indicadores

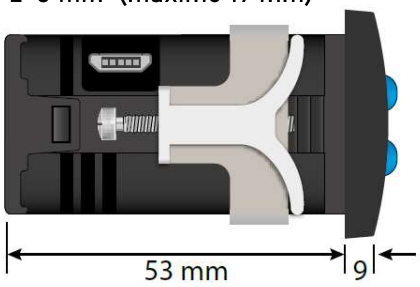
10 IND32-PM MANUAL DE USO

- El indicador IND32-PM de DPF Sensors es un controlador de procesos, cuenta con una pantalla de dígitos blancos grandes y brillantes, con una altura de 14,2 mm.
- Incluye una entrada analógica universal programable (0/10V, 4/20mA, Pt100, termopar) y varias salidas digitales y analógicas.
- Es resistente al polvo y al agua, con un frontal IP67, lo que lo hace adecuado para entornos industriales exigentes.
- Dispone de comunicación por NFC, permite la programación rápida usando un móvil, esta disponible una biblioteca de programaciones.

IND32-P-M, procesos

dimensiones

Espesor del panel recomendado
2-8 mm (máximo 19 mm)



Dispone de multientradas, elegibles por programación

Intensidad	0-4 / 20 mA – impedancia <5Ω (excitación bucle 12 V/20 mA)
Tensión CC	0-1/ 5/ 10/ 100[1] /1000[1] (Zi >110 KΩ) 0-60 mV (Zi >1MΩ)
Potenciómetro	0...1 KΩ / 0...150 KΩ
Temperatura RTD	Pt100 / Pt500 / Pt1000 / Ni100 / Ni200 / PTC 1K / NTC 10K (B3435K, B36945K) / NTC 2252 (B3976K)
Temperatura termopar	J, K, S, R, T, E, N, B (compensación unión fría -25...+85 °C)

Salida por relés con PID y SSR programable

Salida relés	2, configurables como salida comando o alarma (5 amp – 250 Vac. carga resistiva, 1 contacto conmutado, 1 contacto abierto
Salida SSR	Opción programable, 12 Vcc- 25 mA, carga mínima 1 mA

Tiene temporizador interno

La alimentación es universal
24...230 Vca / Vcc
Opción 12 Vcc

CE RoHS IP67 UL c UL us

La programación del controlador se puede realizar por teclado o mediante APP, que permite guardar configuraciones e incluso imprimirlas

para pedidos

IND32-PM	-T
Indicador base, alim 24...230 Vac / Vcc	Alim. 12 Vcc

DPF sensors
www.dpfsensors.com

Introduction

PID Controller IND32-PM relies on programming mode by NFC/RFID technology with dedicated App for Android devices not requiring wirings and power supply, allowing quick set-up/updates on site.
The outputs can be selected as command/multiple alarm modes.
Power supply with extended range 24 to 230V AC/DC with galvanic insulation from the network.

1 Safety guidelines

Read carefully the safety guidelines and programming instructions contained in this manual before connecting/using the device.
Disconnect power supply before proceeding to hardware settings or electrical wirings to avoid risk of electric shock, fire, malfunction.
Do not install/operate the device in environments with flammable/explosive gases.
This device has been designed and conceived for industrial environments and applications that rely on proper safety conditions in accordance with national and international regulations on labour and personal safety. Any application that might lead to serious physical damage/ life risk or involve medical life support devices should be avoided.
Device is not conceived for applications related to nuclear power plants, weapon systems, flight control, mass transportation systems.
Only qualified personnel should be allowed to use device and/or service it and only in accordance to technical data listed in this manual. Do not dismantle/modify/repair any internal component. Device must be installed and can operate only within the allowed environmental conditions. Overheating may lead to risk of fire and can shorten the lifecycle of electronic components.

1.1 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding these safety guidelines and notices can be life-threatening.
Warning!	Disregarding these safety guidelines and notices can result in severe injury or substantial damage to property.
Information!	This information is important for preventing errors.

1.2 Safety Precautions

Danger!	CAUTION - Risk of Fire and Electric Shock. This product is UL listed as open type process control equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
Danger!	If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.
Warning!	Loose screws may occasionally result in fire. For screw terminals tighten screws to tightening torque of 0,5 Nm.
Warning!	A malfunction in the Digital Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Digital Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.

1.3 Precautions for safe use

Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events. Do not handle the Digital Controller in ways that exceed the ratings.

- The product is designed for indoor use only. Do not use or store the product outdoors or in any of the following places.
  - Places directly subject to heat radiated from heating equipment.
  - Places subject to splashing liquid or oil atmosphere.
  - Places subject to direct sunlight.
  - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
  - Places subject to intense temperature change.
  - Places subject to icing and condensation.
  - Places subject to vibration and large shocks.
- Installing two or more controllers in close proximity might lead to increased internal temperature and this might shorten the life cycle of electronic components. It is strongly recommended to install cooling fans or other air-conditioning devices inside the control cabinet.
- Always check the terminal names and polarity and be sure to wire properly. Do not wire the terminals that are not used.
- To avoid inductive noise, keep the controller wiring away from power cables that carry high voltages or large currents. Also, do not wire power lines together with or parallel to Digital Controller wiring. Using shielded cables and using separate conduits or ducts is recommended. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular motors, transformers, solenoids, magnetic coils or other equipment

that have an inductance component). When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the Digital Controller. Allow as much space as possible between the Digital Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.

- A switch or circuit breaker must be provided close to device. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for the controller.
- The device must be protected by a fuse 1A (cl. 9.6.2).
- Wipe off any dirt from the Digital Controller with a soft dry cloth. Never use thinners, benzine, alcohol, or any cleaners that contain these or other organic solvents. Deformation or discoloration may occur.
- The number of non-volatile memory write operations is limited. Therefore, use EEprom write mode when frequently overwriting data, e.g.: through communications.

1.4 Environmental policy / WEEE

Do not dispose electric tools together with household waste material. According to European Directive 2012/19/EU on waste electrical and electronic equipment and its implementation in accordance with national law, electric tools that have reached the end of their life must be collected separately and returned to an environmentally compatible recycling facility.

2 Model identification

The series includes 2 versions: *optional RS485*

Power supply 24..230 VAC/VDC ±15% 50/60 Hz – 5 Watt	
IND32-PM	1 analogue input + 2 relays 5 A + 1 DO
Power supply 12..24 VAC/VDC ±10% 50/60 Hz – 4.5 Watt	
IND32-PM-T	1 analogue input + 2 relays 5 A + 1 DO

3 Technical data

3.1 General features

Displays	3digits 14.2 mm (0.56 pollici)
Operative conditions	Temperature: 0-45° C -Humidity 35..95 uR% Max. altitude: 2000m
Sealing	IP65 front panel (with gasket) IP20 box and terminals
Materials	Box and front panel: PC UL94V2 self-extinguishing
Weight	Approx. 120 g

3.2 Hardware features

Analogue input	**AI1**: Configurable via software. **Input:** Thermocouple type K, S, R, J, T. Automatic compensation of cold junction from -25…85° C. **Thermoresistances:** PT100, PT500, PT1000, Ni100, Ni120, PTC 1K, NTC 10K (β 3435K and β3694K), NTC 2252 (β3976K) **Input V/mA:** 0-10 V, 0-20 o 4-20 mA, 0-60 mV. **Pot. Input:** 1...150 KΩ.	Tolerance (25° C) ± 0.2% ± 1 digit (on F.s.) for thermocouple, thermoresistance and V/mA. Cold junction accuracy 0.1° C/°C. **Impedence:** **0-10 V:** Ri>110 KΩ **0-20 mA:** Ri<5 Ω **0-40 mV:** Ri>1 MΩ
Relay outputs	Configurable as command and alarm output.	Contacts: 5 A - 250 VAC Resistive load.
SSR outputs	Configurable as command and alarm output.	12 V, 25 mA. Min. load 1 mA

IND32-PM		
Power supply	Extended power-supply 24..230 VAC/VDC ±15% 50/60 Hz Overvoltage category: II	Consumption: 5 Watt

IND32-PM-T		
Power supply	Extended power-supply 12..24 VAC/VDC ±10% 50/60 Hz Overvoltage category: II	Consumption: 4.5 Watt

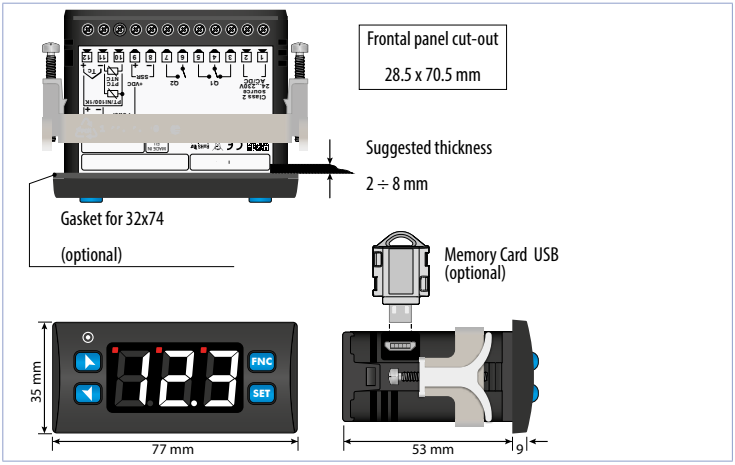
3.3 Software features

Regulation algorithms	ON-OFF with hysteresis. P, PI, PID, PD with proportional time
Proportional band	0..999°C o °F
Integral time	0,0..999 sec (0 exclude)
Derivative time	0,0..999 sec (0 exclude)
Controller functions	Manual or automatic Tuning, selectable alarm, protection of command and alarm setpoints.

3.4 Programming mode

by keyboard	..see paragraph *13*
App	..through download the App on Google Play Store®, see paragraph *11 PROGRAMADOR -NFC-PLUS* When activated by a reader/interrogator supporting NFC-V protocol, controller IND32-PM is to be considered a VICC (Vicinity Inductively Coupled Card) according to ISO/IEC 15693 and it operates at a frequency of 13.56 MHz. The device does not intentionally emit radio waves.

4 Dimensions and installation



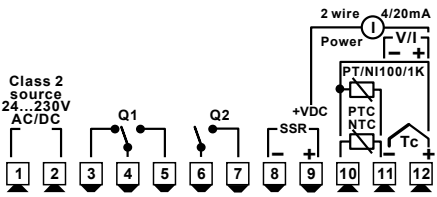
5 Electrical wirings

This controller has been designed and manufactured in conformity to Low Voltage Directive 2006/95/EC, 2014/35/EU (LVD) and EMC Directive 2004/108/EC, 2014/30/EU (EMC). For installation in industrial environments please observe following safety guidelines:

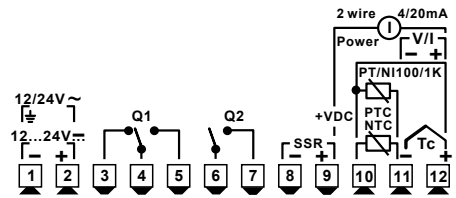
- Separate control line from power wires.
- Avoid proximity of remote control switches, electromagnetic contactors, powerful engines.
- Avoid proximity of power groups, especially those with phase control.
- It is strongly recommended to install adequate mains filter on power supply of the machine where the controller is installed.
  The controller is designed and conceived to be incorporated into other machines, therefore CE marking on the controller does not exempt the manufacturer of machines from safety and conformity requirements applying to the machine itself.
- Wiring IND32-PM, use crimped tube terminals or flexible/rigid copper wire with diameter 0.14 to 1.5 mm² (min. AWG26, max. AWG16). Cable stripping lenght is 7 mm.
- It is possible to connect on a single terminal two wires with same diameter comprised between 0.14 and 0.75mm².

5.1 Wiring diagram

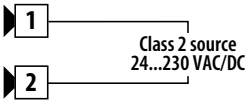
IND32-PM 24...230VAC-DC



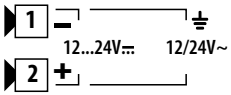
IND32-PM-T 12...24VAC-DC



5.1.a Power supply

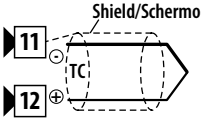


IND32-PM
Switching power supply 24..230 VAC/VDC ±15% 50/60 Hz - 5 Watt.
Galvanic insulation.

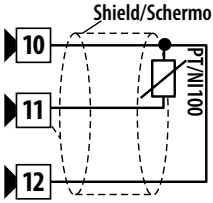


IND32-PM-T
Switching power supply 12..24 VAC/VDC ±10% 50/60 Hz - 4.5 Watt.
Galvanic insulation.

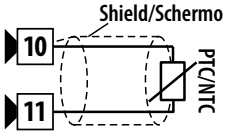
5.1.b Analogue input AI1



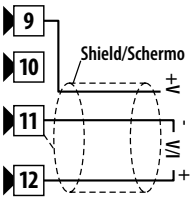
For thermocouples K, S, R, J, T.
- Comply with polarity
- For possible extensions, use compensated cable and terminals suitable for the thermocouples used (compensated).
- When shielded cable is used, it should be grounded at one side only.



For thermoresistances PT100, Ni100.
- For the three-wire connection use wires with the same section.
- For the two-wire connection short-circuit terminals 10 and 12.
- When shielded cable is used, it should be grounded at one side only.

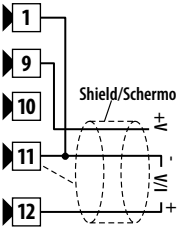


For thermoresistances NTC, PTC, PT500, PT1000 and linear potentiometers.
- When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.



IND32-PM

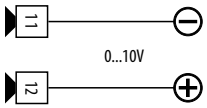
For linear signals in Volt and mA
- Comply with polarity
- When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.



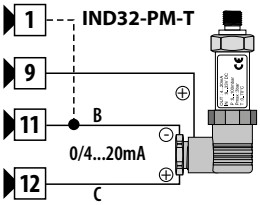
IND32-PM-T

For linear signals in Volt and mA
- Comply with polarity
- When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.
- For 2- and/or 3-wire sensors short-circuit terminals 1 and 11.

5.1.c Examples of connection for linear input



For signals 0..10V
- Comply with polarity

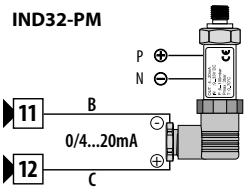


For signals 0/4..20mA with three-wire sensor
- Comply with polarity

C = Sensor output
B = Sensor ground
A = Sensor power supply (12V/25mA)

*** for -12 versions short-circuit terminals 1 and 11**

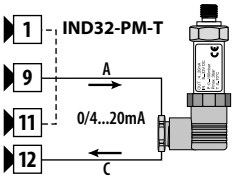
In the picture: pressure sensor.



For signals 0/4..20mA with **external power of sensor**
- Comply with polarity

C = Sensor output
B = Sensor ground

In the picture: pressure sensor. Connect the external power supply to pins P and N.



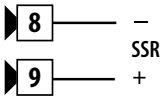
For signals 0/4..20mA with **two-wire sensor**
- Comply with polarity

C = Sensor output
A = Sensor power supply (12V/25mA)

*** for -12 versions short-circuit terminals 1 and 11**

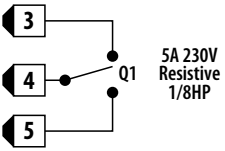
In the picture: pressure sensor.

5.1.d Digital output



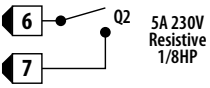
Digital output NPN (including SSR) for command or alarm.
Range 12 VDC/25 mA.

5.1.e Relay output Q1



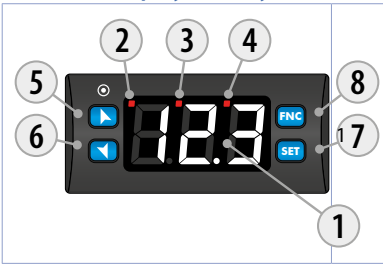
Capacity 5 A / 250 VAC for resistive loads.

5.1.f Relay output Q2



Capacity 5 A / 250 VAC for resistive loads.

6 Display and key functions



Normally displays the process. During the configuration phase, it displays the parameter groups or the parameter being inserted.

6.1 Meaning of status lights (Led)

2	OUT1	ON when command output is active. When it flashes, display shows the command output setpoint (which can be modified by arrow keys).
3	OUT2	ON when alarm output is active. When it flashes, display shows the alarm output setpoint (which can be modified by arrow keys).
4	L1	ON when the controller communicates through serial.

6.2 Keys

5	▲	• Increases the main setpoint. • During configuration allows to scroll the parameters and to modify them togheter with SET • Increase the setpoints (command with OUT1 flashing/alarm with OUT2 flashing)
6	▼	• Decreases the main setpoint. • During configuration allows to scroll the parameters and to modify them togheter with SET • Decrease the setpoints (command with OUT1 flashing/alarm with OUT2 flashing).
7	SET	• If pressed once it allows to visualize the command setpoint. • If pressed twice it allows to visualize the alarm setpoint. • Allows to modify configuration parameters.
8	FNC	• Allows to run the manual Tuning function. • Allows to enter/exit from configuration.

7 Controller Functions

7.1 Modification of main and alarm setpoint value

Setpoint value can be modified from keyboard as follows:

	Press	Display	Do
1	▲ ▼ SET	Display shows the command setpoint and OUT1 flashes.	Increase or decrease the main setpoint value. Afer 4s display shows the process.
2	Press twice SET	Display shows the alarm setpoint and OUT2 flashes.	Increase or decrease the alarm setpoint value. After 4s display shows the process.

8 Tuning

Tuning procedure allows to calculate PID parameters to obtain a optimal regulation. It means a stable control of temperature/process on setpoint without fluctuations and fast response to deviations from setpoint caused by external noises.
Tuning procedure includes calculation and setting of the following parameters:

- Proportional band (system inertia, in °C for temperature).
- Integral time (system inertia expressed in time).
- Derivative time (defines the intensity of the controller reaction to the variation of the measured value, normally ¼ of integral time). During Tuning procedure, it is not possible to change the setpoint.

8.1 Automatic Tune

Automatic tuning procedure allows a precise regulation without detailed knowledge of PID regulation algorithm. Selecting AUto on par. 28 tun, the controller analyzes the proces oscillations and optimizes the PID parameters.
If the PID parameters are not yet selected, at the device switch-on, the manual tunig procedure described in the next paragraph will be launched described into the next paragraph.

8.2 Manual Tune

Manual procedure allows the user greater flexibility to decide when to update PID algorithm pameters. It can be enabled selecting MAn on par. 28 tun
During the manual tuning, the device generates a step to analyze the system inertia to be regulated and, according to the collected data, modifies PID parameters.
Tuning launch:
Press FNC until display shows t.d, and then press SET: display shows t.En.
To avoid an overshoot, the treshold where the controller calculates new PID parameters is determined by this operation: Tune threshold = Setpoint - "*Set Deviation Tune*" (par. 29 S.d.t)
Ex.: if the sepoint is 100 °C and the Par. 29 S.d.t is 20 °C the threshold to calculate PID parameters is (100.0 - 20.0) = 80.0°C.
For a greater precision on PID parameters calculation it is suggested to start the manual tuning procedure when the process is not close to setpoint value.

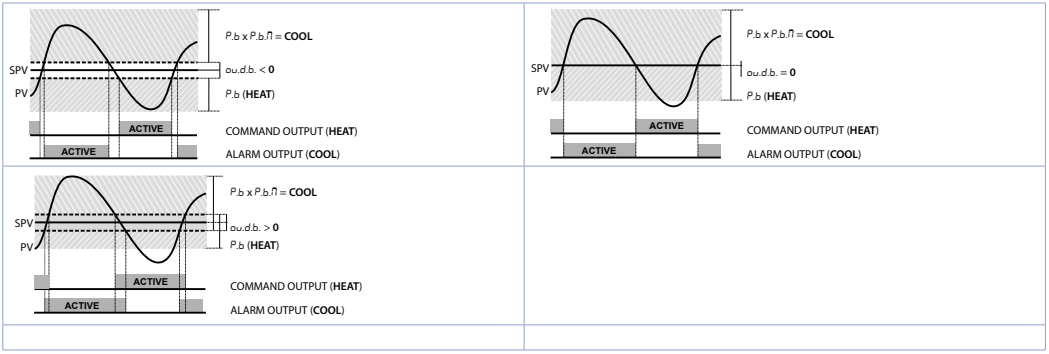
8.3 Tuning performed once

Set onc on parameter 28 tun.
Autotuning procedure is executed only once at next restart.
If the procedure doesn't work, it will be be executed at next restart.

8.4 Dual Action (Heating-Cooling)

IND32-PM is suitable also for systems requiring a combined heating-cooling action. The command output has to be configured as PID for Heating (Par. 17 *Ac.t* = *HEA*. Par. *P.b.* greater than 0), alarms (Par.50 *AL.F* = *coo*).
Command output must be connected to the actuator responsible for heating, while the alarm will control cooling action.
Parameters to be configured for the heating PID are:
Ac.t = *HEA* Command output action type (Heating);
P.b. : Heating proportional band;
i.t. : Integral time of heating and cooling;
d.t. : Derivative time of heating and cooling;
c.t. : Heating time cycle.
Parameters to be configured for the cooling PID are:
AL.F = *coo*. Alarm 1 selection (Cooling);
P.b.M = Proportional band multiplier;
o.d.b : Overlapping / Dead band;
c.c.t: Cooling time cycle.

Par. *P.b.M* (that renges from 1.00 to 5.00) determines the proportional band of cooling action basing on the formula:
Proportional band for cooling action = *P.b.* I x *P.b.M.I.*
This gives a proportional band for cooling which will be the same as heating band if *P.b.M.I* = 1.00, or 5 times greater if *P.b.M.I* = 5.00.
Integral and derivative time are the same for both actions.
Par. *o.d.b* determines the percentage overlapping between the two actions. For systems in which the heating output and cooling output must never be simultaneously active a Dead Band (*o.d.b* ≤ 0), must be configured, vice versa you can configure an overlapping (*o.d.b* > 0).
The following figure shows an example of dual action PID (heating-cooling) with *i.t.* = 0 e *d.t* = 0.
Parameter *c.c.t* has the same meaning of cycle time for heating action *c.t.*



Parameter *co.F* (Cooling Fluid) pre-selects the proportional band multiplier *P.b.M* and the cooling PID cycle time *c.c.t* according to cooling fluid type:

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

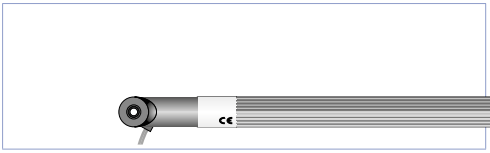
Once parameter *co.F* has been selected, the parameters *P.b.M*, *o.d.b* and *c.c.t* can be however modified.

8.5 LATCH ON function

For use with input *Pot.* and with linear input (0..10 V, 0/4..20 mA), is possible to associate start value of the scale (Par *LL.i*) to the minimum position of the sensor and (par. *uL.i*) to the maximum position of the sensor (par. 11 *LtC* = *Std*).
It is also possible to fix the point in which the controller will display 0 (however keeping the scale range between *LL.i* and *uL.i*) using the "*virtual zero*" option by selecting Par.10= *u.0.5* or *u.0.o*.
Selecting *u.0.o* the virtual zero must be reset at each restart; selecting *u.0.5* the virtual zero will remain fixed once calibrated.
Then refer to the following table for the calibration procedure:

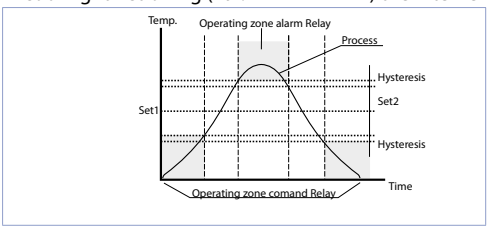
	Press	Display	Do
1	FNC	Exit parameters configuration. Display visualizes writing *LAt*	Place the sensor on minimum operating value (corresponding to *LL.i*)
2	▼	Store value on minimum. Display shows *LoU.*	Place sensor on maximum operating value (corresponding to *uL.i*)

	Press	Display	Do
3	▲	Store value on max. Display shows H.G	To exit standard proceeding press SET. For "*virtual zero*" setting, place the sensor to zero point.
4	FNC	Set virtual zero. Display shows Ero. If "*Virtual zero at start*"is selected, point 4 must be repeated at each starting.	To exit procedure press SET.



9 Dead band function

The dead band function (enabled selecting Par.33 = d.b) creates a band within which the relays are both open or closed.
In **heating functioning**, the intervention threshold of the alarm relay will be SET1 - SET2 while the intervention threshold of the command relay will be SET1 + SET2.
The hyseresis selected on Par.18 = c.HY
A band is created within which the relays are both open and where the alarm relay operates above while the command relay operates under the band limit.
In cooling functioning (Par.17 Ac.t = coo) the intervention thresholds of the two relays are reversed.



When this function is active, standard alarm operation (band, deviation, etc..) is inhibited.

10 Reading and configuration through NFC

IND32-PM is supported by the App: using an ANDROID smartphone with NFC connection it is possible to program the device without using a dedicated equipment*.

*With iOS App, communication between the smartphone and the device is through the RFID Programmer > Bluetooth (2000.35.099), which must be placed on the device's NFC connection point.

This app allows to read and view data already on the device, modify its parameters and setpoints, save and send (via email) complete configurations, reload backups and factory settings.
Procedure:

- Make sure that the NFC sensor of the Android® phone is enabled and that there are no metallic materials between the smartphone and the device (e.g., aluminum covers or magnetic stands);
- Place the NFC antenna of the smartphone / RFID Programmer > Bluetooth at the antenna of the device (located on the front);
- Enable system sounds on your phone, as the notification sound confirms that the device has correctly been detected

The App interface is provided with four tabs: SCAN, DATA, WRITE, EXTRA.
Select the first tab "*SCAN*" to read data stored into the internal memory of the device; place the smartphone in contact with its frontal panel, making sure that the phone's antenna matched with that of the device.
Once detected the device, the App emits a notification sounds and proceeds with the model identification and the reading of the parameters.
The graphic interface shows the advancement and switches to the second tab "*DATA*". It is now possible to move the smartphone away from the controller to make the required modifications more easily.
The device parameters are divided into collapsible groups and are displayed with name, current value and reference index to the manual.
Click on a row to open the setting screen of the related parameter with the detailed view of available options (in case of multiple choice parameters) or of the minimum/maximum/decimals limits (for numeric parameters). Once selected the chosen value, the related row will be updated and underlined into the tab "*DATA*" (hold down the line to undo changes).
To download the new configuration on your device, select the third tab "*WRITE*", place again the smartphone in contact with the device and wait for the operation to complete. The device will show a restart request, necessary to update the configuration with the new written modifications; if it does not restart, the regulator will continue to work with the previous configuration.

In addition to the classic operation of parameters reading->- modification->writing, App is provided with additional functions which can be accessed by the tab "*EXTRA*", as save/upload and email the entire configuration and restore factory values.

10.1 Config. through memory card

The device can be configured through a memory card (not included). This one is linked to the micro-USB port on the upper side of the device.

10.2 Creation / update memory card

In order to save a parameter configuration in the memory card, connect it to micro-USB port and power the instrument. If the memory has never been configured, the device starts normally, but if its data are considered valid, it is possible to view on the display n.no. Press SET in order to start the product without uploading any data from the memory card. Configure, set the parameters and exit configuration. Now, the device saves the configuration just created also in the memory.

10.3 Loading config. from memory card

In order to charge a configuration previously created and saved in the memory card, connect it to the micro-USB port and power the instrument. Now, if the memory is detected and its data are considered valid, it is possible to view on the display n.no. By pressing ▲ you see n.Ld and with SET you confirm the uploading of parameters from the memory card to the controller. If you press directly SET, when viewing n.no, the product starts without uploading any data from the memory card.

11 Loading default values

This procedure allows to restore factory settings of the device.

	Press	Display	Do
1	FNC for 3 sec	Display shows 000 with the 1st digit flashing.	
2	▲ or ▼	Change the flashing digit and move to the next one by pressing SET.	Enter password 999
3	FNC to confirm	The device loads default settings and restarts.	

12 Access configuration

	Press	Display	Do
1	FNC for 3 sec.	Display shows 000 with the 1st digit flashing.	
2	▲ or ▼	Change the flashing digit and move to the next one by pressing SET.	Enter password 123
3	FNC to confirm	Display shows the first parameters	
4	▲ or ▼	Scroll parameters	
5	SET	The display shows the parameter value flashing	
6	▲ or ▼	Increases or decreases visualized value	Introduce new data
7	SET	Confirms and stores the new value.	Repeat steps 4 to 7 for modify another parameter.
8	FNC	End of configuration. the controller exit from configuration.	

12.1 Parameters list functioning

The controller integrates many features that make the configuration parameters list very long. To make it more functional, the parameters list is dynamics and it changes as the user enables / disables the functions. Practically, using a specific function that occupies a given input (or output), the parameters referred to other functions of that resource are hidden to the user making the parameters list more concise.

To simplify the reading/interpretation of the parameters, pressing SET it is possible to visualize a brief description of the selected parameter.

Finally, keeping pressed FNC, it is possible to move from the mnemonic visualization of the parameter to the numeric one, and viceversa.

Ex. The first parameter can be displayed as SEn.(mnemonic visualization) or as P01 (numeric visualization)

13 Table of Configuration Parameters

GROUP A - Analogue input

1 SEn Sensor AI1

Analogue input configuration / sensor AI1 selection

tc.H	Tc-K	-260° C..1360° C. (**Default**)
tc.S	Tc-S	-40° C..1760° C
tc.r	Tc-R	-40° C..1760° C
tc.J	Tc-J	-200° C..1200° C
tc.t	Tc-T	-260° C..400° C
Pt	Pt100	-200° C..600° C
ni1	Ni100	-60° C..180° C
ni2	Ni120	-60° C..240° C
nt1	NTC 10K β3435K	-40° C..125° C
nt2	NTC 10K β3694K	-40° C..150° C
nt3	NTC 2252 β3976K	-40° C..150° C
Ptc	PTC 1K	-50° C..150° C
Pt5	Pt500	-200° C..600° C
Pth	Pt1000	-200° C..600° C
0.10	0..10 V	
0.20	0..20 mA	
4.20	4..20 mA	
Pot	Potentiometer (set the value on Par. 7)	

2 dP Decimal Point

Select number of displayed decimal points for AI1

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

3 dEG Degree

C	Celsius degree (**Default**)
F	Fahrenheit degree
K	Kelvin degree

4 LL.1 Lower Linear Input AI1

AI1 lower limit only for linear signals.
Ex.: with input 4..20 mA this parameter takes value associated to 4 mA. The value may be greater than the one entered on the next parameter.
-199..+999 [digit[1 p. 18]] **Default:** 0.

5 uL.1 Upper Linear Input AI1

AI1 upper limit only for linear signals.
Ex: with input 4..20 mA this parameter takes value associated to 20 mA.The value may be lower than the one entered on the previous parameter.
Upper limit for termination, in case of process transmission in modbus master.
-199..+999 [digit[1 p. 18]] **Default:** 999.

6 Lc.E Lt Error

If AI1 is a 4-20 mA input, it determines the current value below the probe error E-05 is signaled.

20	26	32	38
22	28	34	
24	30 (**Default**)	36	

7 PuA Potentiometer Value AI1

Selects the value of the potentiometer connected on AI1 1..150 kohm. **Default:** 10kohm

8 1oL Linear Input over Limits AI1

If AI1 is a linear input, allows the process to bypass the limits (Par. 4 and 5).

dS	Disabled (**Default**)	En	Enabled

9 oCA Offset Calibration AI1

AI1 Offset calibration. Value added/subtracted to the process value (ex: usually correcting the ambient temperature value).
-199..+999 [digit[1 p. 18]] (degrees.tenths for temp. sensors). **Default** 0.

10 GCA Gain Calibration AI1

Value multiplied to the process value to calibrate the working point.
Ex: to correct the range from 0..1000°C showing 0..1010°C, set the parameter to -1.0
-19.9%..+99.9%, **Default:** 0.0.

11 LtC Latch-On AI1

Automatic setting of limits for AI1 linear input.

dis	Disabled. (**Default**)	Std	Standard
uSt.	Virtual Zero Stored	uon.	Virtual Zero at start

12 cFL Conversion Filter AI1

ADC Filter: Number of sensor readings to calculate mean that defines process value. **NB:** when readings increase, control loop speed slows down. 1..15. (**Default:** 10)

13 cFr. Conversion Frequency AI1

Sampling frequency of digital / analogue converter for AI1. Increasing the conversion speed will slow down reading stability (example: for fast transients, as the pressure, it is advisable to increase sampling frequency)

4.17	4.17 Hz (Min. conversion speed)
6.25	6.25 Hz
8.33	8.33 Hz
10.0	10.0 Hz
12.5	12.5 Hz
16.7	16.7 Hz (**Default**) Ideal for filtering noises 50/60 Hz
19.6	19.6 Hz
33.2	33.2 Hz
39.0	39.0 Hz
50.0	50.0 Hz
62.0	62.0 Hz
123	123 Hz
242	242 Hz
470	470 Hz (Max. speed conversion)

GROUP B - Outputs and regulation Process

16 coU Command Output

Selects the command output related to the process and the outputs related to the alarms.

o.12	Command on relay output Q1. (**Default**)
o.1S	Command on relay output Q1.
SSr	Command on digital output.
o.21	Command on relay output Q2

	Command	AL. 1
o.12	Q1	Q2
o.1S	Q1	DO1
SSr	DO1	Q1
o.21	Q2	Q1

17 Ac.t Action type

Action type to control process.

dis	Disable (unhandled command)
HEA	Heating (N.A.) (**Default**)
coo	Cooling (N.C.)
bAnH	heating dead band
bAnc	cooling dead band

18 cHY Command Hysteresis

Sets the hysteresis value used for process control during ON/OFF functioning
-199..+999 [digit[1 p. 18]] (degrees.tenths for temp. sensors). **Default** 0.2.

19 LLS Lower Limit Setpoint

Lower limit setpoint selectable for command setpoint.
-199..+999 [digit[1 p. 18]] (degrees.tenths for temp.sensors) **Default:** 0.

20 uLS Upper Limit Setpoint

Lower limit setpoint selectable for command setpoint.
-199..+999 [digit[1 p. 18]] (degrees.tenths for temp.sensors) **Default:** 999.

21 c.rE Command Reset

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

AtrE	Automatic Reset (**Default**)
MtrE	Manual Reset (by keyboard or by digital input).
MtrS	Manual Reset Stored (keeps relay status also after an eventual power failure).
Atr.t	Automatic reset with timed activation. The command remains active for the time set on the Par.24 c.dE., even if the conditions generating it are missing. To be able to act again, the conditions for activating the command must disappear.

22 c5E **Command State Error**

State of contact for command output in case of error.

If Par. c.ou=**On(relay) :**

oPn Contact open. (**Default**)

CLS Contact closed.

If Par. c.ou=SSr is digital output (SSR)**:**

oFF Digital output OFF. (**Default**)

on Digital output ON.

23 c.Ld. **Command Led**

Defines led C1 state corresponding to the related output. If the valve command is selected, this parameter is not managed.

o.c. ON with open contact or SSR switched off.

c.c. ON with closed contact or SSR switched on. (**Default**)

24 c.dE **Command Delay**

Command delay (only in ON / OFF functioning).
Negative: delay when turning off output.
Positive: delay when turning on output.
-199..+999 seconds.
Default: 0

25 c5P **Command Setpoint Protection**

Controls access to the command setpoint 1 value

FrE Modification allowed (**Default**)

LcH Protected

Hid Protected and not displayed

GROUP C - Autotuning and PID

28 tun **Tune**

Selects autotuning type for command

dis Disabled. If proportional band and integral time parameters are to set to zero, the regulation is ON/OFF type.. (**Default**)

Aut Automatic P.I.D. parameters calculation

MAn Manual (launch by keyboards or by digital input)

Onc P.I.D. parameters calc. only at first start

29 S.d.t **Setpoint Deviation Tune**

Selects deviation from command setpoint as threshold used by autotuning to calculate P.I.D. parameters.
0..999 [digitp. 18] (degrees for temp.sensors)
Default: 30.

30 P.b **Proportional Band**

Proportional band for process P.I.D. regulation
(Process inertia).
0 = ON/OFF if Par.31 i.t equal to 0 (**Default**)
1..999 [digitp. 18] (degrees for temp. sensors).

31 i.t **Integral Time**

Integral time for process P.I.D. regulation
(Process inertia duration).
0...999 sec. (0 = integral disabled)
Default: 0

32 d.t **Derivative Time**

Derivative time for process P.I.D. regulation
(Normally ¼ of integral time).
0...999 sec. (0 = derivative disabled)
Default: 0

33 d.b **Dead Band**

Dead band of process 1 P.I.D.
0..999 [digitp. 18] (degrees.tenths for temp. sensors), **Default:** 0

34 P.b.c **Proportional Band Centered**

Defines if the proportional band must be centered or not on the setpoint. In double loop functioning (heating/cooling), always disabled.

dis Disabled. Band under (heating) or over (cooling)(**Default**)

En Centered band

35 o.o.S **Off Over Setpoint**

In P.I.D. enables the command output switching off, when a certain threshold is exceeded (setpoint + Par. 36)

d.S Disabled (**Default**)

En Enabled

36 o.d.t **Off Deviation Threshold**

Sets deviation from command setpoint, used to calculate the intervention threshold for "Off Over Setpoint" function.

-199..+999 [digit[1 p. 18]] (degrees.tenths for temp.sensors) **Default**: 0

37 c.t **Cycle Time**

Cycle time for P.I.D. regulation of process 1 (for P.I.D. on remote control switch 15 s; for PID on SSR 2s).

1...300 seconds

Default: 15 sec.

38 co.F **Cooling Fluid**

Type of refrigerant fluid for heating/cooling P.I.D. for process. Enable the cooling output on parameter AL.F

Air Air (**Default**) oil Oil H2O Water

39 P.b.M **Proportional Band Multiplier**

Proportional band multiplier for heating/cooling P.I.D. for process. Proportional band for cooling action is given by parameter P.b multiplied for this value

1.00...5.00, **Default**: 1.00

40 o.d.b **Overlap / Dead Band**

Dead band combination for heating / cooling P.I.D. (double action) for process 1.

Negative: Dead band.

Positive: overlap.

-19.9%...50.0%, **Default**: 0.0%

41 c.c.t **Cooling Cycle Time**

Cycle time for cooling output in heating/cooling P.I.D. mode for process.

1...300 seconds, **Default**: 10 sec.

42 LL.P **Lower Limit Output Percentage**

Selects min. value for command output percentage.

0%...100%, **Default**: 0%.

43 uL.P **Upper Limit Output Percentage**

Selects max. value for command output percentage.

0%...100%, **Default**: 100%.

44 M.G.t **Max Gap Tune**

Sets the max. process-setpoint allowed gap before the automatic tune recalculates PID par. of the process.

0...999 [digit[1 p. 18]] (degrees.tenths for temp. sensors) **Default:** 2.0

45 Mn.P. **Minimum Proportional Band**

Selects the min. proportional band value selectable by the automatic tune for the PID regulation of process.

0...999 [digit[1 p. 18]] (degrees for temp. sensors) **Default:** 2

46 MA.P **Maximum Proportional Band**

Selects the max. proportional band value selectable by the automatic tune for the PID regulation of process.

0...999 [digit[1 p. 18]] (degrees for temp. sensors) **Default:** 100

47 Mn.i **Minimum Integral Time**

Selects the min. integral time value selectable by the automatic tune for the P.I.D. regulation of process.

0...999 seconds

Default: 20 sec.

GROUP D - Alarm

50 AL.F **Alarm Function**

Alarm selection.

d.S Disabled (**Default**)

AuA Absolute Upper Activation. Absolute referred to the process, active over

ALA Absolute Lower Activation. Absolute referred to the process, active under

bAn Band alarm (command setpoint ± alarm setpoint)

A.bA Asymmetric band alarm (command setpoint + alarm setpointH and command setpoint - alarm setpointL).

uP.d Upper Deviation alarm

Lo.d Lower Deviation alarm
Ac.u Absolute Command Upper Activation. Absolute alarm referred to the command setpoint, active over
Ac.L Absolute Command Lower Activation. Absolute alarm referred to the command setpoint, active under
coo Cold actuator auxiliary (Cold action in double loop)
PEr. Probe error. Alarm active in case of sensor rupture.

51 AS.o. Alarm State Output

Alarm output contact and intervention type.
n.o.S Normally open, active at start (**Default**)
n.c.S Normally closed, active at start
n.o.t Norm.open,active on eaching alarm[2 p. 18]
n.c.t Norm.closed,active on reaching alarm[2 p. 18]
n.o.u (N.O. Threshold Variation) disabled after changing control setpoint[3 p. 18]
n.c.u (N.C. Threshold Variation) disabled after changing control setpoint[3 p. 18]

52 A.HY. Alarm Hysteresis

Alarm 1 hysteresis
-199..+999 [digit[1 p. 18]] (degrees.tenths for temp. sensors). **Default** 0.5.

53 AL.L. Alarm Lower Limit

Lower limit selectable for the Alarm setpoint.
-199..+999 [digit[1 p. 18]] (degrees for temp.sensors) **Default:** 0.

54 A.u.L. Alarm Upper Limit

Upper limit selectable for the Alarm setpoint
-199..+999 [digit[1 p. 18]] (degrees for temp.sensors) **Default:** 999.

55 A.rE. Alarm Reset

Alarm contact reset type.
ArE Automatic reset (**Default**)
MrE Manual reset (manual reset by SET key or by digital input)
MrS Stored manual reset (keeps the output status also after a power failure)
Art. Automatic reset with timed activation. The alarm remains active for the time set on the parameter A.dE., even if the conditions generating it are missing. To be able to act again, the alarm conditions must disappear.

56 AS.E. Alarm State Error

Alarm output status in case of error.

If the alarm output is a relay:
oPn Contact or valve open. (**Default**)
CLS Contact or valve closed.

If the alarm output is digital output (SSR):
oFF Digital output OFF. (**Default**)
on Digital output ON.

57 ALd. Alarm Led

Defines the status of the led A in correspondence of the related output
o.c. ON with open contact or DO switched off.
c.c. ON with closed contact or DO switched on. (**Default**)

58 A.dE. Alarm Delay

Alarm Delay.
-199...999 seconds. **Default:** 0.
Negative value: delay when leaving alarm status
Positive value: delay when triggering alarm status.

59 AS.P. Alarm Setpoint Protection

Controls access to the Alarm setpoint
FrE Editable by the user (**Default**)
Lch Protected
Hid Protected and hidden

GROUP E - Display and interface

62 u.FL Visualization Filter

diS Disabled
PtF Pitchfork filter (**Default**)
F.or First Order
F.o.P First Order with Pitchfork
2 M 2 Samples Mean
... ...n Samples Mean
10.M 10 Samples Mean

63 toD Timeout Display

Determines the display timeout

diS	Disabled. Display always ON (**Default**)
15	15 seconds
1M	1 minute
5M	5 minutes
10M	10 minutes
30M	30 minutes
1h	1 hour

64 toS Timeout Selection

Selects which display is switched off when Display Timout expires

ALL	Turn all OFF (display and led)
diSP	Turn OFF only display (**Default**)
n.dP	Turn all OFF (except decimal point)

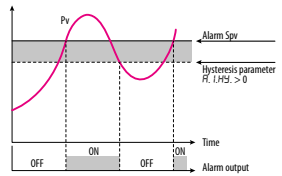
65 nFC NFC Lock

Disables NFC capabilities

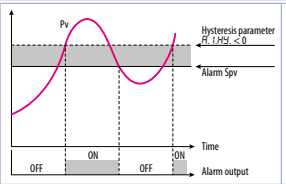
diS	NFC lock Disabled: behaviour, the device can be programmed via NFC using the smartphone app. (**Default**)
En	NFC lock Enabled: NFC protection active, the device will ignore any configuration update written through nfc.

14 Alarm Intervention Modes

14.a Absolute or threshold alarm active over (par.50 ALF = A.uA)

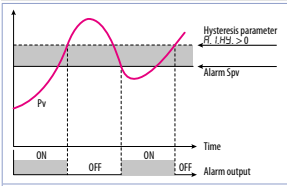


Absolute alarm active over. Hysteresis value greater than "0" (Par. 52 A.HY > 0).

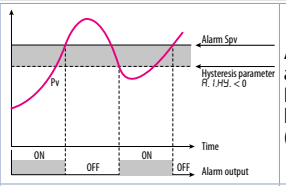


Absolute alarm active over. Hysteresis value lower than "0" (Par. 52 A.HY < 0).

14.b Absolute or threshold alarm active below (par. 50 ALF = AL.A)

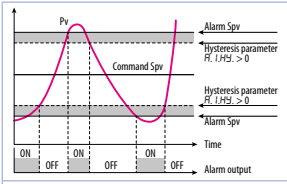


Absolute alarm active below. Hysteresis value greater than "0" (Par.50 A.HY > 0).

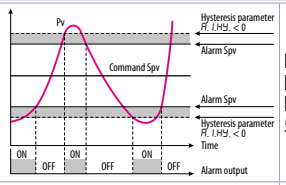


Absolute alarm active below. Hysteresis value lower than "0" (Par. 50 A.HY < 0).

14.c Band alarm (par. 50 ALF = bAn)

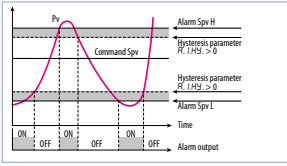


Band alarm hysteresis value greater than "0" (Par. 50 A.HY > 0).

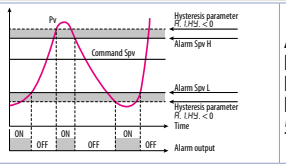


Band alarm hysteresis value lower than "0" (Par. 50 A.HY < 0).

14.d Asymmetric band alarm (par. 50 ALF = A.bA)

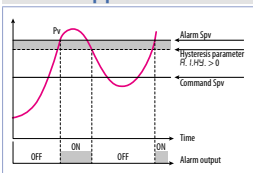


Asymmetric band alarm with hysteresis value greater than "0" (Par. 52 A.HY > 0).

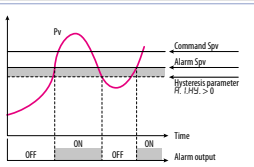


Asymmetric band alarm with hysteresis value lower than "0" (Par. 52 A.HY < 0).

14.e Upper deviation alarm (par. 50 AL.F = uP.d)

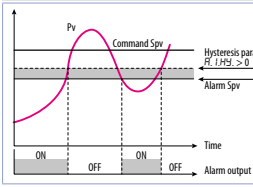


Upper deviation alarm value of alarm setpoint greater than "0" and hysteresis value greater than "0" (Par. 52 AL.HY. > 0). **

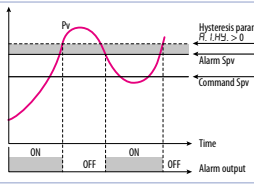


Upper deviation alarm value of alarm setpoint less than "0" and hysteresis value greater than "0" (Par. 52 AL.HY. > 0). **

14.f Lower deviation alarm (par. 50 AL.F = Lo.d)

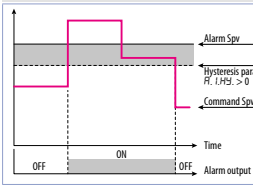


Lower deviation alarm value of alarm setpoint greater than "0" and hysteresis value greater than "0" (Par. 52 AL.HY. > 0). **



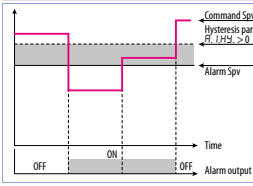
Lower deviation alarm value of alarm setpoint less than "0" and hysteresis value greater than "0" (Par. 52 AL.HY. > 0). **

14.g Absolute or threshold alarm referred to command setpoint active over (par. 50 AL.F = AL.c.u)



Absolute alarm referred to command setpoint active over. Hysteresis value greater than "0" (Par. 52 AL.HY > 0).

14.h Absolute or threshold alarm referred to command setpoint active below (par.50 AL.F=AL.c.L)



Absolute alarm referred to command setpoint active below. Hysteresis value greater than "0" (Par. 52 AL.HY > 0).

** *With hysteresis value less than "0" (AL.HY < 0) the dotted line moves under the alarm setpoint.*

15 Table of anomaly signals

If installation malfunctions, the controller switches off the regulation output and reports the anomaly noticed. For example, controller will report failure of a connected thermocouple visualizing E-05 flashing on display.
For other signals see table below.

	Cause	What to do
E.02	Cold junction temperature sensor failure or environment temperature out of range	Call assistance
E.04	Incorrect configuration data. Possible loss of instrument calibration	Verify that configuration parameters are correct.
E.05	Sensor connected to AI1 broken or temperature out of range	Control connection with probes and their integrity.
E.08	Missing calibration	Call assistance
E.80	RFID tag malfunction	Call assistance

Notes / Updates

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

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

3 Changing the control setpoint, the alarm will be disabled. It will stay disabled as long as the parameters that created it are active. It only works with deviation alarms, band alarms and absolute alarms (referring to the control setpoint)

Table of Configuration Parameters

Antes de usar el dispositivo leer con atención las informaciones
de seguridad y configuración contenidas en este manual.

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