has one status only, the "run time" status.

12.1 Modify a parameter in "Operator level"

While the instrument is showing the "Standard display":

1. Press the ↵ button.

2. The upper display will show the acronym of the first parameter promoted to this level while the lower display will show its value.

3. By ▲ and ▼ buttons assign to this parameter the desired value.

4. Press the ↵ button in order to store the new value and go to the next parameter.

5. When you want to come back 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 button is pressed for more than 10 seconds, the instrument goes back to the "Standard display" and the new value of the last selected parameter will be lost.

12.2 Enter the "Limited access level"

While the instrument is showing the "Standard display":

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 ▼ buttons set the value assigned to [118] PAS2 (Level 2 password).

Notes:
1. The factory default password for configuration parameters is equal to 20.
2. All parameter modification are protected by a time out. If no button is pressed for more than 10 second the instrument comes automatically back to the Standard display, the new value of the last selected parameter is lost and the parameter modification procedure is closed.

   When you desire 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 modification 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 controller from controlling during the programming procedure (its control output will be Off). A password equal to 2000 + the programmed value (e.g. 2000 + 20 = 2020) will switch the control out off during configuration. The control will restart automatically when the para-meter modification procedure will be manually ended.
4. Push ↵ button.
5. The instrument will show on the upper display the acronym of the first parameter promoted to this level and on the lower display its value.
6. By ▲ and ▼ buttons assign to this parameter the desired value.
7. Press the ↵ button in order to memorize the new value and go to the next parameter.
8. When you want to come back to the “Standard display” push the ↩ button for more than 5 s.

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

Sometime 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 parameter present in level 2 but it will not be possible to modify it;
7. It is possible to come back to the “Standard display” by pushing the ↩ button for more than 3 seconds or by pushing no buttons for more than 10 seconds.

12.3.1 Keyboard function

↩ Performs the action programmed by [128] uSrb (↩ button function during RUN TIME) parameter.
↵ Enters the parameter modification procedures.
▲ Not active in Mode 2 SPEED operation.
▼ Not active in Mode 2 SPEED operation.

12.3.2 Display management

This instrument allows to program (see parameter [125] diS.t) the time out of the display.

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

When [125] diS.t is different to OFF (display ever ON) 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.

13 ERROR MESSAGES

13.1 List of possible errors

Message	Error
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

Mode 2 SPEED parameters list

inP GROUP - Main and auxiliary input configuration

no.	Param.	Description	Dec. Point	Values	Default
9	IO3.F	I/O 3 function		dG2c Digital input 2 driven by contact; dG2U Digital input 2 driven by 12... 24 VDC.	out3
10	rEcS	Enable Recipes (control + speed coupling)		No Control and speed are independent; Yes Control and speed are related.	
11	diF1	Digital Input 1 function		nonE Not used; Sd.r.S SPEED/TIME run/stop [stauts]; Sd.r.t SPEED/TIME run/stop [transition]; ch.Sd Sequential SPEED selection [transition]; Sd.1.4 Speed binary 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

SPEd group - Speed control

no.	Param.	Description	Dec. Point	Values	Default
47	SPd.P	Start speed at Power ON		AS.Pr Same speed was set at power OFF; OFF.A Starts with speed 0 waiting a start command.	
48	SPd.b	Band to enable speed control		1... 9999 E.U.	
49	SPd.t	Engineering Units of the Speed/Time variable		PErc Shown as an output %; tinE Shown as a time; E.U. Shown in engineering units (km/h, m/s, l/min).	
50	Sd.dF	Speed decimal figure		0... 3	
51	SPd.r	Speed reference		Parameter masked if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
52	n.SPd	Number of used speed/time		1... 4	
53	Sd.t1	Speed/time 1		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
54	Sd.t2	Speed/time 2		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
55	Sd.t3	Speed/time 3		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
56	Sd.t4	Speed/time 4		0... 100% if [49] Spd.t = Perc; 00.01...99.59 (mm.ss) if [49] Spd.t = tinE; 0... 9999 E.U. if [49] Spd.t = E.U..	
57	A.Sd.t	Active speed/time		Sd.t1; Sd.t2; Sd.t3; Sd.t4.	
58	Sd.cA	Speed calibration (if [49] SPd.t is equal to tinE)		YES/no	

PAn group - Operator HMI parameters

no.	Param.	Description	Dec. Point	Values	Default
126	PAS2	Level 2 password (limited access level)	0	oFF (Level 2 not protected by password); 1... 200.	20
127	PAS3	Level 3 password (complete configuration level)	0	3... 200	30
128	uSrb	button function during RUN TIME		nonE No function; Sd.St Run /stop of the SPEED output; SPd.S Sequential speed selection.	SPd.S
129	H.diS	Main display management		SPEd Current speed (E.U.); Sd.nA Speed name (the name of the speed currently selected Sd.t1, Sd.t2, Sd.t3 or Sd.t4).	SPEd
130	L.diS	Secondary display management		nonE Standard display; SPEd Current speed (E.U.); Sd.nA Speed name (the name of the speed).	Sd.nA
131	di.cL	Display colour		1 Display red (fix); 2 Display green (fix); 3 Display orange (fix).	0
133	di.St	Display Timeout	2	oFF Display always ON; 0.1... 99.59 (mm.ss).	oFF
135	bG.F	Bargraph function (KX7 only)		nonE Bargraph not lit; Po.h Speed in use (in %).	Po.h

Ser group - Serial link parameters

no.	Param.	Description	Dec. Point	Values	Default
139	Add	Instrument address		oFF Serial interface not used; 1... 254.	1
140	bAud	baud rate		1200 1200 baud; 2400 2400 baud; 9600 9600 baud; 19.2 19200 baud; 38.4 38400 baud.	9600

COn group - Consumption parameters

no.	Param.	Description	Dec. Point	Values	Default
141	Co.tY	Count type		oFF Not used; 1 Total worked days: number of hours the instrument is turned ON divided by 24; 2 Total worked hours: number of hours that the instrument is turned ON.	oFF
142	h.Job	Threshold of the working period		oFF Threshold not used; 1... 9999 days (when [141] cotY = 1); 1... 9999 hours (when [141] cotY = 2).	0
143	t.Job	Worked time (not resettable)		1... 9999 days	

14 GENERAL NOTES

14.1 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.

14.2 Warranty

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.

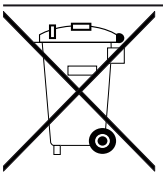
14.3 Maintenance

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.

14.4 Disposal



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

15 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.