REGULATION FRANCE

WINE CONTROLLER

Engineering Manual

24/02 - Code: ISTR_M_K-1Eseries_E_03_--

1 MOUNTING REQUIREMENTS

This instrument is intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, exposed terminals and wiring on the back.
Select a mounting location having the following characteristics:

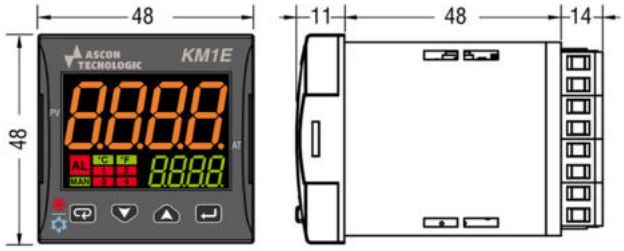
1. It should be easily accessible;
2. There is minimum vibrations and no impact;
3. There are no corrosive gases;
4. There are no water or other fluids (i.e. condensation);
5. The ambient temperature is in accordance with the operative temperature (0... 50°C);
6. The relative humidity is in accordance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

The instrument can be mounted on panel with a maximum thickness of 15 mm.
When the maximum front protection (IP65) is desired, the optional gasket must be mounted.

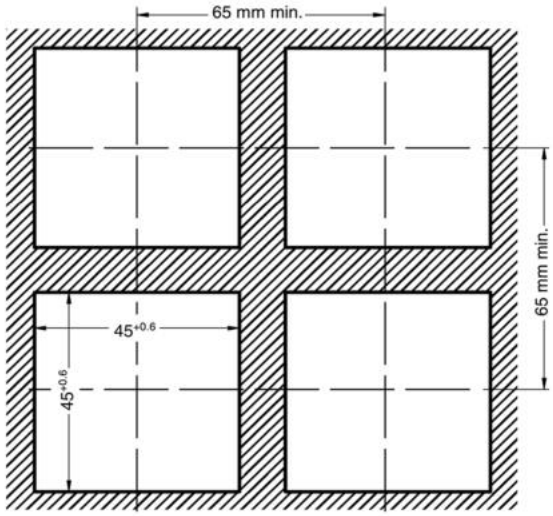
2 OUTLINE DIMENSIONS (mm)

2.1 KM1E

2.1.1 Dimensions

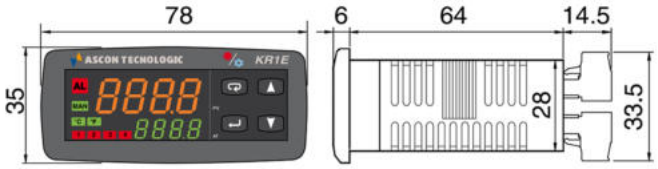


2.1.2 Panel cutout

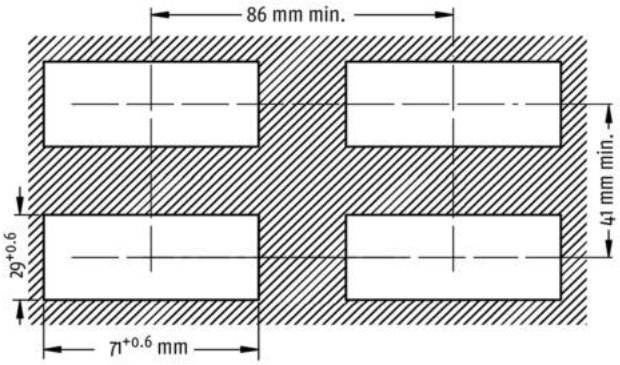


2.2 KR1E

2.2.1 Dimensions



2.2.2 Panel cutout



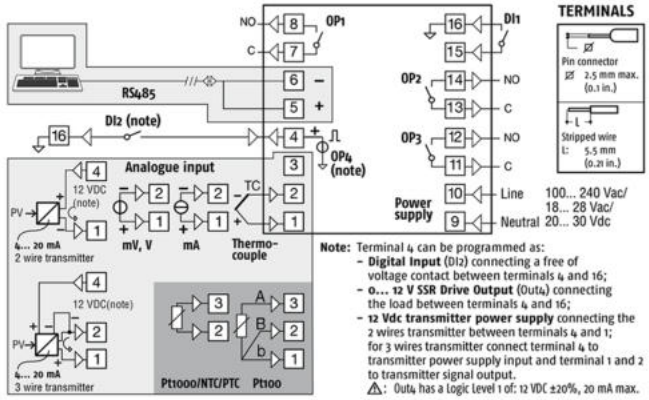
3 ELECTRICAL CONNECTIONS

3.1 General notes about wiring

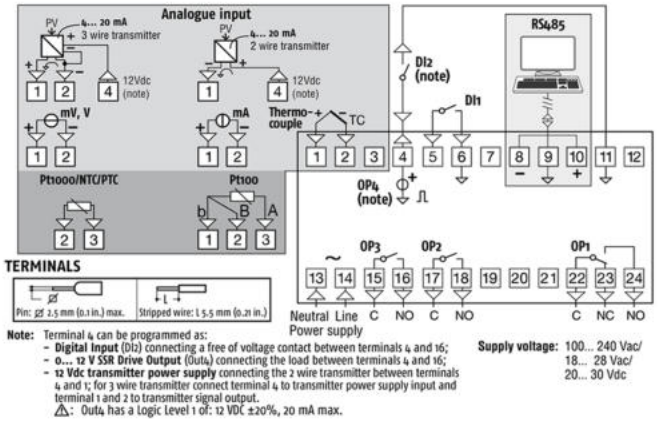
1. Do not run input wires together with power cables.
2. External components (like zener barriers, etc.) connected between sensor and input terminals may cause errors in measurement due to excessive and/or not balanced line resistance or possible leakage currents.
3. When a shielded cable is used, it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

3.2 Electrical wiring diagram

3.2.1 KM1E



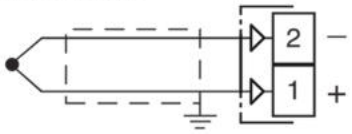
3.2.2 KR1E



3.3 Inputs

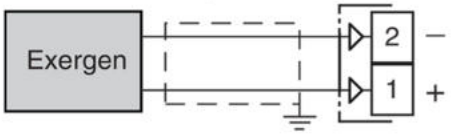
⚠ The connection modes of the various analogue input types are the same for both instruments. Therefore in this paragraph the separation between KM1E and KR1E is not carried out.

3.3.1 Thermocouple Input



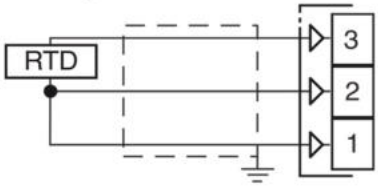
External resistance: 100 Ω max., maximum error 25 µV.
Cold junction: automatic compensation between 0... 50°C.
Cold junction accuracy: 0.05°C/°C after a warm-up of 20 minutes.
Input impedance: > 1 MΩ.
Calibration: According to EN 60584-1.
Note: For TC wiring use proper compensating cable preferable shielded.

3.3.2 Infrared Sensor Input



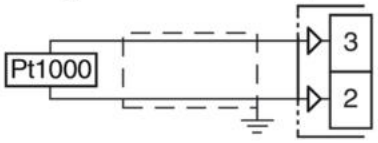
External resistance: not relevant.
Cold junction: automatic compensation between 0... 50°C.
Cold junction accuracy: 0.05°C/°C.
Input impedance: > 1 MΩ.

3.3.3 RTD Pt 100 Input



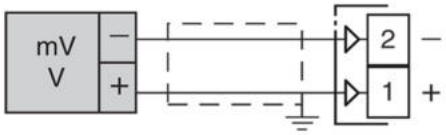
Input circuit: Current injection (150 µA).
Line resistance: Automatic compensation up to 20Ω/wire with maximum error ±0.1% of the input span.
Calibration: According to EN 60751/A2.
Note: The resistance of the 3 wires must be the same.

3.3.4 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.

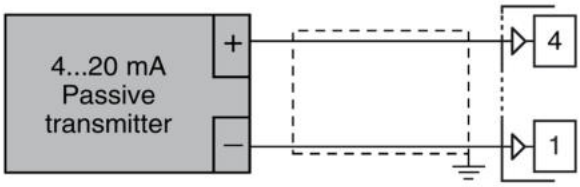
3.3.5 V and mV Input



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

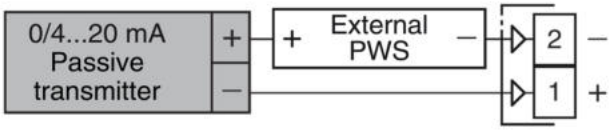
3.3.6 mA Input

0/4... 20 mA input wiring for passive transmitter using the auxiliary pws

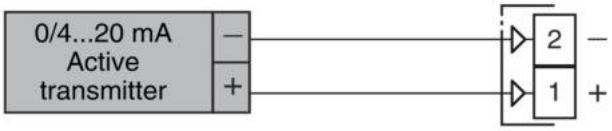


Input impedance: < 53Ω.
Internal auxiliary PWS: 12 VDC (±10%), 20 mA max..

0/4... 20 mA input wiring for passive transmitter using an external pws



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



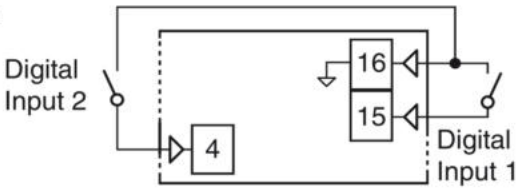
3.3.7 Logic Inputs

Safety notes:

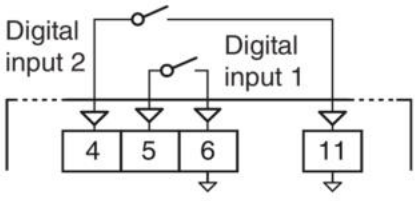
– Do not run logic input wiring together with power cables;
– The instrument needs 150 ms to recognize a contact status variation;
– Logic inputs are **NOT** isolated by the measuring input. A double or reinforced isolation between logic inputs and power line must be assured by the external elements.

Logic input driven by dry contact

KM1E



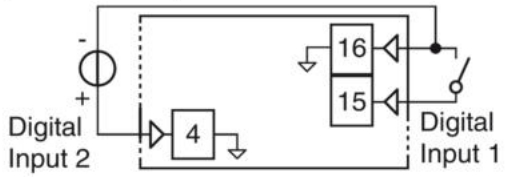
KR1E



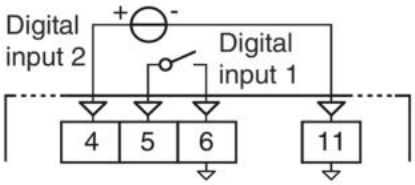
Maximum contact resistance: 100Ω.
Contact rating: DI1 = 10 V, 6 mA;
DI2 = 12 V, 30 mA.

Logic inputs driven by 24 VDC

KM1E



KR1E



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

3.4 Outputs

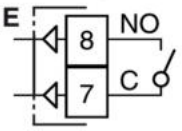
Safety notes:

– 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 output is not isolated. A reinforced isolation must be assured by the external solid state relays.
– For SSR output if the line length is longer than 30 m use a shielded wire.

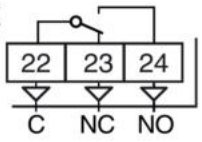
⚠ **Before connecting the output actuators**, we recommend to configure the parameters to suit your application (e.g.: input type, Control strategy, alarms, etc.).

3.4.1 Output 1 (OP1)

KM1E



KR1E

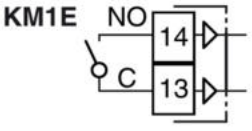


Contact rating: • 4 A /250 V cosφ =1
• 2 A /250 V cosφ =0.4
Operation: 1 x 10^5

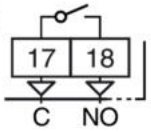
3.4.2 Output 2 (OP2)

Relay Output

KM1E



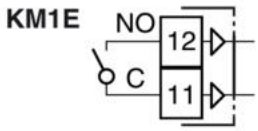
KR1E



Contact rating: • 2 A /250 V cosφ = 1;
• 1 A /250 V cosφ = 0.4.
Operation: 1 x 10^5.

3.4.3 Output 3 (OP3)

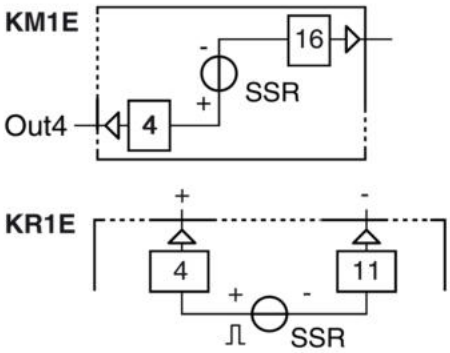
Relay Output



Contact rating: • 2 A /250 V cosφ = 1;
• 1 A /250 V cosφ = 0.4.
Operation: 1 x 10^5.

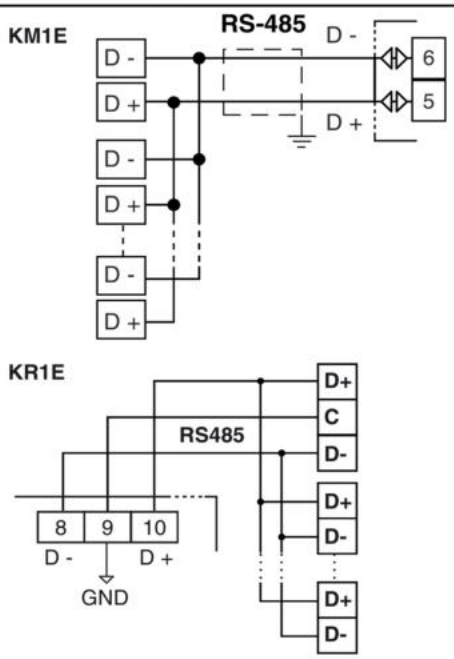
3.4.4 Output 4 (OP4)

SSR Output



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

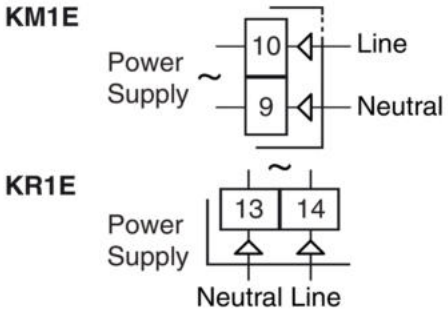
3.5 Serial Interface



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.

3.6 Power Supply



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

Notes:
1. Before connecting the instrument to the power line, make sure that line voltage is equal to the voltage shown on the identification label;
2. The polarity of the power supply has no importance;
3. The power supply input is NOT fuse protected. Please, provide a T type 1A, 250 V fuse externally.
4. When the instrument is powered by the A01 key, the outputs are NOT supplied and the instrument can show the "ouLd" (Out 4 Overload) indication.

4 TECHNICAL CHARACTERISTICS

4.1 Technical specification

Case: Plastic, self-extinguishing degree: V-0 according to UL 94;
Front protection: for indoor locations according to EN 60070-1
KM1E IP65 with the optional gasket installed,
KR1E IP65 with the optional screw type bracket**;**
Terminals protection: IP20 according to EN 60070-1;
Installation: Panel mounting;
Terminal block:
KM1E 16 M3 screw terminals,
KR1E 24 M3 screw terminals, both for 0.25... 2.5 mm² cables (AWG22... AWG14) with connection diagram;
Dimensions:
KM1E48 x 48, depth 75.5 mm, (1.77 x 1.77 x 2.97 in.),
KR1E 78 x 35 depth 69.5 mm (3.07 x 1.37 depth 2.73 in.);
Panel cutout:
KM1E45(+0.6) x 45(+0.6) mm [1.78(+0.023) x 1.78(+0.023) in.],
KR1E 71(+0.6) x 29(+0.6) mm [2.79(+0.023) x 1.14(+0.023) in.];
Weight: 180 g max..
Power supply:• 24 VAC/DC (±10% of nominal value);
• 100... 240 VAC (-15... +10% of nominal value);
P**ower 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;
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.

5 HOW TO ORDER

5.1 KM1E

Model
KM1E -= Controllers optimized for wine cellars management

Power supply
H = 100... 240 VAC
L = 24 VAC/DC

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

Output 1
R = Relay SPST 4 A (resistive load)

Output 2
R = Relay SPST 2 A (resistive load)

Output 3
- = None
R = Relay SPST 2 A (resistive load)

Input/Output 4
D = Digital I/O (see the Connections diagram for details)

Serial Communications
- = 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)

5.2 KR1E

Model
KR1E -= Controllers optimized for wine cellars management

Power supply
H = 100... 240 VAC
L = 24 VAC/DC

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

Output 1
R = Relay SPST 4 A (resistive load)

Output 2
R = Relay SPST 2 A (resistive load)

Output 3
- = None
R = Relay SPST 2 A (resistive load)

Input/Output 4
D = Digital I/O (see the Connections diagram for details)

Serial Communications
- = 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
- = Standard (AT package + "Butterfly" type brackets)
V = AT package + Screw type bracket for IP65

6 CONFIGURATION PROCEDURE

6.1 Introduction

When the instrument is switched ON, it starts immediately working in accordance with the parameters values loaded in memory.
The instrument behaviour and its performance are governed by the value of the stored parameters.
At the first start up the instrument will use a "default" parameter set (factory parameter set); this set is a generic one (e.g. a TC Pt100 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**".

6.2 Instrument description

This instrument is a special version derived from our standard KUBE line and dedicated to the specific needs of wine making and oenology markets with the following features:

– Temperature ON/OFF control with hysteresis, Heating (set point SP) or Cooling (set point SP2);
– Highly readable display whose color indicates if control is in Heating (Red) or Cooling (Green) mode selected, for a safe control.

Suitable for the following control modes:

– One circuit control (Out1 relay for Heating and Cooling – see [1] node = 1 at pages 6 and 14);
– 2 circuits control (Out1 relay for Heating and Out2 relay for Cooling – see [1] node = 2 at pages 6 and 14) with Heating or Cooling manual selection;
– 2 circuits control (Out1 relay for Heating and Out2 relay for Cooling – see [1] node = 3 at pages 6 and 14) with automatic Heating and Cooling action;
– 2 circuits control (Out1 relay for Heating and Out2 relay for Cooling – see [1] node = 4 at pages 6 and 14) with automatic Heating, Cooling and Heat/Cool action.
– Heating or Cooling selection: manually by a dedicated front button, digital input, serial communication or automatically;
– Control run (Auto) or stop (Stand-By) selection: manually by a dedicated front button, digital input or serial communication;
– Low (AL1) and high (AL2) alarms and sensor break detection with relay output Out3;
– Temperature sensor break detection with manual forcing of control output;
– Easy to configure for the installer (wine market preconfigure), easy to use for the operator (dedicated front buttons);
– Controller and/or software configuration backup using the key (**A01**) through the serial port;
– 3 separated menus: operator (free access), limited access (protected), configuration (protected).

With its high standard of adaptability this instrument is able to cover all wine market needs at highest reliability level.

6.3 Instrument behaviour at Power ON

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

Auto mode

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

Standby 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.

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

6.4 Entering the "Configuration modes"

6.4.1 Complete configuration procedure

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 shows 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 shows 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.

6.5 How to exit the "Configuration mode"

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

6.6 Keyboard functions during parameter changing

- A short press allows to exit from the current parameter group and select a new parameter group.
  A long press allows you to close the configuration parameter procedure (the instrument returns to the "*Standard display*").
- When the upper display is showing a group and the lower display is empty, this key allows to enter in the selected group.
  When the upper display is showing a parameter and the lower display is showing its value, this key allows to store the 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.

6.7 Factory reset - default parameters loading procedure

Sometime, 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 first Power ON).

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

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

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

The procedure is complete.

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

6.8 Configuring all the parameters

In the following pages we are going to describe all the instrument's parameters. 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).

Note: In this manual the parameter numbers not described are reserved.

3 inP Group - Main and auxiliary input configuration

[1] nodE - Operative mode selection

Available: Always.

Range:

1 Heat (**SP** on **Out1**) **or** Cool (**SP2** on **Out1**),
2 Heat (**SP** on **Out1**) **or** Cool (**SP2** on **Out2**),
3 Heat (**SP** on **Out1**) **and** Cool (**SP2** on **Out2**),
4 Heat (**SP** on **Out1**) **or** Cool (**SP2** on **Out2**) **or** Heat (**SP** on **Out1**) **and** Cool (**SP2** on **Out2**),
5 Heat (**SP** on **Out1**) **or** Cool (**SP** on **Out1**),
6 Heat (**SP** on **Out1**) **or** Cool (**SP** on **Out2**),
7 Heat (**SP** on **Out1**) **and** Cool (**SP** on **Out2**),
8 Heat (**SP** on **Out1**) **or** Cool (**SP** on **Out2**) **or** Heat (**SP** on **Out1**) **and** Cool (**SP** on **Out2**).

[2] SEnS - Input type

Available: Always.

Range:

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

Pt1	RTD Pt 100	(-200... +850°C/-328... +1562°F);
Pt10	RTD Pt 1000	(-200... +500°C/-328... +932°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;	
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	(-46... +785°C/-50... 1445°F);
ir.cA	Exergen IRS K	(-46... +785°C/-50... 1445°F).

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

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;	
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	(-46... +785°C/-50... 1445°F);
ir.cA	Exergen IRS K	(-46... +785°C/-50... 1445°F).

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. All changes to SEnS parameter setting forces the [3] dP = 0 and changes all parameters related with dP (e.g. set points, proportional band, etc.).

[3] dP - Decimal point position

Available: Always.
Range: When [2] SenS is set as a linear input: 0... 3;
When [2] SenS is different from a linear input: 0 or 1.
Note: All changes to dP parameter setting causes a change to all parameters related with it. **e.g.:**
Set Points, Proportional band, etc..

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

Available: When a linear input is selected by [2] SenS.
Range: -1999... 9999.
Notes: **1.** SSc allows the scaling of the analogue input to set the minimum displayed/measured value. 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 than the full scale read-out in order to obtain a reverse read-out scaling. **e.g.:**
0 mA = 0 mBar and 20 mA = -1000 mBar (vacuum).

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

Available: When a linear input is selected by [2] SenS.
Range: -1999... 9999
Notes: **1.** FSc allows the scaling of the analogue input to set the maximum displayed/measured value. The instrument is able to display the measured value until it reaches a value of 5% higher than 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 and 20 mA = -1000 mBar (vacuum).

[6] unit - Engineering unit

Available: When a temperature sensor is selected by [2] SenS parameter.
Range: **°c** Centigrade;
°F Fahrenheit.

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

[7] FiL - Digital filter on the measured value

Available: Always.
Range: oFF (No filter);
0.1... 20.0 s.
Note: This is a first order digital filter applied on the measured value. For this reason it will affect the measured value but also the control action and the alarms behaviour.

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

Available: Always.
Range: on Out4 is forced to ON (used as a transmitter power supply);
out4 Used as digital output 4;
dG2.c Digital input 2 for contact closure;
dG2.U Digital input 2 driven by 12... 24 VDC.
Notes: **1.** Setting [8] io4.F = dG2.C or dG2.U, the [19] O4F parameter becomes not visible while [10] diF2 parameter becomes visible.
2. Setting [8] io4F = on the [19] O4F parameter and the [10] diF2 parameter become NOT visible.
3. Setting [8] io4F different than dG2.C or dG2.U, the instrument forces [10] diF2 parameter to nonE. If [9] diF1 was equal to (SP4 or UPDN) it will be forced to nonE too.
4. Changing [8] io4F = on to [8] io4F = Out4 makes the [19] O4F parameter visible and equal to nonE.

[9] 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 Standby mode of the instrument [transient]. A first contact closure force the instrument in Standby mode while a second closure reactivate the Auto mode;
St.b2 Standby mode of the instrument [status]. When the contact is closed the instrument operates in Standby mode. When the contact is open the instruemnt operate in Auto mode;
HC.tr Control action and set point selection [transient]. Every contact closure revert the control action from Heat (SP) to Cool (SP2) and viceversa;
HC.St Control action and set point selection [status]. When the contact is closed the control action is Cool with SP2 while when the contact is open the control action is Heat and it uses SP.
Notes: **1.** When [1] nodE = 3 or 7, HC.tr and HC.St are masked.
2. When [1] nodE = 1 or 2 and [9] diF1 = HC.St, the button manages the Standby only.
3. When [1] nodE = 1 or 2 and [9] diF1 = HC.St, the control action changes coming from serial link are ignored.

[10] diF2 - Digital input 2 function

Available: When [8] Io4.F = diG2.
Range: nonE No function;
AAc Alarm Reset [status];
ASi Alarm acknowledge (ACK) [status];
HoLd Hold of the measured value [status];
St.bY Standby mode of the instrument [transient]. A first contact closure force the instrument in Standby mode while a second closure reactivate the Auto mode;
St.b2 Standby mode of the instrument [status]. When the contact is closed the instrument operates in Standby mode. When the contact is open the instruemnt operate in Auto mode;
HC.tr Control action and set point selection [transient]. Every contact closure revert the control action from Heat (SP) to Cool (Sp2) and viceversa;
HC.St Control action and set point selection [status]. When the contact is closed the control action is Cool with SP2 while when the contact is open the control action is Heat and it uses SP.
Notes: **1.** When [1] nodE = 3 or 7, HC.tr and HC.St are masked.
2. When [1] nodE is equal to 1 or 2 and [9] diF1 is equal to HC.St, the button manages the Standby only.
3. When [1] nodE is equal to 1 or 2 and [9] diF1 is equal to HC.St, control action changes coming from serial link are ignored.

[11] 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

[12] o1.Ac - Out 1 action

Available: Always.
Range: dir Direct action;
rEU Reverse action;
dir.r Direct action with reversed LED indication;
rEU.r Reverse action with reversed LED indication.
Notes: **1.** Direct action: the output repeats the status of the driven element. **e.g.:** *The output is an alarm output with direct action. When the alarm changes to ON the relay will be energized (logic output 1).*
2. Reverse action: the output status is the opposite of the driven element status. **e.g.:** *The output is an alarm output with reverse action. When the alarm changes to 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.

[13] o2F - Out2 function

Available: When [1] nodE = 1 or 5.
Range: nonE Output not used. With this setting the status of **Out2** can be driven directly from serial link.
AL Alarm output;
or.bo Out-of-range or burn out indicator;
P.FAL Power failure indicator;
bo.PF Out-of-range, Burnout and Power failure indicator;
St.By Standby status indicator;
on Out2 always ON;
riSP Inspection request.

[14] o2.AL - Alarms linked up with Out2

Available: When [1] nodE = 1 or 5 and [13] o2F = AL.
Range: 0... 15 with the following rule:
+1 Alarm 1;
+2 Alarm 2;
+4 Sensor break (burn out);
+8 Overload on Out4 (short circuit on the Out4).

[15] o2Ac - Out 2 action

Available: Always.
Range: dir Direct action;
rEU Reverse action;
dir.r Direct action with reverse LED indication;
rEU.r Reverse action with reverse LED indication.

[16] o3F - Out3 function

Available: When the instrument has Out3 option.
Range: nonE Output not used. With this setting the status of this output can be driven directly from serial link.
AL Alarm output;
or.bo Out-of-range or burnout indicator;
P.FAL Power failure indicator;
bo.PF Out-of-range, Burnout and Power failure indicator;
St.By Standby status indicator;
on Out3 always ON;
riSP Inspection request.

[17] o3.AL - Alarms linked up with Out3

Available: When [16] o3F = AL.
Range: 0... 15 with the following rule:
+1 Alarm 1;
+2 Alarm 2;
+4 Sensor break (burn out);
+8 Overload on Out4 (short circuit on the Out4).

[18] o3Ac - Out 3 action

Available: When [16] o3F ≠ nonE.
Range: dir Direct action;
rEU Reverse action;
dir.r Direct action with reverse LED indication;
rEU.r Reverse action with reverse LED indication.

[19] o4F - Out 4 function

Available: When the [8] io4.F = Out4.
Range: nonE Output not used. With this setting the status of the this output can be driven directly from serial link.
AL Alarm output;
or.bo Out-of-range or burn out indicator;
P.FAL Power failure indicator;
bo.PF Out-of-range, Burnout and Power failure indicator;
St.By Standby status indicator.

[20] o4.AL - Alarms linked up with Out4

Available: When [25] o4F = AL.
Range: 0... 15 with the following rule.
+1 Alarm 1;
+2 Alarm 2;
+4 Sensor break (burn out);
+8 Overload on Out4 (short circuit on Out4).
This option only shows ouLd on the display.

[21] o4Ac - Out 4 action

Available: When [8] Io4.F = Out4 and [19] o4F ≠ nonE.
Range: dir Direct action;
rEU Reverse action;
dir.r Direct action with reverse LED indication;
rEU.r Reverse action with reverse LED indication.

AL1 Group - Alarm 1 parameters

[22] AL1t - Alarm 1 type

Available: Always.

Range: 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 sensor break alarm (SEbr) will be ON when the display shows ---- indication.

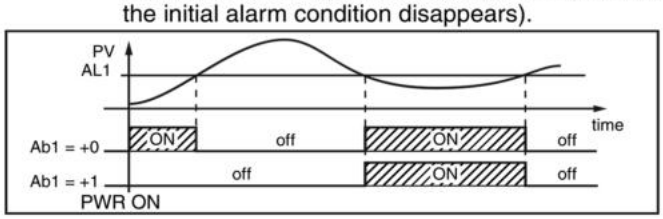
[23] Ab1 - Alarm 1 function

Available: When [28] AL1t is different from nonE.

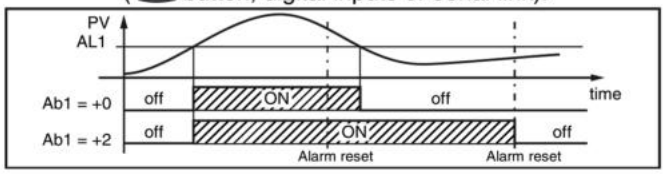
Range: 0... 8 with the following rule:
+1 Not active at power up;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;

Example: Setting Ab1 equal to 5 (1 + 4) alarm 1 will be "Not active at power up" and "Acknowledgeable".

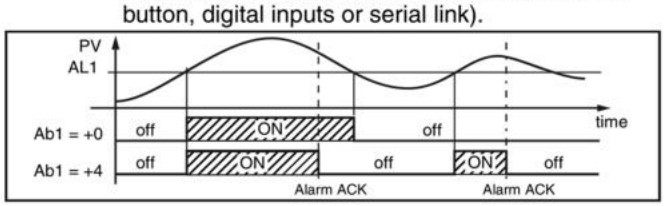
Notes: **1.** The "**Not active at power up**" selection allows to inhibit the alarm function at instrument power up or when the instrument detects a transfer from Stand-by mode to Auto mode.
The alarm will be automatically enabled when the measured value reaches, for the first time, the alarm threshold ±hysteresis (in other words, when the initial alarm condition disappears).



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



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



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

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

Available: When [22] AL1t is different from nonE

Range: From -1999 to [25] AL1H engineering units.

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

Available: When [22] AL1t is different from nonE.

Range: From [24] AL1L to 9999 engineering units.

[26] AL1- Alarm 1 threshold

Available: When:
[22] AL1t = LoAb - Absolute low alarm;
[22] AL1t = HiAb - Absolute high alarm;

Range: From [24] AL1L to [25] AL1H engineering units.

[27] HAL1 - Alarm 1 hysteresis

Available: When [22] AL1t is different from nonE.

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 generate the alarm and then turn the instrument ON again.
– All band alarms use the same hysteresis value for both thresholds;
– 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).

[28] AL1d - Alarm 1 delay

Available: When [22] AL1t is different from nonE.

Range: 0 oFF;
1... 9999 seconds.

Note: The alarm goes ON only when the alarm condition persists for a time longer than [34] AL1d time but the reset is immediate.

[29] AL1o - Alarm 1 enabling during Stand-by mode and Out of range indications

Available: When [22] AL1t is different from nonE.

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

AL2 Group - Alarm 2 parameters

[30] 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.

[31] Ab2 - Alarm 2 function

Available: When [30] AL2t is different from nonE.
Range: 0... 7 with the following rule:
- **+1** Not active at power up;
- **+2** Latched alarm (manual reset);
- **+4** Acknowledgeable alarm;

Example: Setting Ad2 equal to 5 (1 + 4) the alarm 2 will be "Not active at power up" and "Acknowledgeable".
Note: For other details see [23] Ab1 parameter.

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

Available: When [30] AL2t is different from nonE.
Range: -1999 to [33] AL2H engineering units.

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

Available: When [30] AL2t is different from nonE.
Range: From [32] AL2L to 9999 engineering units.

[34] AL2 - Alarm 2 threshold

Available: When:
[30] AL2t is different from nonE.
Range: From [32] AL2L to [33] AL2H engineering units.

[35] HAL2 - Alarm 2 hysteresis

Available: When [30] AL2t is different to nonE
Range: 1... 9999 engineering units.
Note: For other details see [27] HAL1 parameter.

[36] AL2d - Alarm 2 delay

Available: When [30] 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 [36] AL2d time but the reset is immediate.

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

Available: When [30] AL2t different from nonE.
Range:
- **0** Never;
- **1** During Standby;
- **2** During overrange and underrange;
- **3** During overrange, underrange and stand-by.

rEG group - Control parameters

[38] HSt.H - Hysteresis of the Heating action

Available: Always.
Range: 1... 9999 Engineering units.

[39] HSt.C - Hysteresis of the Cooling action

Available: Always.
Range: 1... 9999 Engineering units.

[40] od - Delay at Power up

Available: Always
Range: oFF Function not used;
0.01... 99.59 hh.mm.
Note: This parameter defines the time during which (after a Power up) the instrument remains in Standby mode prior to start all the other functions (control, alarms, etc.).

SP Group - Set point parameters

[41] SPLL - Minimum set point value

Available: Always.
Range: From -1999 to [42] SPHL engineering units.
Note: Changing the [41] SPLL value, the instrument checks all local set points (SP and SP2 parameters). If a SP is out of this range, the instrument forces it to the maximum acceptable value.

[42] SPHL - Maximum set point value

Available: Always.
Range: From [41] SPLL to 9999 engineering units.
Note: For other details see [41] SPLL parameter.

[43] SP - Set Point 1

Available: Always.
Range: From [41] SPLL to [42] SPHL engineering units.

[44] SP 2 - Set Point 2

Available: When [1] nodE = 1, 2, 3 or 4.
Range: From [41] SPLL to [42] SPHL engineering units.

[45] SP.u - Rate of rise for positive set point change (ramp up)

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

[46] SP.d - Rate of rise for negative set point change (ramp down)

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

PAn group - Operator HMI

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

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

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

Available: Always.
Range: 3... 200.
Note: Setting [47] PAS2 equal to [48] PAS3, the level 2 will be masked.

[49] uSrb - button function during RUN TIME

Available: Always.
Range: nonE No function;
AAc Alarm reset;
ASi Alarm acknowledge;
chSP Sequential set point selection (note);
St.by Standby mode. The first pression puts the instrument in standby mode while a second one puts the instrument in Auto mode;
1H.2C Heat with SP or Cool with SP2 without Standby;
HC.Sb Heat or Cool or Standby.
Note: 1H.2C and HC.Sb are visible only when [1] nodE is equal to **1**, **2**, **4**, **5**, **6**, **8**.

[50] diSP - Secondary Display Management

Available: Always.
Range: nonE "*Standard display*";
Pou Power output;
SP Set point 1;
SP2 Set point 2;
SPo Operative set point (**note**)
AL1 Alarm 1 threshold;
AL2 Alarm 2 threshold;
Note: When [1] nonE = 3 (H and C action) the lower display works as follows:
- When the heating action is ON, the lower display shows the SP.
- When the Cooling action is ON, the lower display shows the SP2.
- When no action is active, the lower display is empty.

[51] 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.

[52] FiLd - Filter on the displayed value

Available: Always.
Range: 0.0 Filter disabled (OFF);
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.).

[53] dSPu - Status of the instrument at power up

Available: Always.
Range: AS.Pr Starts in the same way it was prior to the power down;
Auto Starts in Auto mode;
St.bY Starts in stand-by mode.

[54] oPEr - Operative mode selection

Available: Always.
Range: Auto Auto mode;
St.bY Standby mode.

Ser group - Serial link parameter

[55] Add - Instrument address

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

[56] bAud - Baud rate

Available: When [55] 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

[57] 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 [57] 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 [57] 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 [57] 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 [57] h.Job.

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

Available: Always
Range: oFF Threshold not used;
1... 9999 days
1... 9999 hours.

[59] 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.

[60] 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.

[61] AL.o - Adjust Low Offset

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

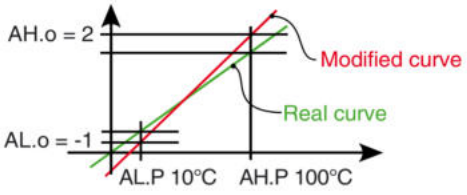
[62] AH.P - Adjust High Point

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.

[62] 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 [60] AL.P = 10 (low working point) and [61] 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 [62] AH.P = 100 (low working point) and [63] 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 [47] 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 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 user requirements.

7.1 Parameter promotion procedure

The "*limited access*" parameter set is a list, so that, before to start the 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:

- SP - First set point;
- SP2 - Second set point;
- AL1 - Alarm 1 threshold;
- AL2 - Alarm 2 threshold.

But it is needed that the operator can change only the set point and alarm 1 values. In this case the promotion list will be:

Parameter	Promotion	Limited Access	Operator
- SP -	o 2	SP	SP
- SP2 -	A 3	SP2	
- AL1 -	o 5	AL1	AL1
- AL2 -	A 6	AL2	

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: Shows that this parameter is **NOT** promoted and it is present only in configuration. In this case the number is forced to zero.
- A: Shows that this parameter has been promoted to the limited access level. The number will show the position in the limited access list.
- o: Shows that the parameter has been promoted to the Operator level. The number shown indicates 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 changes 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 the promotion procedure, push ⟲ button and maintain the pressure for more than 10 s. The instrument returns to the "*Standard display*".

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

8 OPERATIVE MODES

This is a special version of the instrument and it is specifically designed for Wine market.

As we said at paragraph 6.1, when the instrument is powered ON starts immediately to work according to the stored parameters values.

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

During "run time" we can force the instrument to operate in two different modes: Automatic mode or Standby mode:

- In **Automatic mode** the instrument drives automatically the control output according to the parameters values set and the set point/measured value.
- In **Standby** mode the instrument operates as an indicator. It shows on the upper display the measured value and on the lower display the set point alternately to the "StbY" message and forces the control outputs to zero.

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

8.1 The Wine version speciality - How to quickly change the control mode and the control action selected

During wine making, different phases can require different control actions. As an example, a cooling action is frequently required during fermentation but, in other phases, a heating action can be necessary to obtain specific organoleptic characteristics.

For this reason the instrument allows the user or the operator to quickly select the desired control action.

The instrument can be programed (by [1] nodE parameter) in order to operate in 8 different modes.

8.1.1 Opearting Modes

Mode 1

The control action can be quickly switched from Heat (using SP) to Cool (using SP2) and vice-versa but the control output is always Out1.

The colour of the upper display shows the control action actually selected:

- **Green** for **Cool** using SP2 on Out1;
- **Red** for **Heat** using SP on Out1.

Mode 2

The control action can be quickly switched from Heat (using SP) to Cool (using SP2) and vice-versa but outputs are fixed (Heating output is Out1 while Cooling output is Out2).

The colour of the upper display shows the control action actually selected:

- **Green** for **Cool** using SP2 on Out2;
- **Red** for **Heat** using SP on Out1.

Mode 3

The instrument performs Heat (using SP) and Cool (using SP2) actions at the same time; the outputs are fixed (Heating output is Out1 while Cooling output is Out2).

The colour of the upper display shows the control action actually active while the lower one shows the set point in use:

- When the Heat output (Out1) is ON the upper display is **Red** and the lower display shows the SP value.
- When the Cool output (Out2) is ON, the upper display is **Green** and the lower display shows the SP2 value.
- When there is NO action the upper display is **Amber** and the lower display is empty.

Mode 4

This mode allows to select the control mode between Heat, Cool or Heat and Cool. The selection is circular (H → C → H/C); the set points and outputs are fixed (Heating uses SP and output Out1 while Cooling SP2 and Out2).

The colour of the upper display shows the control action actually selected:

- **Green** for Cool action using SP2 on Out2;
- **Red** for Heat action using SP on Out1;
- **Amber** for Heat/Cool (Heat with SP on Out1 and Cool with SP2 on Out2).

Mode 5

Similar to **Mode 1**, but both the actions use SP (and its hysteresis) and Out1 only. The control action can be quickly switched from Heat to Cool and vice-versa but using SP and Out1 only.

The colour of the upper display shows the control action actually selected:

- **Green** for **Cool** using SP on Out1;
- **Red** for **Heat** using SP on Out1.

Mode 6

Similar to **Mode 2**, but both the actions use SP (and its hysteresis) only. The control action can be quickly switched from Heat to Cool (both using SP) and vice-versa but outputs are fixed (Heating output is Out1 while Cooling output is Out2).

The colour of the upper display shows the control action actually selected:

- **Green** for **Cool** using SP on Out2;

– **Red** for **Heat** using SP on Out1.

Mode 7

Similar to **Mode 3**, but both the actions use SP (and its hysteresis) only. The instrument performs Heat and Cool actions at the same time. Outputs are fixed: the Heating output is Out 1 while the Cooling output is Out 2 using SP set point only.

The colour of the upper display shows the control action actually selected:

– When the **Heat** output (Out1) is ON the upper display is **Red** and the lower display shows the SP value;
– When the **Cool** output (Out2) is ON, the upper display is **Green** and the lower display shows the SP value;
– When no action is ON the upper display is **Amber** and the lower display is empty.

Mode 8

Similar to **Mode 4**, but both the actions use SP (and its hysteresis) only. This mode allows to select the control mode between Heat, Cool or Heat and Cool. The selection is circular (H → C → H/C → H → ...).

The colour of the upper displays changes in accordance with the control action selected:

– **Green** for Cool action using SP on Out2;
– **Red** for Heat action using SP on Out1;
– **Amber** for Heat/Cool (Heat with SP on Out1 and Cool with SP on Out2).

8.1.2 How to change the control action

When parameter [1] nodE = **1**, **2**, **4**, **5**, **6** or **8**, and [49] uSrb = 1H.2C or HC.Sb to change the selected control action, proceed as follows:

1. Press and maintain pressed the button for more than 5 s but less than 10 s;
2. The upper display blinks once.
3. Release the button;
4. The control action changes and the colour of the upper display changes accordingly.

8.1.3 How to stop/restart the control action

For all the operative modes, when the [49] uSrb = HC.Sb to **stop** or **restart** the control action:

1. Press the button for more 10 seconds;
2. The display blinks once and the lower display shows StbY message (confirms that the control action is stopped). During stand-by mode the lower display alternately shows the StbY message and the value selected by [50] diSP parameter;
3. Release the button.
4. To return in **Auto** mode, press for more than 10 s;
5. The display blinks once then the lower display shows rEG message (confirms that the control action is restarted). During AUTO mode the lower display shows only the value selected by [50] d iSP parameter.

8.2 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 return to the "*Standard display*" push the button for more than 5 seconds.

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

8.3 Entering 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 [118] PAS2 (Level 2 password).

Notes:

1. The factory default password for configuration parameters is equal to 20.
2. All parameter changes are protected by a time out. If no button is pressed for more than 10 s the instrument automatically returns to the "*Standard display*", the new value of the last selected parameter is lost and the change parameter procedure is closed.
   To work with no time out (e.g. for the first instrument configuration) use a password equal to 1000 plus the programmed password (e.g. 1000 + 20 [default] = 1020).
   It is always possible to manuallyend the parameter configuration procedure (see below).
3. During the parameter setting procedure the instrument continues to perform the control.
   In certain conditions (e.g. when a parameter change can produce a heavy bump to the process) it is advisable to temporarily stop the controller from controlling during the programming procedure (the control output will be OFF). A password equal to 2000 + the programmed value (e.g. 2000 + 20 = 2020) switches OFF the control output during configuration. The control restarts automatically when the parameter setting 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 one its value.
6. Using the / buttons assign to this parameter the desired value.
7. Press the button in order to store the new value and go to the next parameter.
8. When you want to return to the "*Standard display*" push the button for more than 5 s.

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

Sometimes it is necessary to give to the operator the possibility to see the value assigned to the parameter promoted in the Limited Access level but it is important that all changes are made by authorized personnel only.
In this cases, proceed as follows:

1. Press the ↵ button for more than 5 seconds;
2. The upper display will show PASS while the lower display shows 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 level 2 and lower shows its value;
6. Using ↵ button it is possible to see the value assigned to all parameters present in level 2 but it will not be possible to modify it;
7. It is possible to return to the "*Standard display*" pressing the ↩ button for more than 3 seconds or by pressing no buttons for more than 10 seconds.

8.5 Automatic mode

8.5.1 Keyboard functions when the instrument is in Auto mode

↩ Performs the action programmed by [121] 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).

8.5.2 Direct set point modification

This function allows to quickly modify the set point value selected by [83] A.SP (selection of the active Set point).
While the instrument is showing the "*Standard display*":

1. Push the ▼ or the ▲ button for more than 2 s.
   The upper display shows the acronym of the selected set point (e.g. SP2) and the lower display shows its value.
2. By ▲ and ▼ buttons, assign to the active set point the desired value.
3. To exit, press NO buttons for more than 5 second or press 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.

8.5.3 Additional information

This instrument is able to show you some additional information that can help in managing the system.
The additional information are related to how the instrument is programmed, hence in many cases, only part of this information is available.

1. While the instrument is showing the "*Standard display*" push ▲ button for less than 2 seconds.
   The lower display shows H or c followed by a number, this value is the output power applied to the process.
   H means that the controller is performing an Heating action,
   c means that the controller is performing a Cooling action.
2. Push ▲ button again. When the wattmeter function is running the lower display shows U followed by the measured energy.

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

3. 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.
4. Push ▲ button again. The instrument returns to the "*Standard display*".

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

8.5.4 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 [125] diS.t is different from OFF (display always ON) and no buttons are pressed for a time longer than the [125] diS.t value, 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.

8.6 Standby mode

This operative mode also deactivates the automatic control and forces the control output to zero.
In this mode the instrument operates as an indicator.
When the instrument is in Standby mode the upper display shows the measured value while the lower one alternately shows the set point and the message "StbY".

Notes:

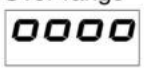
1. During Standby mode, the relative alarms are disabled while the absolute alarms are operative or not according to the ALxo (Alarm x enabling during Stand-by mode) parameter setting.
2. Switching to Standby mode during self-tune execution causes the the self-tune function abort.
3. During Standby mode, all functions not related with the control (wattmeter, independent timer, "worked time", etc) continue to operate normally.
4. When the instrument is swapped from Standby to auto mode, the instrument starts 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

Also the sensor break is pointed out 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 paragraph 4).
3. If no errors are detected, send the instrument to your supplier to be checked.

Note: When an out or range is detected, the instrument enable 3 special password used to force the control output as follows:

- In mode 1 or 2, when a Heat action is selected, setting a password equal to 10 forces the Heat output to ON. Setting a password equal to 0, the Heat output goes OFF.
  When a cool action is selected, setting a password equal to -10 will force the cool output to ON. Setting a password equal to 0, the cool output goes OFF.
- in mode 3, a password equal to -10 turns the cool output (out 2) to ON, a password equal to 10 turns heat output (out 1) to ON while a password equal to 0 turns both outputs to OFF.

9.2 List of possible errors

Error	Reason	Action
ErAt	Fast Auto-tune cannot start. The measured value (PV) is too close to the set point (SP)	Push the ↵ button in order to delete the error message
ouLd	Overload on output 4. A short circuit is present on Out 4 while is used as output or transmitter power supply	When the short circuit disappears the output restarts to operate.
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

10 USAGE, MAINTENANCE, DISPOSAL

10.1 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.

⚠ 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.

⚠ 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.

10.2 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.

10.3 Disposal

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

11 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.

12 ACCESSORIES

The instrument has a lateral socket into which a special tool can be inserted. This tool, named A01, allows:

– To store a complete instrument configuration and to use it for other instruments.
– To transfer a complete instrument configuration to a PC or from a PC to an instrument
– To transfer from a PC to an instrument a complete instrument configuration
– To transfer a configuration from an A01 to another one.
– To test serial interface of the instruments and to help the OEM during machine start up.

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

Appendix A

inP GROUP - Main and auxiliary input configuration

no.	Param.	Description	Dec. Point	Values	Default
1	nodE	Operative mode selection	0	**1** Heat (SP) **or** Cool (SP2) using Out1 only; **2** Heat (SP + Out1) **or** Cool (SP2 + Out2); **3** Heat (SP + Out1) **and** Cool (SP2 + Out2); **4** Heat (SP + Out1) **or** Cool (SP2 + Out2) **or** Heat (SP + Out1) **and** Cool (SP2 + Out2) **5** Heat **or** Cool using SP and Out1 only; **6** Heat (Out1) **or** Cool (Out2) using SP only; **7** Heat (Out1) **and** Cool (Out2) using SP only; **8** Heat (Out1) **or** Cool (Out2) **or** Heat (Out1) **and** Cool (Out2) using SP only	1
2	SEnS	Sensor selection (according to the HW)			
		Model D	0	Pt1 RTD Pt 100 (-200... +850°C/-328... +1562°F); Pt10 RTD Pt 1000 (-200... +500°C/-328... +932°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 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); t TC T (-70... +400°C/-94... +752°F); Ir.J Exergen IRS J (-46... +785°C/-50... +1445°F); Ir.cA Exergen IRS K (-46... +785°C/-50... +1445°F).	Pt1
		Model P		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; 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); t TC T (-70... +400°C/-94... +752°F); Ir.J Exergen IRS J (-46... +785°C/-50... 1445°F); Ir.cA Exergen IRS K (-46... +785°C/-50... 1445°F).	Ptc
3	dP	Decimal Point Position (linear inputs)	0	0... 3	0
		Decimal Point Position (temp. inputs)		0/1	
4	SSC	Initial scale read-out for linear inputs	dp	-1999... 9999	0
5	FSc	Full Scale Readout for linear inputs	dp	-1999... 9999	1000
6	un it	Engineering unit		°C/°F	°C
7	F iL	Digital filter on the measured value	1	0 oFF; 0.1... 20.0 s	1.0
8	IO4F	I/O 4 function		on Output used as PWS for TX; out4 Output 4 (digital output 4); dG2c Digital input 2 driven by contact; dG2U Digital input 2 driven by voltage.	out4
9	di F1	Digital Input 1 function		none Not used; AAc Alarm reset; ASi Alarm acknowledge (ACK); HoLd Hold of the measured value; St.by Stand by mode (transition). 1st contact closure = Standby mode, 2nd closure = Auto mode;	oFF
10	di F2	Digital Input 2 function		St.b2 Manual mode (status). Contact closed = Stand by, open = Auto; Hc.tr Control action & set point selection (transition): Each contact closure reverts the control action from Heat (SP1) to Cool (Sp2) and viceversa; HC.St Control action and set point selection (status) Contact closed = Cool (SP2), Contact open = Heat (SP1).	oFF
11	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
12	o1Ac	Out1 action		dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED	dir
13	o2F	Out2 function		nonE Output not used; AL Alarm output; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.By Standby status indicator; on Out2 always ON; riSP Inspection request.	AL
14	o2AL	Alarms linked up with Out2		0... 15 +1 Alarm 1; +2 Alarm 2; +4 Sensor break (burn out); +8 Overload on Out4 (short circuit on Out4).	
15	o2Ac	Out 2 action		dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED	
16	o3F	Out3 function		nonE Output not used; AL Alarm output; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.By Standby status indicator; on Out3 always ON; riSP Inspection request.	
17	o3AL	Alarms linked up with Out3		0... 15 +1 Alarm 1; +2 Alarm 2; +4 Sensor break (burn out); +8 Overload on Out4 (short circuit on Out4).	
18	o3Ac	Out3 action		dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED	
19	o4F	Out 4 function		nonE Output not used; AL Alarm output; or.bo Out-of-range or burn out indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.By Standby status indicator.	
20	o4AL	Alarms linked up with Out4		0... 15 +1 Alarm 1; +2 Alarm 2; +4 Sensor break (burn out); +8 Overload on Out4 (short circuit on Out4).	
21	o4Ac	Out4 action		dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED	

AL1 group - Alarm 1 parameters

no.	Param.	Description	Dec. Point	Values	Default
22	AL 1t	Alarm 1 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Windows alarm in alarm outside the windows; LHAI Windows alarm in alarm inside the windows; SE.br Sensor Break.	HiAb
23	Ab 1	Alarm 1 function	0	0... 7: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm.	0
24	AL 1L	- For High and low alarms, it is the low limit of the AL1 threshold; - For band alarm, it is low alarm threshold	dp	From -1999 to AL1H (E.U.)	-1999
25	AL 1H	- For High and low alarms, it is the high limit of the AL1 threshold; - For band alarm, it is high alarm threshold	dp	From AL1L to 9999 (E.U.)	9999
26	AL 1	AL1 threshold	dp	From AL1L to AL1H (E.U.)	0
27	HAL 1	AL1 hysteresis	dp	1... 9999 (E.U.)	1
28	AL 1d	AL1 delay	0	0 oFF; 1... 9999 (s)	oFF
29	AL 1o	Alarm 1 enabling during Stand-by mode and out of range conditions	0	0 Never; 1 During stand by mode; 2 During overrange and underrange; 3 During overrange, underrange and stand-by.	0

AL2 group - Alarm 2 parameters

no.	Param.	Description	Dec. Point	Values	Default
30	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.	Loab
31	Ab2	Alarm 2 function	0	0... 7: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm.	0
32	AL2L	- For High and low alarms, it is the low limit of the AL2 threshold; - For band alarm, it is low alarm threshold	dp	From -1999 to AL2H (E.U.)	-1999
33	AL2H	- For High and low alarms, it is the high limit of the AL2 threshold; - For band alarm, it is high alarm threshold	dp	From AL2L to 9999 (E.U.)	9999
34	AL2	AL2 threshold	dp	From AL2L to AL2H (E.U.)	0
35	HAL2	AL2 hysteresis	dp	1... 9999 (E.U.)	1
36	AL2d	AL2 delay	0	0 oFF; 1... 9999 (s)	oFF
37	AL2o	Alarm 2 enabling during Stand-by mode and out of range conditions	0	0 Never; 1 During stand by mode; 2 During overrange and underrange; 3 During overrange, underrange and stand-by.	0

rEG group - Control Parameters

no.	Param.	Description	Dec. Point	Values	Default
38	HSEH	Hysteresis of the Heating action		1... 999 (E.U.)	
39	HSEC	Hysteresis of the Cooling action		1... 999 (E.U.)	
40	od	Delay at Power ON		oFF Function not used; 0.01... 99.59 hh.mm.	

SP group - Set point parameters

no.	Param.	Description	Dec. Point	Values	Default
41	SPLL	Minimum set point value	dP	From -1999 to SPHL	-1999
42	SPHL	Maximum set point value	dP	From SPLL to 9999	9999
43	SP	Set point 1	dP	From SPLL to SPLH	0
44	SP 2	Set point 2	dP	From SPLL to SPLH	0
45	SPu	Rate of rise for **POSITIVE** set point change (ramp UP)	2	0.01... 99.99 engineering units per minute inF Ramp disabled (step transfer)	inF
46	SPd	Rate of rise for **NEGATIVE** set point change (ramp DOWN)	2	0.01... 99.99 engineering units per minute inF Ramp disabled (step transfer)	inF

PAn group - Operator HMI parameters

no.	Param.	Description	Dec. Point	Values	Default
47	PAS2	Level 2 password (limited access level)	0	0 oFF (Level 2 not protected by password); 1... 200.	20
48	PAS3	Level 3 password (complete configuration level)	0	3... 200	30
49	uSrb	button function during Run Time		nonE No function; AAc Alarm reset; ASi Alarm acknowledge; chSP Sequential set point selection (note); St.by Standby mode. The first pression puts the instrument in standby mode while a second one puts the instrument in Auto mode; 1H.2C Heat with SP1 or Cool with SP2 without Standby; HC.Sb Heat or Cool or Standby.	
50	diSP	Secondary Display Management		nonE "Standard display"; Pou Power output; SP1 Set point 1; SP2 Set point 2; SPo Operative set point; AL1 Alarm 1 threshold; AL2 Alarm 2 threshold.	0
51	diSt	Display Timeout	2	0 oFF (Display always ON); 0.1... 99.59 (mm.ss).	oFF
52	FiLd	Filter on the displayed value	1	0 oFF (Filter disabled); 0.1... 20.0 (E.U.).	oFF
53	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; St.bY Starts in stand-by mode.	AS.Pr
54	oPEr	Operative mode selection		Auto Auto mode; St.bY Stand by mode	Auto

Ser group - Serial link parameters

no.	Param.	Description	Dec. Point	Values	Default
55	Add	Instrument address		oFF Serial interface not used; 1... 254.	1
56	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
57	Co.tY	Count type		0 oFF (Not used); 1 Total worked days: no. of hours the instrument is turned ON divided by 24; 2 Total worked hours: no. 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 [57] 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 [57] 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 [57] 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 [57] h.Job.	oFF
58	h.Job	Threshold of the working period		0 oFF (Threshold not used); 1... 9999 days; 1... 9999 hours.	0
59	t.Job	Worked time (not resettable)		0... 9999 days	

CAL group - User calibration parameters

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