NEX

Thermal protection device for electric units

4 analog input channels, 4 output relays

USER'S MANUAL

ALMA Elettronica S.r.l.

The ALMA Elettronica S.r.l.company can modify the device and this manual without notice

Codice Manuale M0002

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Introduction

Congratulations for your choice to purchase *NEX*, the electronic device for temperature monitoring.
This manual gives you the information you need when you install and configure the *NEX* device.
For a useful usage of this manual, we suggest you to read it standing near to the *NEX* device to directly verify the instructions.

Device Overview

The *NEX* device comes into begin to satisfy the insulated resin transformers or dry type transformers user's requirements.
In details the *NEX* device characteristics are:

- **4 analog input channels** for resistive probes Pt100 to measure 4 temperatures: the temperatures in the three transformer columns and the one in the core (see figure 1).
- **backlighted LCD display 16 characters x 2 lines**, for the visualization of all the 4 measured temperatures. In this way we obtain the whole temperature situation in only one visualization.
- **Membrane keyboard** with 4 keys to program setup parameters.
- **Non volatile data storage**.
- **4 output relays** to perform 3 alarm levels equal for all the inputs, and a general alarm to signal operation anomalies in the device or in the probes. The 3 alarm levels are useful to drive fans, external signalings (as lights or sirens), and the unhook of the electric unit from the electrical line.

The system performs useful reading of the measured temperatures and a very easy definition of the control parameters.
The *NEX* device has been realized compliance with the electromagnetic compatibility requirement.

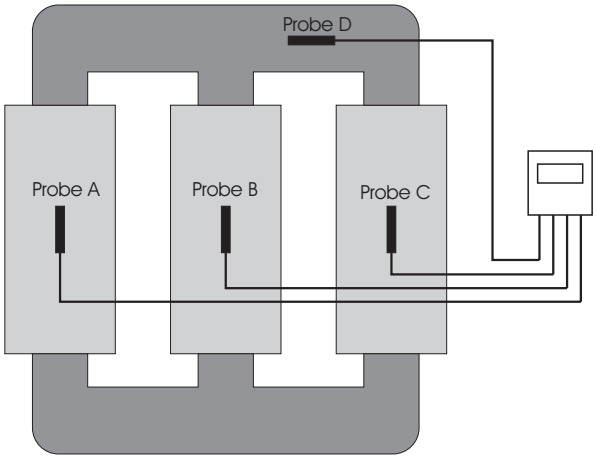


Figure 1

Technical specifications

Power supply

- nominal line voltage and frequency: 24 ÷ 250 Vcc and Vac at 40 ÷ 60 Hz
- maximum line voltage from 20 to 260 Vcc and Vac
- Vcc with reversible polarity
- Maximum power absorption 7 VA
- Protection against electrical and magnetic noises

Inputs

- 4 analog input channels for three wires Pt100 probes compliance with requirement DIN 43760. The operator can de-activate the 4th channel from programming
- connection with removable terminals for wires of 1,5 mm^2 section
- cables length compensation up to 500 m (1 mm^2 section)
- detection for broken or not connected probes
- input channels protected against electromagnetic noises and spikes

Outputs

- 4 output relays with contacts capacity of 5A with 250Vac
  - one relay for the 1st setpoint level (for fan control)
  - one ralay for the 2nd setpoint level (pre-alarm)
  - one relay for the 3rd setpoint level (unhook of the electrical unit)
  - one relay for probe fault or working anomaly signaling (general alarm)
- output connection with removable terminals for wire of 1,5 mm^2 section and capacity of 8A/250 Vac

Device dimensions

- frontal dimension 96 mm x 96 mm compliance with DIN 43700 requirements. Device length of 105 mm with rear terminals
- assembling on the front of the electric panel
- panel cut-out 92 mm x 92 mm
- ABS self-extinguishing container
- Frontal panel in anti-scratch poly-carbonate with keyboard and signal leds

Performances

- Temperature monitoring from 20°C to 200°C
- Temperature measurements accuracy ±0,5% full scale, ±1 digit
- Digital linearity of probe signal compliance with DIN 43760 requirements

- Self-diagnostics
- Operating temperature range from 5°C to 50°C
- Humidity lower then 95% no-condensing
- Compliance with CE requirement
- User data storage for 10 years without power supply
- Device functionality self-diagnostic
- Alarm signal for working anomalies or wrong user data definition

Displaying and data management

- backlighted LCD display 16 characters x 2 lines, for the visualization of all the 4 measured temperatures
- 3 leds indicating alarm levels
- 1 led indicating working anomalies or probe fault
- user data programming by membrane keypad
- automatic exit from programming procedure after 30 seconds of no operation
- 3 temperature levels programming for 3 input channels
- 3 temperature levels programming for the 4^{th} input channel
- hysteresis, alarm memory, delay and impulse data programming
- notification for wrong user data statements
- stated data recall and visualization by the membrane keypad
- maximum measured temperature storage for each input channel
- memory alarm reset by membrane keypad

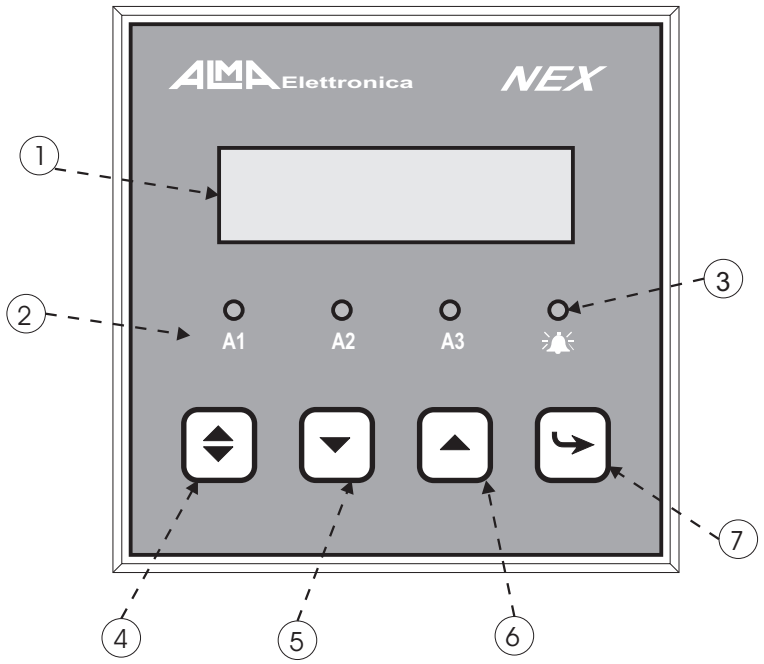
Cautions

- avoid power supply out of the device nominal range
- use shielded cables for the probes
- avoid the device working in room with conditions out of the nominal ones previously reported and in particular in presence of condensing humidity.

Installation Instructions

For a right operation, the *NEX* device has to be installed compliance to the requirements reported in the Technical Specifications paragraph.
The device provides fixing accessories and removable terminals for electrical connections.

Device and accessories description



front view

Figure 2

Figure 2 represents the scheme of the device.

Frontal panel

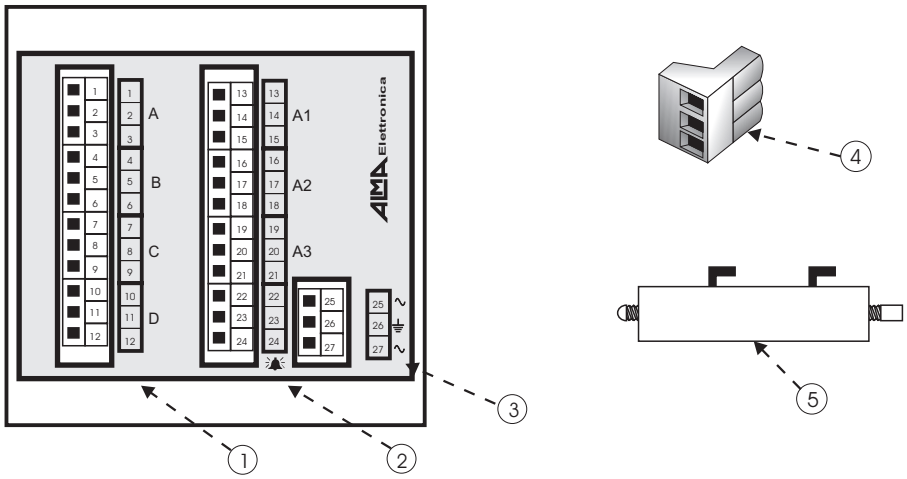
1. Backlighted LCD display 16 characters per 2 lines. It allows the simultaneous visualization of the measured temperatures. It is possible to visualize and modify the alarm sets using the keys.
2. Leds A1, A2, A3 point out the corresponding alarm activation due to the exceeding of the alarm sets by one of the measured temperatures.
3. *General Alarm* led points out anomalies. This led lights up in these cases:
   – *The self-diagnostics program pointed out an anomaly*

– *There is a damaged or not connected probe*
– *The system is in no-active control (data programming modality)*

4. Second function ⬍ key. Pressed with the confirming key (7) it allows to enter the programming modality; in this modality it allows the shift on number to be modified.
5. Decrease ▼ key. Out of the programming modality it allows the navigation in the data visualization pages. In the programming modality it allows to decrease the value of the programming datum.
6. Increase ▲ key. Out of the programming modality it allows the navigation in the data visualization pages. In the programming modality it allows to increase the value of the programming datum.
7. Confirming ↪ key. In the programming modality it confirms the set datum.

Back panel and accessories

1. Connector for probes connection
2. Connector for the relay outputs
3. Power supply connector
4. Removable terminals for the wiring harness
5. Clips for the device clamping.



Rear view and accessories

Figure 3

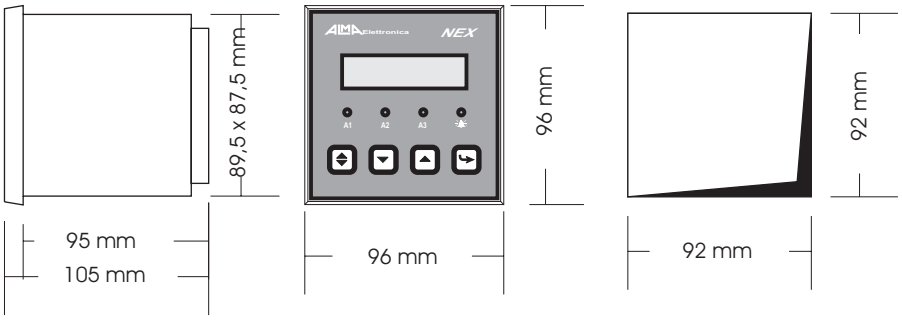


Figure 4

Mechanical installation

The *NEX* device provides a black self-extinguishing ABS container. The device dimensions are compliance to the standard of DIN 43700: 96 mm x 96 mm section and a maximum depth of 105 mm.
The dimensions of the panel perforation are 92 mm x 92 mm. The fixing is carried out using the clamps provided with the device.
See Figure 4.

Electrical connections

All the connections are carried out with the removable terminals provided with the device for a simplified wiring harness. For the wiring harness you can refer to the figure 5 and to the terminals numeration.

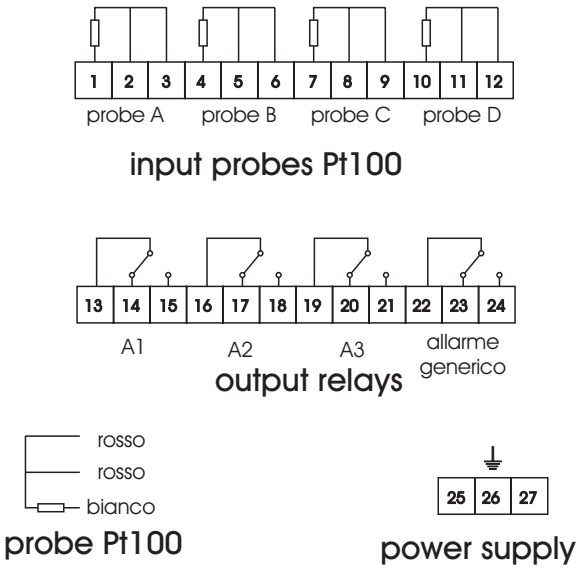


Figure 5

Power Supply

The power supply connection is performed connecting the power voltage to the terminals 25 and 27 without any respect of polarity for Vcc.
The nominal allowed voltages are in the 24 Vcc 240 Vcc range for the direct voltage, or in the 24 Vca 240 Vca range with 50 Hz frequency for the alternate voltage.
Terminal 26 has to be connected to the ground reference.
The device power supply

is protected from momentary input over-voltages.

The damage due to a wrong power supply is not covered by guarantee.

The device does not provide internal fuses, so that you must provide an external adequate protection.

Relays outputs connection

Figure 5 shows the position of the relays not excited (turned off device).
The alarm relays are excited when one of the probes exceeds the set limit. The *General Alarm* relay operates in intrinsic security, so that it is excited at the device switching on, and it is de-excited when conditions that compromise the device functionality take place. In this way when the device is switched off you have the no-active control signal.

Probes connection

The analog inputs are compatible with three wires Pt100 resistive probes.
For the sensors connection we suggest you the following expedients:

- use a shielded cable to connect the probe with the device and with the shield fixed to the ground reference inside the electric panel
- the connection cables route has to be separated from the high-tension cables and from cables driving inductive elements as remote-control switch
- the 3 wires of each probe will have the same length and section so that they have all the same line resistance. The line resistance will be lower than 10 Ω, corresponding to a wire of 500 meters length and 1 mm^2 section. It is also possible to use 2 wires Pt100 probes making a link on the terminals for the line resistance measure, as shown in figure 6. In that case the temperature's measure will be affected by an error as large as longer is the probe connection cable.

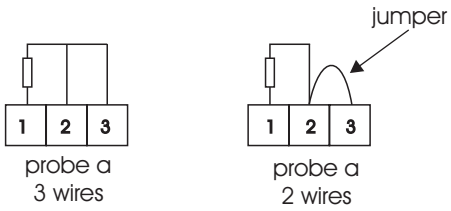


Figure 6

Instructions for use

Visualization and keyboard use

On the *NEX* device the measured temperatures and the set data visualization is done by the navigation on pages by keyboard. Besides this kind of visualization has a very intuitive use, it allows the simultaneous visualization of data related to the same ambit.

Navigation on pages

Navigation on visualization pages takes place using the increase and decrease keys referred to with ▲ and ▼ symbols.

Pages are cyclically placed: when you arrive to the last page you directly go to the first one (see figure 7). Referring to the scheme, with the key ▼ you run the pages clockwise, whereas with the key ▲ you run the pages anticlockwise.

The usually visualized page is page 1, which is the principle one. It shows the temperatures measured by the probes. The device visualizes this page at the switching on and every time it is standing for a time greater than 30 seconds (no key pushed).

Page 2 visualizes the maximum values of temperatures measured by each probe.

Page 3 visualizes the three alarm levels setpoints programmed for probes A, B and C.

Page 4 visualizes the three alarm levels setpoints programmed for probe D. If lines

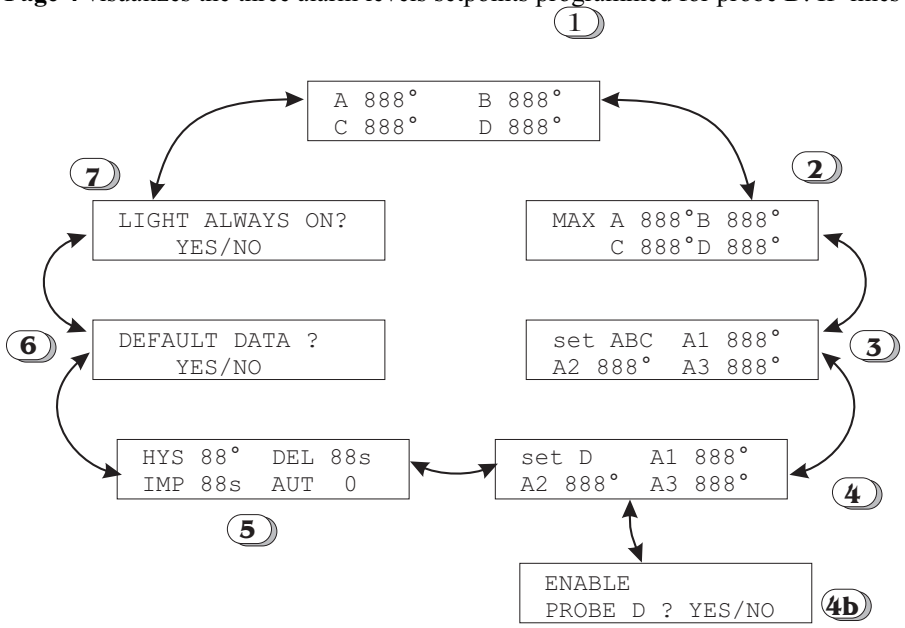


Figure 7

appear instead of numbers, it means that the D probe has been de-activated by programming. Entering the programming modality from this page, you go to **page 4b** that allows the activation or de-activation of the D probe.
Page 5 visualizes the hysteresis, delay, alarm memory and impulsive release data.
Page 6 provides the loading of the data set usually fornished with the device.
In **page 7** you can choose the operation of the display backlighting: always or limited-time alight.

Programming

The programmable data can be modified following a procedure, later on described, that allows to intuitively set data in little groups.
Data are visualized collected in pages as described in the previous paragraph. To modify one of these groups you must follow the next procedure:

- using ▲ and ▼ keys (as indicated in the previous paragraph) you can choose the visualization page containing the data to be programmed (for example, page 3 in figure7)
- simultaneously pushing ▲▼ and ↵ keys you can enter the programming modality.

In the programming modality, according to the data group, either a guided page with specific questions or the same page with a flashing cursor standing on a cipher of the first datum to be modified, appears. The programming modality entry is easily recognizable, because also the *General Alarm* led lights up to signal that the device is no more in the active-control modality.

Once you entered the programming modality, a flashing cursor appears on one of the visualized data. Using ▲ and ▼ keys it is possible to increase, decrease or anyway modify. For numerical data it is possible to shift the cursor to the next cipher pushing the ▲▼ key. The shift is cyclical: keeping on pushing the ▲▼ key you pass through all the datum ciphers and after the last one you return to the initial one. This is usefull to correct erroneous sets. When the datum definition is completed, you must confirm it pushing the ↵ key and the cursor will shift on a cipher of the next datum. If you don't want to modify the datum it's sufficient to confirm it pushing the ↵ key.
Once you have confirmed the last programmable data of the visualized page, the device carries out a conformity test of the set data: if the test is positive, the set data are storaged and the device leaves the programming modality and returns to the usual visualization modality.
If the data test is negative an error signal appears and the device doesn't leave the programming modality showing the same page to correct data.

The exit from the programming modality can occur also for inactivity, if nobody pushes a key for at least 30 seconds. In that case the device ignores the data modifications eventually done and restores data set before entering the programming modality.

You have to program even not numerical data using the ▲ and ▼ keys and confirm them by the ↪ key.

A brief description of each page programming follows:

- in **page 2** of figure 7 in the programming modality, simultaneously pushing the ▲▼ and the ↪ keys, you can modify the maximum temperatures reached by each acquisition channel. You can only put these data at zero. Entering the programming modality the four maximum values will be simultaneously put at zero. Anyway you won't see zeros because the device, once you have finished the zero setting, will do a comparison with the measured temperatures that will surely be greater so that the maximum values will immediately be updated.
- in **page 3** of figure 7 in the programming modality, simultaneously pushing the ▲▼ and the ↪ keys, you can modify the temperature levels relative to the three A, B and C probes alarms. The data modification modality is the general one described above. The A1 threshold is the first alarm level, the A2 threshold is the second one and the A3 one is the last level (*transformer's uncoupling*).
- in **page 4** of figure 7 in the programming modality, simultaneously pushing the ▲▼ and the ↪ keys, you can go the 4b page that allows the D probe activation or de-activation. This probe is usually joined to the transformer's core, but sometimes it's not installed. In that case you have to de-activate the probe from programming to avoid the system's signal of an alarm for the disconnected probe. You can decide to activate or de-activate the D probe using the ▲ and the ▼ keys. If you activate the probe, you go to the temperature's thresholds programming page for the alarms: as for A, B and C probes the A1 threshold is the first alarm level, the A2 threshold is the second one and the A3 one is the last level (*transformer's uncoupling*).
- in **page 5** of figure 7 in the programming modality, simultaneously pushing the ▲▼ and the ↪ keys, you can set a series of data whose meaning is specified in the *Description of programmable data* paragraph.
- in page 6 of figure 7 in the programming modality, simultaneously pushing the ▲▼ and the ↪ keys, you can restore the standard data. In the programming modality it's necessary to answer 'sì' or 'no' using the ▲ and ▼ keys.
- in **page 7** of figure 7 in the programming modality, simultaneously pushing the ▲▼ and the ↪ keys, you can choose two different options for the backlighting of the display. In the programming modality it's necessary to answer YES or NO using the ▲ and ▼ keys. If you answer YES the display will be always lighted. If you choose the second operation modality the backlighting will be usually turned off and will be turned on for a short time when the user pushes any key.

Entering the programming modality, if you simultaneously push the ▲▼ and the ↪ keys in the **page 1** of figure 7, you can cancel the alarms in case the alarm memory has been programmed (see the *Description of programmable data* paragraph).

When the programming data modality is activated the system is in no-active control modality, so that the relays are de-excited and the "No-active control/General alarm" led lights up.

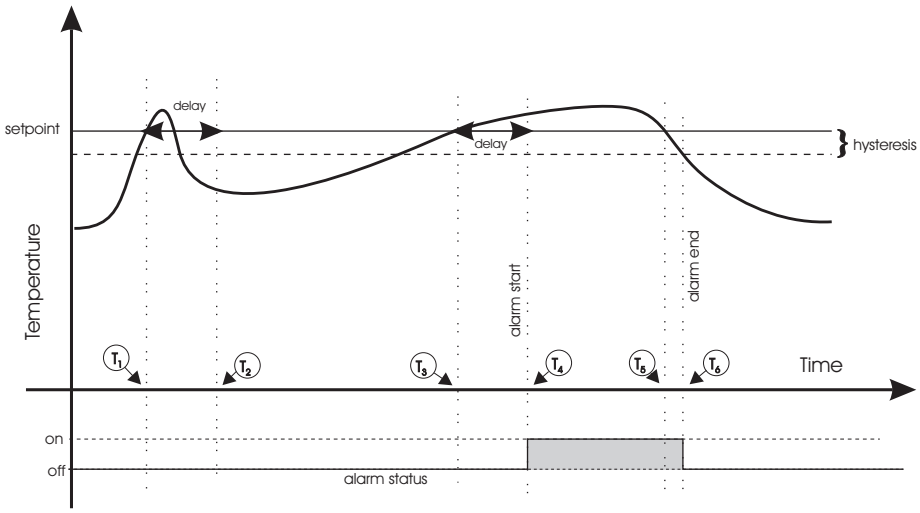
Description of programmable data

The programmable data are the following ones:

- *3 temperatures setpoint* for the ABC probes: the exceedings of those levels excites the alarms A1, A2 and A3. On these data a condition is present: the value of A1 has to be lower than the value of A2 and this one has to be lower than that of A3. If you don't respect this condition, the system signals an error and doesn't permit the exit from the programming modality.
- *3 temperatures setpoint* for the D probe: the exceding of the set levels excites the alarms A1, A2 and A3. There is a condition on this data: the value of A1 has to be lower than that of A2, whose value has to be lower than that of A3. If you don't respect this condition, the system signals an error doesn't permit the exit from the programming modality.
- A unique *hysteresis* datum for all the programmable temperature thresholds. It avoids the alarms to switch on and off closely in time because of temperature oscillation around the temperature setpoint. This data appears as HYS in page 5 of the Figure 7.
- A *delay* datum to excite each alarm when a temperature threshold is exceeded: it represents the minimum time the temperature has to spend over the setpoint for the alarm activation. It avoids the alarms to be activated for temporary exceedings of the temperature setpoint. This data appears as DEL in page 5 of the Figure 7.
- *Alarm memory* for the alarms also when the temperature returns under the corresponding threshold value. You can select this option when you want to verify the alarm causes: in fact, in this case the alarm has to be de-activated by hand using the keys on the frontal panel. This data appears as AUT in page 5 of the Figure 7.
- *Impulse* length. It is activated only on the A3 alarm and you have to use it only if you have a throw coil isolator for the electric unit's unhooking. The relay corresponding to the A3 alarm (unhooking) will be closed for a number of seconds equal to the impulse length. If you don't want the relay to close you have to set this datum equal to zero. This data appears as IMP in page 5 of the Figure 7.

Figure 8 shows the significance of the programmable data above described.
In the figure, on the horizontal axis is represented time and on the vertical one temperature.
The horizontal lines correspond to the programmable temperature setpoint and this

datum minus the hysteresis (the dashed line). In the bottom of the figure is represented the alarm situation, which means the corresponding relay's shut down.
At time T_1 the curve representing temperature exceeds the setpoint, but the alarm doesn't activate because temperature returns under the setpoint before the set delay time T_2's term. In this way you avoid the corresponding threshold activation when you have very fast transients.
At time T_3 the curve representing temperature exceeds again the setpoint and after



the set delay, at time T_4, the output channel is activated.
At time T_5 the curve representing temperature goes under the setpoint, but the alarm is de-activated at time T_6 when it goes under the value of the setpoint minus hysteresis.

It follows the list of data with the corresponding minimum and maximum programmable value:

	Name of Datum	Min. Programmable value	Max. Programmable Value	Standard Values	Notes
paginata 3	SET ABC A1	0 °C	199 °C	100 °C	First alarm level for A, B e C probes
	SET ABC A2	0 °C	199 °C	120 °C	This datum has to be greater than SET ABC A1
	SET ABC A3	0 °C	199 °C	135 °C	This datum has to be greater than SET ABC A2
paginata 4	SET D A1	0 °C	199 °C	110 °C	First alarm level for D probe
	SET D A2	0 °C	199 °C	130 °C	This datum has to be greater than SET D A1
	SET D A3	0 °C	199 °C	145 °C	This datum has to be greater than SET D A2
paginata 2	MAX A	0 °C	0 °C	0 °C	Only zero setting
	MAX B	0 °C	0 °C	0 °C	Only zero setting
	MAX C	0 °C	0 °C	0 °C	Only zero setting
	MAX D	0 °C	0 °C	0 °C	Only zero setting
paginata 5	**HYS**TERESIS	0 °C	99 °C	5 °C	
	DELAY	0 sec	99 sec	0 sec	
	ALARM MEMORY (**AUT**)	0	1	0	If it is equal to 1 there is alarm memory, if it is equal to 0 there is not
	IMPULSE	0 sec	99 sec	0 sec	If it is equal to 0 the unhooking relay stays closed for the alarm lenght. If it is not equal to 0 the unhooking relay stay closed only for a time, in seconds, equal to the set value (*impulse*)

Solution of problems

In this paragraph we give you some suggestions to solve anomalies you can meet using the *NEX* device.

Problem	Solution
The *NEX* device doesn't turn on	Verify the connection to the power supply. Verify there is line voltage. Verify that the power supply values are compliance with those specified in this manual. *If the problem persists please contact the device distributor.*
The device emits the *General Alarm* signal	Verify there is no error messages on the display. Verify the suitable connection of probes. Verify that the device is not in the programming modality. In this case wait 30 seconds before touching any key: the device will automatically exit this modality and turn back to the visualization one. *If the problem persists please contact the device distributor*
The device shows the message *Data Error* and doesn't exit the programming modality	This situation occurs when at the exit from the programming modality and the device carries out a conformity test of the set data. If you are setting the alarm thresholds for the probes, verify that A1<A2<A3. If you want to exit from the programming modality without changing data wait 30 seconds without touching any key: the device will automatically exit from this modality and turn back to the visualization one re-setting the previously used data.
The probe measures a temperature greater than the corresponding setpoint but the alarm doesn't activate	Verify if the delay datum has been set. If it has not the relay will close only after a time equal in seconds to the delay length if temperature doesn't undergo the set threshold before.
The A3 alarm is activated (the led is alight) but the relay is de-excited	Verify that the impulse datum has not been programmed.

Problem	Solution
The measured temperature is lower than the setpoint but the corresponding alarm is activated	Verify the value of the set datum of *hysteresis* and control if the measures temperature in lower than the threshold minus this value: the alarm stops only when the temperature undergoes the setpoint minus the hysteresis value (see figure 8). If this is not the cause of the problem, verify that the *alarm memory* has been set. In this case the alarms can be de-activated by hand the programming modality in the principal page (see page 1 of figure 7)
In the principal page of temperatures visualization on the D probe datum some dashes appear	If on the D probe datum some dashes appear instead of a number it means that the D probe is de-activated. To activate it see the procedure described in the *Programming* paragraph.
In the principal page of temperatures writing ERR appears on some probes' datum	If on the temperature datum measured by some probe the writing ERR appears it means that the probe is damaged or badly connected. In this situation also the *Generic Alarm* signaling lights up. Test the probe's connection and try to change the connection channel to verify if the problem it's really on the probe.

Guarantee conditions

The thermal protection *NEX* devices are covered by guarantee for a period of 24 months since the consignment date for anomalies due to production defects.

The guarantee consists in the free repair or substitution of the components that have been damaged in the devices' construction, arrived at our office carriage paid.

The product's guarantee declines in the following cases:

- device's damages deriving from negligence, use or installation not compliance with the instructions furnished in the user's manual
- wrong power supply
- damages due to changes in the line voltage to which the device is connected as in the case of discharges caused by thunderbolts or other external phenomena
- tampering with the device
- damages due to accidental causes or to negligence
- non-payment of the device

The guarantee period is determined on the basis of the serial number written on the device's label so that it has not to be cancelled nor modified.

Parts subjected to wear by use are not covered by guarantee.

Furthermore, removal and re-installation costs are not covered by guarantee, as transport costs and risks and any other direct or indirect cost due to repair of the device you consider damaged.

The constructor declines any responsibility for harms done to persons, animals or things directly or indirectly coming out from a proper or improper use of the device.

The device's repair or substitution is subjected to the unobjectionable constructor's opinion.

When the guarantee period falls the damaged device's repair will involve the debit entry for the damaged components substitution and for the labour.

For any dispute the competent Court is the one of Bologna (Italy).

Notes

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