PRESYS®

Universal Digital Indicator

DMY-2030 *Light*

Technical Manual

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1.0 - Introduction

1.1 - Description

PRESYS DMY-2030 *Light* Indicator is able to monitor one universal standard input and accepts direct connection of thermocouples, RTD, current (mAdc) and voltage (mVdc, Vdc). Thermocouples and RTD inputs are linearized automatically by tables stored in EPROM memory. There is a 24Vdc voltage source isolated from output and with short-circuit protection in order to power transmitters.

It can communicate with computers by means of an optional communication module RS-232 or RS-422/485.

The type of input is selected by software configuration, together with the connection of the input signal to the proper terminals. All configuration data is protected by password and stored in non-volatile memory.

According to modularity design concept, the Indicator accepts up to three output modules. One can make use of one retransmitter output (4-20mA, 1-5V, 0-10V) and up to two output alarm modules (SPDT relay, solid state relay or open collector voltage). The alarm outputs can be configured independently to operate with latch, what requires the operator acknowledge by means of the front panel keys in order to deactivate the outputs after the process variable returns to normal condition. The outputs are electrically isolated from inputs.

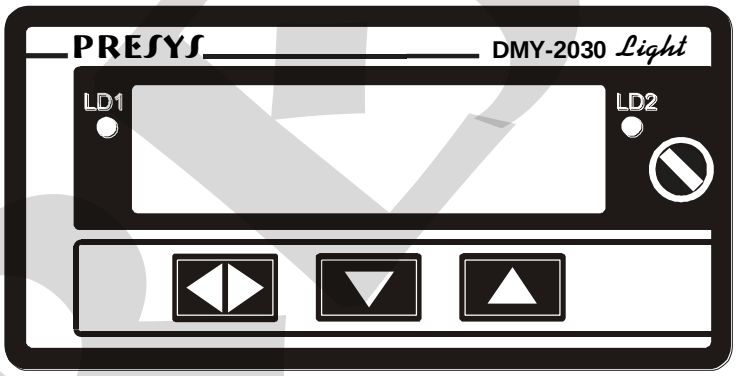


Fig. 1 - DMY - 2030 *Light* Indicator front panel

The front panel has a high visibility display configurable up to 4 ½ digits to show the process variable. The leds are used as a visual indication of alarm associated to the alarm outputs. During configuration, the display shows mnemonics and parameter values.

It accepts 90 to 240Vac or 130 to 340Vdc (with any polarity) power supply.

The instrument has an extruded aluminum case which avoids electrical noise, electromagnetic interference, radiofrequency interference, etc., and its robust construction makes it tough enough for the most hostile environment.

1.2 - Order Code

DMY - 2030 *Light* - ____ - ____ - ____ - ____ - ____ - ____
A B C D E F

Field A Output 1
0 Not used
1 4 to 20mA
2 1 to 5V
3 0 to 10V

Field B Output 2
0 Not used
1 SPDT relay
2 Open collector voltage
3 Solid state relay

Field C Output 3
Same code of Output 2

Field D Power Supply
1 90 to 240Vac or 130 to 340Vdc (any polarity)
2 24Vdc
3 12Vdc

Field E Communication
0 Not used
1 RS 232
2 RS 485

Field F Case Protection Grade
0 General usage, protected place
1 Front aspersion-proof
2 Weather-proof

Note 1 - The input type, indication and relay usage as alarms are, among other things, items that the user can program through the front keys (if wanted, specify these information so that all the configuration can be made by PRESYS).

Note 2 - Other hardware and software features can be available under previous consult.

Code Example:

1) DMY - 2030 *Light* - 0 - 1 - 0 - 1 - 0 - 0

This code defines a DMY-2030 indicator with one SPDT relay which can be used as high and low alarm, 90 to 240Vac or 130 to 340Vdc electric power supply, protected field usage.

1.3 - Technical Specifications

Input:

•One input configurable for thermocouple (J, K, T, E, R, S, under ITS - 90), Pt-100 RTD under DIN 43760, 4 to 20mA, 0 to 55mVdc, 1 to 5Vdc, 0 to 10Vdc. 250Ω input impedance for mA, 10MΩ for 5Vdc and 2MΩ above 5Vdc. Table 1 shows the temperature ranges for thermocouples and RTD, and the resolution for linear input sensors.

Input Sensor	**Measuring Range Limits**			
Thermocouple	lower limit °F	higher limit °F	lower limit °C	higher limit °C
Type J	-184.0	1886.0	-120.0	1030.0
Type K	-346	2498	-210	1370
Type T	-418	752	-250	400
Type E	-148.0	1436.0	-100.0	780.0
Type R	-58	3200	-50	1760
Type S	-58	3200	-50	1760
RTD 3-wire Pt-100	-346.0	1256.0	-210.0	680.0*
Linear	Span		Resolution	
Voltage	0 to 55mV		3μV	
	1 to 5V		250μV	
	0 to 10V		500μV	
Current	4 to 20mA		1μA	

(*) includes wire resistance

Table 1 - Measuring ranges for input sensors

Outputs:

- One 4 to 20mA, 1 to 5Vdc or 0 to 10Vdc analog retransmitter optional module galvanically isolated up to 300Vac from power supply and input.

- SPDT relays for alarm rated for 3A at 220Vac or up to 10A at 220Vac under order (in this case, the alarm module is not plugged to a connector, but soldered to the board). It is possible to use up to 2 alarm modules.

- Logic signal, open collector transistor, 24Vdc, 40mA max. with isolation.

- Solid state relay rated for 2A at 250Vac with isolation.

Serial Communication:

RS-232 or RS-485, with 50Vdc isolation, as an optional module for connection in the CPU board.

Indication:

Standard indication of -9999 to 19999 range.

Configuration:

By front panel push-buttons and internal jumpers (for the output).

Sampling rate:

64ms sampling rate, for the indication of input in -9999 to 19999 range. The display is updated each 0.5 second.

Accuracy:

±0.1% of full scale for TC, RTD, mA, mV and V input.

±0.5% of full scale for analog retransmitter output and 750Ω maximum load.

Linearization:

±0.1°C for RTD and ±0.2°C for TC.

Square root extraction:

±0.5% of reading, for input above 10% of span. 0 to 5% programmable Cut-off.

Cold junction compensation:

± 2.0°C at range from 0 to 50°C ambient temperature.

Thermal stability:

±0.005% / °C of span with reference of 25°C ambient temperature.

Power supply:

Universal 90 to 240Vac or 130 to 340Vdc (any polarity), 10W nominal; 24Vdc, 12Vdc and other values are optional.

2-wire transmitter power supply:

24Vdc voltage and 50mA maximum, isolated from output, short-circuit protection.

Operating Ambient:

0 to 50°C temperature and 90% maximum relative humidity.

Dimensions:

1/8DIN (48 x 96mm) with 162mm depth, panel cut of 45 x 92mm.

Weight:

0.5kg approx.

Warranty:

One-year warranty.

2.0 - Installation

2.1 - Mechanical Installation

DMY-2030 *Light* Indicator front panel has 1/8DIN size (48 x 96mm).
It is fixed by the rails which press it against the back side of the panel.
After preparing a 45 x 92mm cut in the panel, remove the rails from the Indicator and slide its rear through the cut until its front reaches the panel. Place the rails again in the Indicator from the back of the panel and tighten the screws as shown in figure 2.

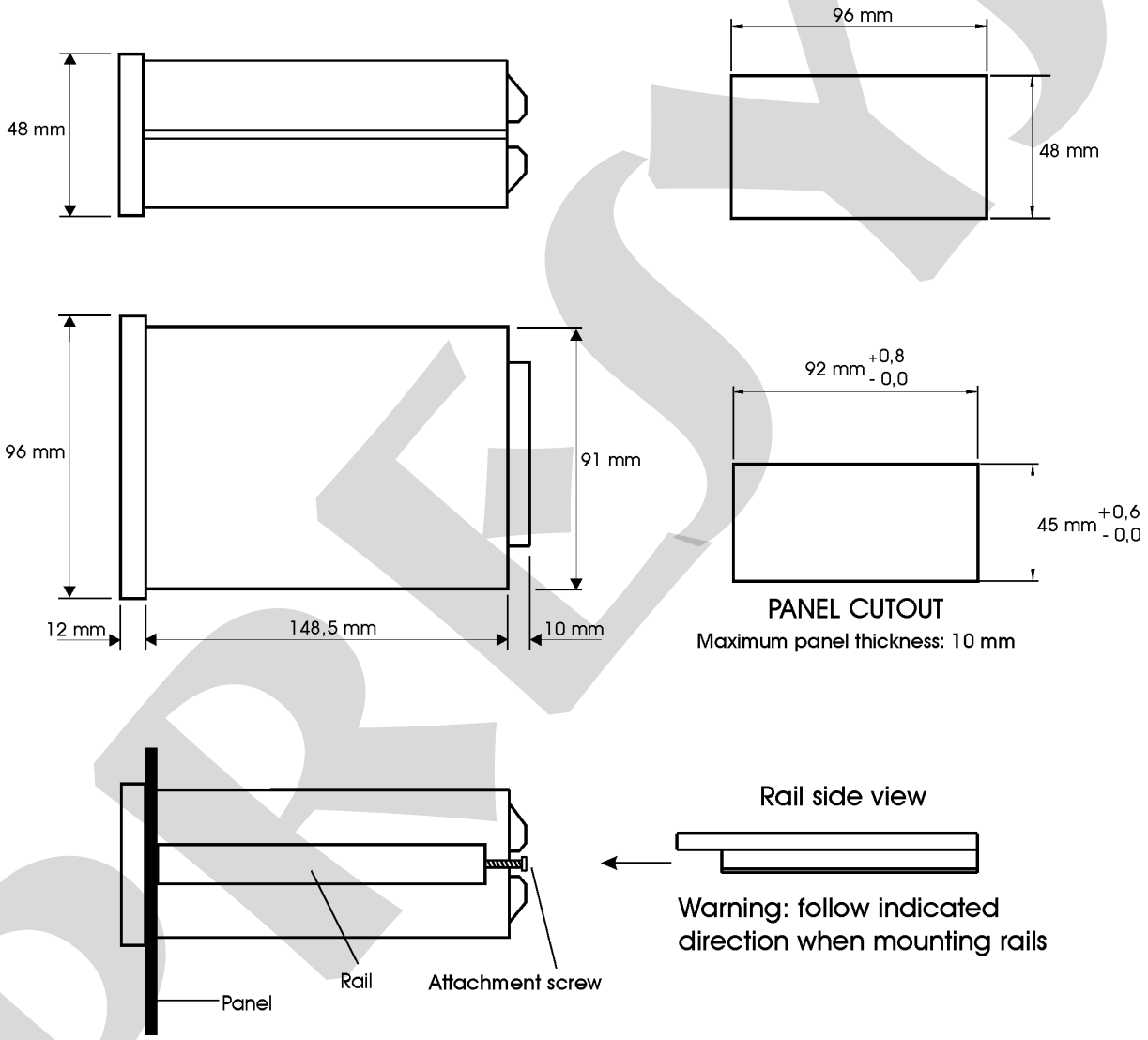


Fig. 2 - Dimensional drawing, panel cutout and side view

2.2 - Electrical Installation

DMY-2030 *Light* Indicator may be powered by voltage between 90 and 240Vac or 130 to 340Vdc, any polarity. Remember that the internal circuit is powered whenever the instrument is connected to the external power supply.

Input and output signals must be connected to the instrument only when it is turned off.

Figure 3 shows the instrument rear terminals for connection of power supply, ground, communication, process input and output signals.

Signal wiring must be kept far away from power wires.

Due to its metal case the instrument ground should be connected to earth ground. Never connect the ground to neutral terminal.

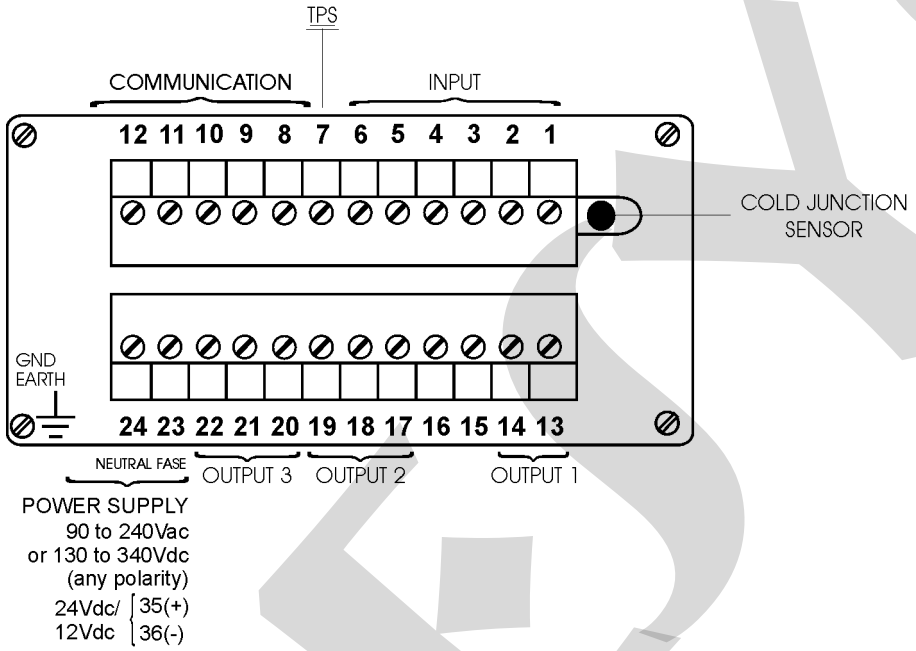


Fig. 3 - Indicator terminals

2.3 - Process Input Signal Connections

The Indicator universal standard inputs can be connected to thermocouples, 3-wire RTD, current (mA) or voltage (V or mV). See the different types and ranges of input sensors in table 1, section 1.3 on Technical Specifications.

The input sensor is enabled by software configuration (see section 3.2 on Configuration) and by the selection of the appropriated terminals of the instrument.

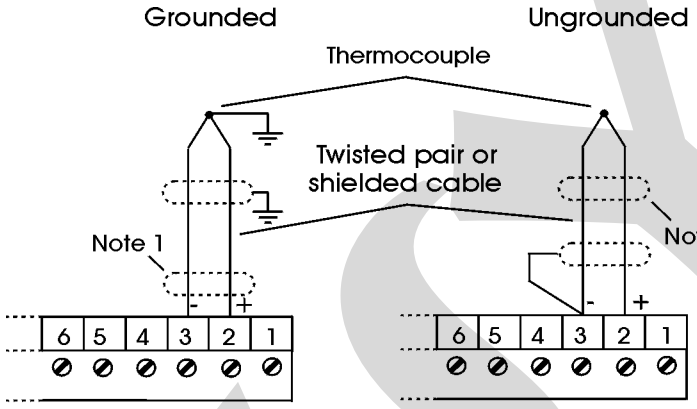
In order to avoid noise in the wiring, use twisted pair cable and cross sensor connection wire inside a metallic tube or use shielded cable. Make sure to connect only one shield wire end either to board terminal or to sensor ground, as shown in the next items.

WARNING: GROUNDING TWO SHIELD WIRE ENDS MAY CAUSE NOISE IN THE INDICATOR.

2.3.1 - Thermocouple Input

Connect the thermocouple to terminals 2(+) and 3(-) as shown in figure 4.

In order to reduce the error due to cold junction compensation, use thermal paste in the rear (from the terminals where the thermocouple is connected to the cold junction sensor). Use appropriate compensating cables with the same material of the thermocouple in order to connect it to the instrument. Check if the thermocouple polarity is equal to those of the terminals.



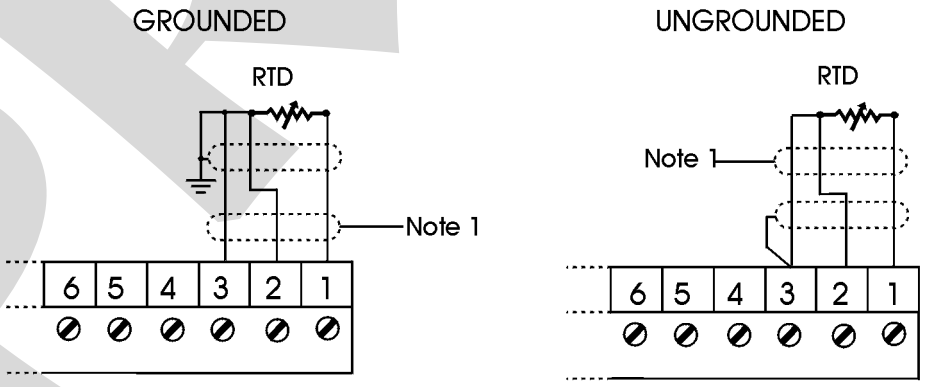
Note 1: Keep the shielded cable disconnected at this end.

Fig. 4 - Thermocouple connection

2.3.2 - RTD Input

The 3-wire RTD is connected to terminals 1 and 3, and the compensation wire is connected to terminal 2.

Use wires of same material, gauge and length on all 3 for compensating resistance. The maximum resistance of each connection wire must be 10Ω. Use 18AWG wire (minimum) for distances up to 50m and 16AWG for distances greater than 50m.

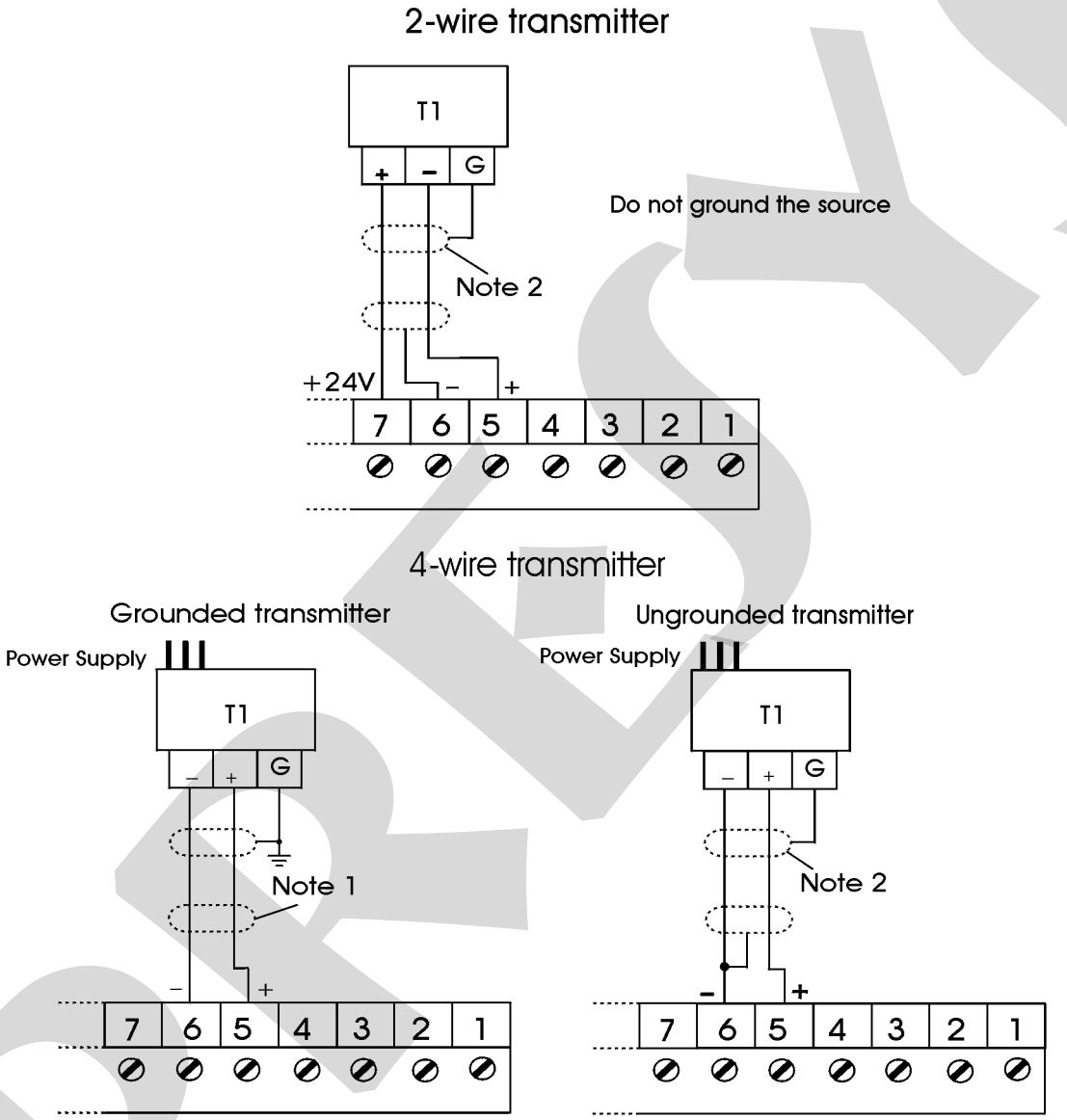


Note 1: Keep the shielded cable disconnected at this end.

Fig. 5 - RTD connection

2.3.3 - Milliampere Input

The 4-20 mA current signal is applied to terminals 5(+) and 6(-). The current signal can be generated by a transmitter with an external power supply. In case of using the 24Vdc internal voltage source from the Indicator to power a two-wire transmitter, the current is received only by terminal 5(+). Figure 6 shows both possibilities of connection.

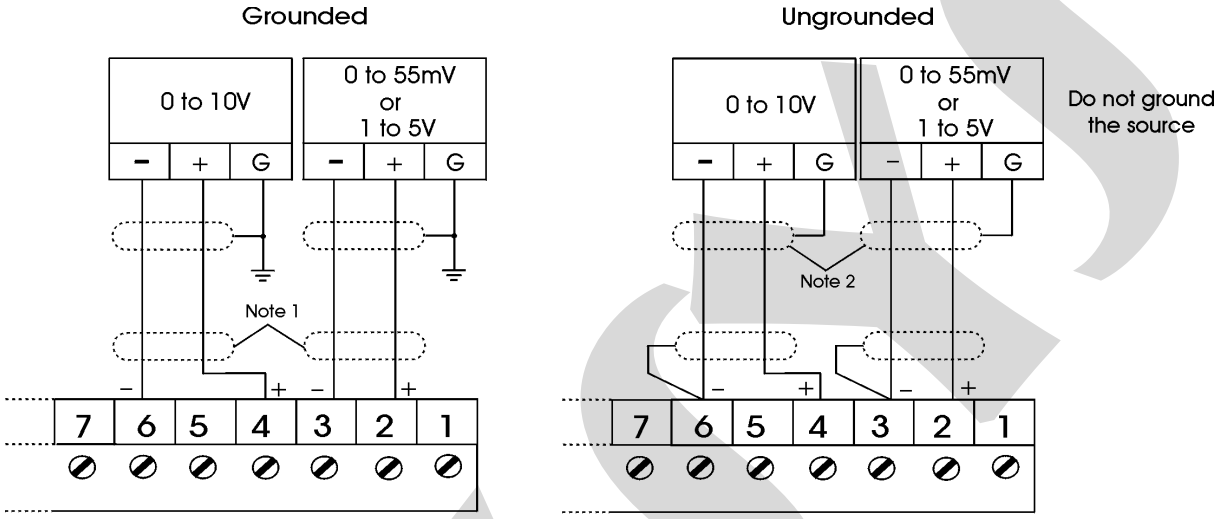


Note 1: Keep the shielded cable disconnected at this end.
Note 2: Connect the shielded cable to transmitter ground terminal.
When there is no ground terminal, keep the shielded cable disconnected at this end.

Fig. 6 - Milliampere Input

2.3.4 - Volt or Millivolt Input

0 to 55mVdc or 0 to 5 Vdc must be applied to terminals 2 (+) and 3 (-). 0 to 10Vdc must be applied to terminals 4(+) and 6(-). The connections are shown in figure 7.



Note 1: Keep the shielded cable disconnected at this end.

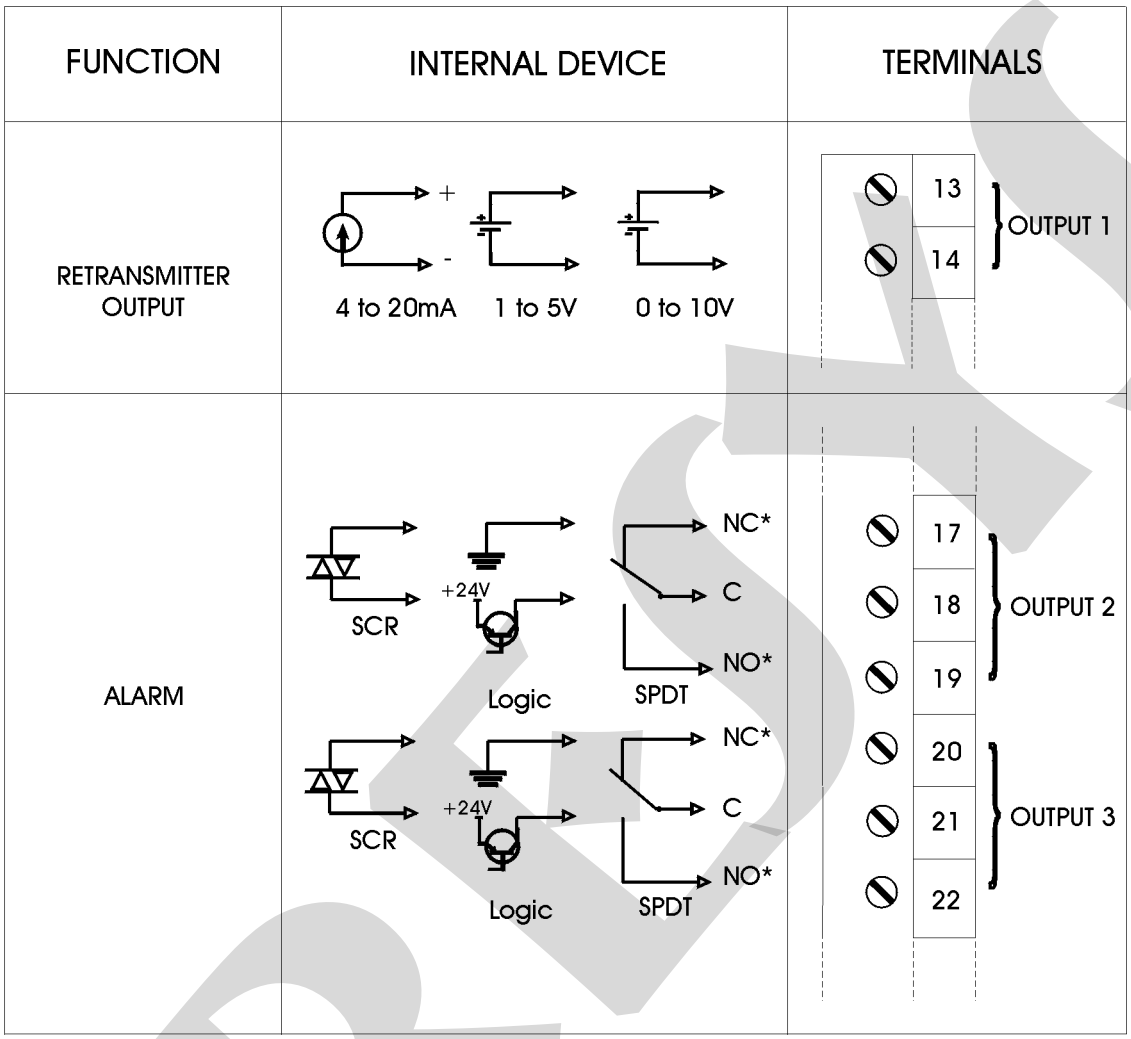
Note 2: Connect the shielded cable to ground terminal. When there is no ground terminal, keep the shielded cable disconnected at this end.

Fig. 7 - Voltage source connection

2.4 - Output Connection

The Indicator can have up to three output modules: output 1 to 3. Output 1 is used as a retransmitter output (4 to 20mA, 1 to 5Vdc or 0 to 10Vdc). Outputs 2 and 3 are used only as alarm outputs (SPDT relay, open collector voltage and solid state relay). Figure 8 shows the Indicator output types.

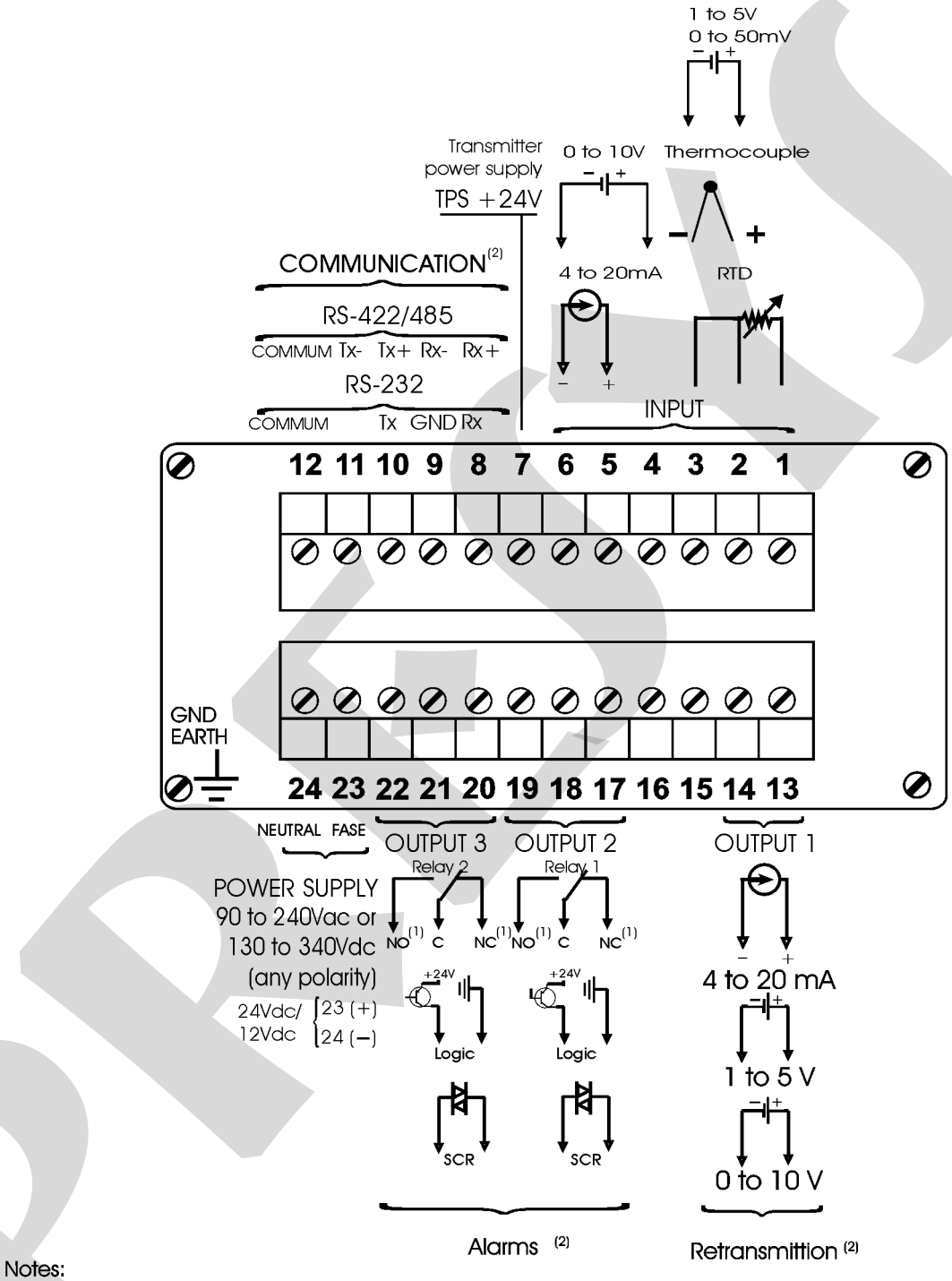
Note that the output terminals will present the corresponding signals only if the optional modules are installed and the output is correctly configured. Refer to section 3.2 on Configuration for further details.



(*) Position of relay contacts when the Indicator is powered on and in non-alarm condition. When the Indicator is powered off or in alarm condition, the position of the relays changes.

Fig. 8 - Output Connection

2.5 - Connection Diagram



Notes:

(1) NC and NO refer to the condition of the relay contacts when the indicator is powered on and in non-alarm condition.

(2) Optional modules.

2.6 - Communication

DMY-2030 *Light* Indicator communicates with computers through RS-232 or RS-485 and with use of a MODBUS protocol communication software, when the optional communication module is installed and the communication parameters are configured.

Specific information on communication and signal connection is described in the communication manual.

2.7 - Engineering units

A label with several Engineering Units is supplied with each Indicator. Select the one corresponding to the variable shown on the display and stick it to the front panel of the Indicator.

3.0 - Operation

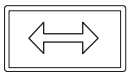
3.1 - Normal operation

DMY-2030 *Light* Indicator has two modes of operation: normal operation and configuration mode.

During normal operation, the Indicator monitors the inputs, verifies alarm conditions and activates the outputs when necessary.

Configuration mode is used to select and configure all the Indicator parameters.

The normal operation mode, in which the Indicator is to be found most of the time, is called level zero. In this level, the three front panel keys have the following functions:

Key ENTER  Changes information shown on the display. When the display shows the process variable, it goes to alarm 1 setpoint, if configured. Next, one can see alarm 2 setpoint (if configured), the "Conf" mnemonic (which allows one to enter the configuration level) and the process variable again. It allows the acknowledgment of alarms configured with latch function, after the alarm condition returned to normal state.

Key DOWN  Decreases the setpoint value of the alarm shown.

Key UP  When "Conf" is shown, the password for changing from level zero to level one is asked. Increases the setpoint value of the alarm shown. Presents the alarms which require acknowledgment, when the process variable is shown, and allows returning to the process variable.

The information sequence presented on the display is shown on figure 9.

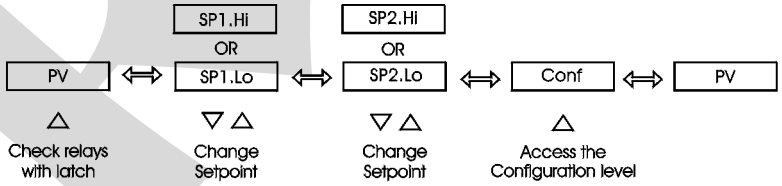


Fig. 9 - Information in the operation level.

The normal operation and configuration modes present a "timer" which make the display return to the process variable, when it shows any other kind of information and no key is pressed for 1 minute. It does not apply to the Calibration level (Calib. mnemonic). See item 3.2 on Configuration.

3.2 - Configuration

In order to access the configuration mode the operator is required to provide a password which avoids a non-authorized person to change any critical parameters of the process. So, when UP is pressed while “Conf” is shown in the normal operation mode, the PASS warning is displayed and the user should press the UP, DOWN and ENTER keys (exactly in this order) to access the configuration levels. If the user provides an incorrect sequence of keys or if it takes more than 15 seconds for the password to be given, the display returns immediately to the normal operation level. This procedure is shown in figure 10.

Note: In the diagrams below, the rectangles represent the display appearance after pressing the keys.

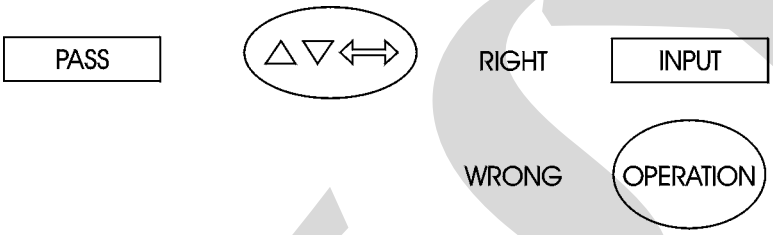


Fig. 10 - Key sequence password

All configuration parameters are stored in the non-volatile memory and determine the normal operation of the instrument. With these parameters the user can adjust the instrument to his needs, when it is necessary to change the configuration from factory.

Configuration parameters are distributed in six hierarchical levels shown in figure 11.

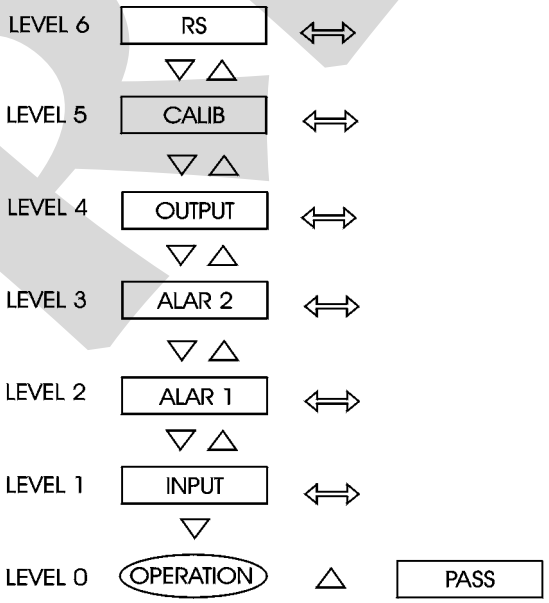


Fig. 11 - Parameter levels diagram

In order to move through the levels and access the parameters of any one of them, use the front panel keys which have the following functions:

Key	Description
ENTER	Enters the level
UP	Moves to higher levels
DOWN	Moves to lower levels

The Indicator allows the user to know what kind of input, alarms or output are configured without need to access a specific parameter level. The mnemonics corresponding to the level and to the configuration chosen move on the display continuously, as soon as one reaches one of the levels (except Calib. and RS).

Inside each level, the front panel keys have the following functions:

Key	Description
UP	Moves the options in increasing direction
DOWN	Moves the options in decreasing direction
ENTER	Confirm or advance options inside a level, if the display does not show ESC. When ESC is shown, it returns one or more positions.

When accessing any parameter of a configuration level, the Indicator directly shows the option or value corresponding to the current configuration of the parameter. In case a value is presented, use the UP and DOWN keys to change each digit and press ENTER to move to the next one. When configuring the options of a parameter, the UP and DOWN keys are used to move through the options and the ENTER key, to confirm the choice.

The hierarchical levels are presented in sequence. The options of each level are explained step by step with all their corresponding parameters.

Level 1 - Input

The input sensors, described in table 1 of section 1.3 on Technical Specifications, are configured according to the parameters of the Input level shown below:

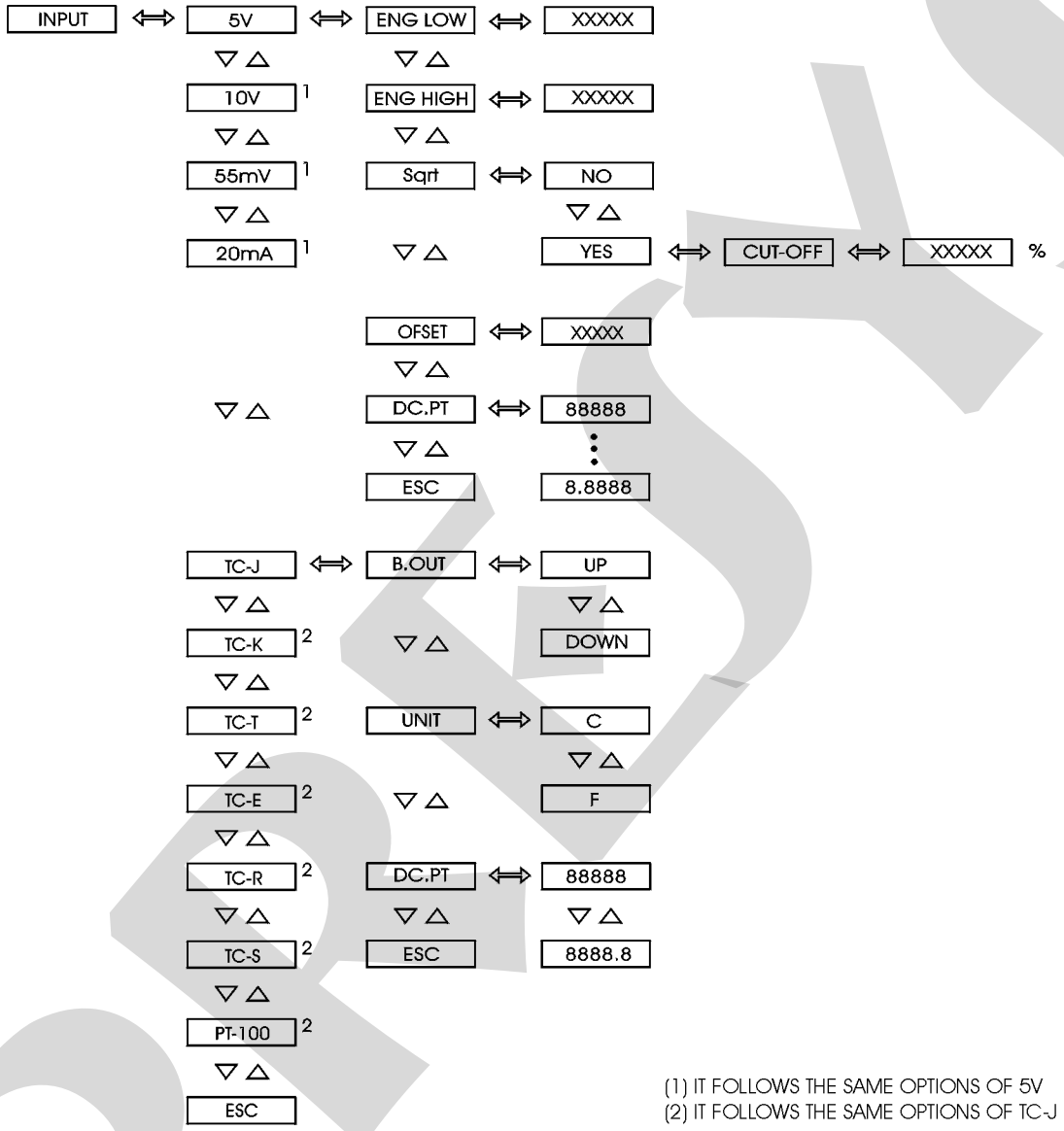


Fig. 12 - INPUT level options

The table below refers to the ranges of the parameters shown in figure 12.

Mnemonic	Parameter	Range	Factory Value	Units
ENG LOW	display indication associated to the input zero scale	-1009 to 20019	0.0	EU*
ENG HIGH	display indication associated to the input full scale	-1009 to 20019	100.0	EU
CUT-OFF	minimum value for square root	0 to 5	0	%
OFF SET	constant added to display indication	-9999 to 30000	0	EU

(*) EU - Engineering Unit

When selecting a linear sensor one must configure its scale. Define two points by associating the Eng High display indication to the signal corresponding to full scale of the linear sensor chosen, and Eng Low indication to the signal corresponding to zero scale of the sensor.

In the Indicator, zero scale corresponds to 1V for 1-5V scale, 0V to 0-10V, 0mV to 0-50mV and 4mA to 4-20mA, while full scale is the maximum signal of the chosen input (5V, 10V, 50mV or 20mA).

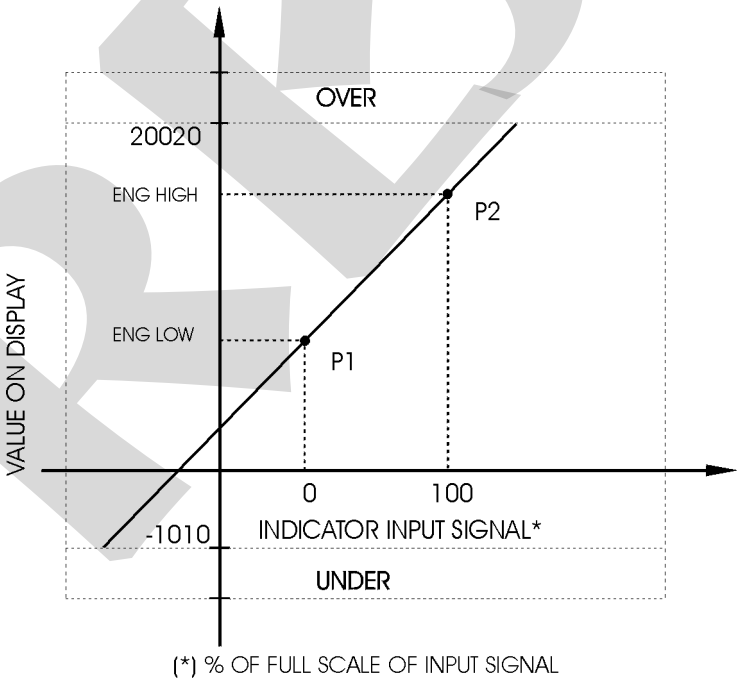


Fig. 13 - Linear input configuration

SQRT - allows presenting on the display the squared root of the linear input signal. The Cut-Off parameter given in % of the full scale makes input values below Cut-Off to be shown as zero scale. See figure 14.

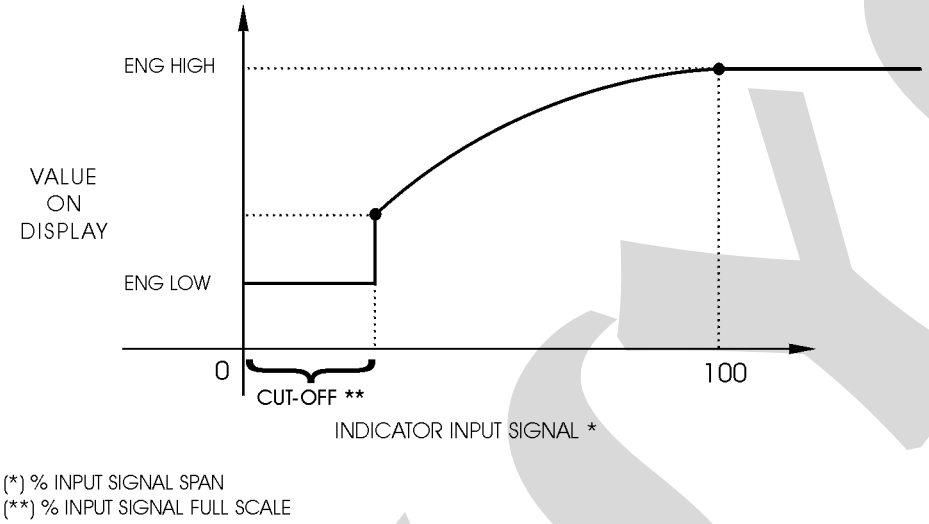


Fig. 14 - Input signal square root

DC.PT - sets the decimal point position for visualization of Engineering units in display. There are up to four decimal places for linear signals, and for temperature sensors there is one decimal place or none.

OFSET - allows the user to enter an off-set value in Engineering Units to be added to the measured variable.

B.OUT - When temperature sensors break (thermocouple or RTD) or there are wires disconnected, the display indicates burn-out. In this case, choosing the UP option for this parameter activates the high-alarms and the DOWN option activates the low-alarms.

UNITS - selects °C or °F for temperature indication.

NOTE: DMY-2030 *Light* INDICATOR PRESENTS ALREADY COLD JUNCTION COMPENSATION FOR THERMOCOUPLE MEASUREMENT.

Levels 2 and 3 - Alarms

The Indicator accepts up to two alarm devices: relays 1 and 2. The alarm condition can also be visualized by the couple of leds on the front panel, LED 1 and LED 2, corresponding to alarm 1 and 2, respectively.

Level 2, indicated by the “Alar 1” mnemonic, corresponds to the configuration of alarm 1 (relay 1 installed in output 2), and level 3, “Alar 2” mnemonic, to alarm 2 (relay 2 installed in output 3). The connectors on the Power Supply Board corresponding to each one of the relays are listed below:

Relay	Board Connectors
1	MOD3 (Output 2)
2	MOD4 (Output 3)

Each devise can be configured as high alarm or low alarm of the measuring variable, or can be deactivated. When configuring an alarm it is necessary to provide its setpoint (SP) and hysteresis (HIST). One can enable the latch (LATCH) and delay (DELAY) functions for each alarm.

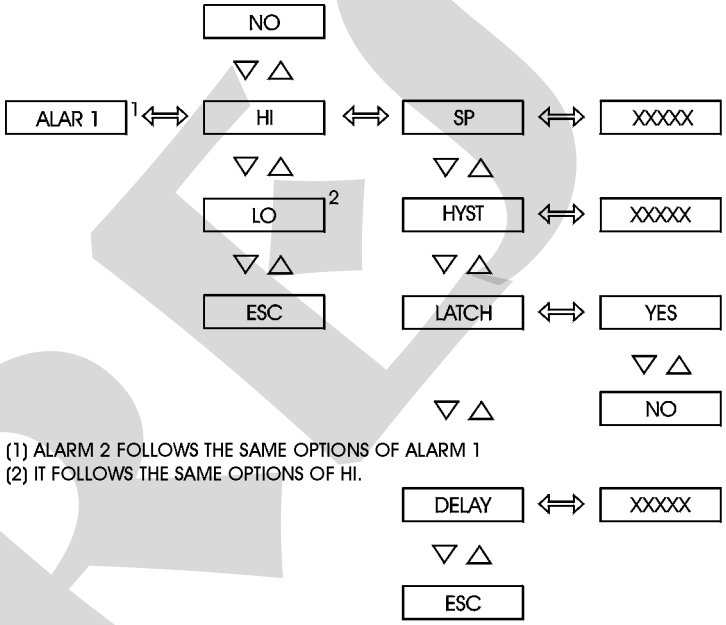


Fig. 15 - ALARM 1 and ALARM 2 levels options

LATCHED - configures the relay to be deactivated only after the alarm condition ends and the operator acknowledges this alarm. The acknowledgment of the alarm condition is performed within the normal operation mode by pressing the UP key until it is shown the mnemonic corresponding to the relay one is looking for. Note that it will be shown only the relays configured with latch operation which require acknowledgment in order to return to normal state. After reaching the relay, press the ENTER key. If there is no alarm condition for this relay, it will change its state. Continue pressing the UP key to return to operation mode.

DELAY - causes the relay to be activated only after a certain time interval defined by the user. Figure 16 below illustrates the delay operation for a high-alarm.

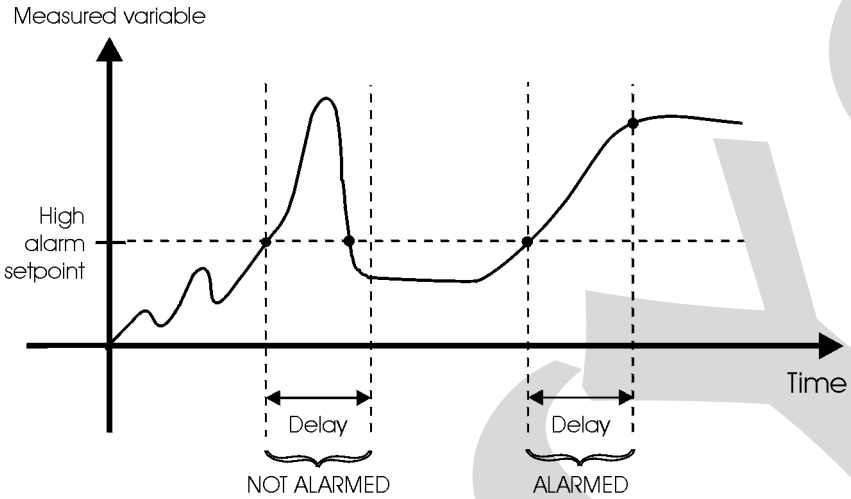


Fig.16 - Relay with delay

The table below refers to the ranges of the parameters shown in figure 15.

Mnemonic	Parameter	Range	Factory Value	Units
SP	alarm setpoint	-1009 to 20019	50.0	EU
HYST	alarm hysteresis	0 to 250	1.0	EU
DELAY	delay for activating the relay	0.0 to 3000.0	0.0	s

Once the alarms are configured, the user can see or set the values of their setpoints in the normal operation level. The mnemonics of alarm setpoints have a code which is explained below:

Mnemonic	Description
SP1.Hi	High-alarm setpoint for relay 1
SP1.Lo	Low-alarm setpoint for relay 1
SP2.Hi	High-alarm setpoint for relay 2
SP2.Lo	Low-alarm setpoint for relay 2

Note: The relays are powered on when the instrument is on and there is no alarm condition, and the relays are powered off when in alarm condition or in case of power failure.

Relay modules are provided with circuits for eliminating electrical arch (RC snubber). The snubbers are put in parallel with the relay contacts, by placing the jumpers J1 and J2 localized on the back of the relay board. When the jumpers are not placed, the relay contacts are kept without snubbers. The relay module is sent from factory with the jumpers not placed.

Note the position of the jumpers in the following figure. The jumpers may be localized on the front or the back side of the board, depending on its version.

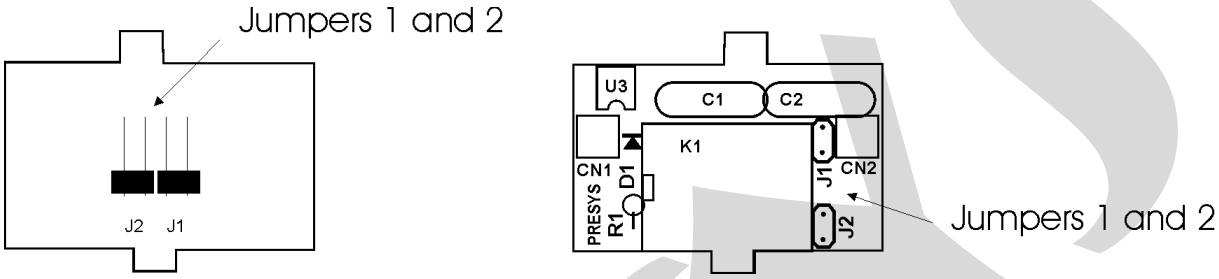


Fig. 17 - Jumpers for selection of snubbers on the relay board

Alarm and control relays are extremely critical in control and safety of industrial processes. In order to ensure the expected relay behavior, consider the following two loading conditions.

- High currents circulating through the relay contacts (from 20 mA to 3 A). When the relay switches high currents there is the occurrence of electrical arch which damage quickly the relay contacts. Besides, electrical noise is generated. In these conditions, it is recommended to use the RC snubbers which come with the relay module (placed jumpers).

- Low currents circulating through the relay contacts (less than 20 mA). The relays could not function properly when the jumpers are placed. In this case, the snubbers maintain a 4.5 mAac/9.0 mAac current when connected to a 120 Vac/220 Vac circuit. This current is enough, in certain casses, to power a horn or alarm lamps, preventing their deactivation. In this situation, there is no need to use the snubbers and the jumpers must be removed.

Level 4 - Output

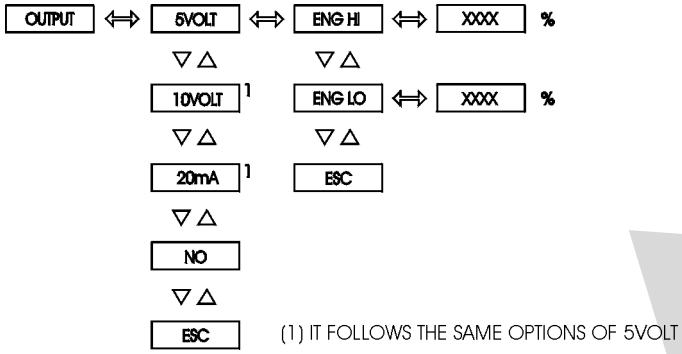


Fig. 18 - OUTPUT level options

The table below refers to the ranges of the parameters shown in figure 18.

Mnemonic	Parameter	Range	Factory Value	Units
ENG LOW	display indication associated to the output zero scale	-1009 to 20019	0.0	EU
ENG HIGH	display indication associated to the output full scale	-1009 to 20019	100.0	EU

Select the range of the retransmitter output as 4-20mA, 1-5V or 0-10V. The relationship between Engineering Unit (input signal indication on the display) and the signal from the output terminals is defined in the same way as mentioned for linear input scale configuration. Define two points as illustrated in figure 19. Eng Low is the indication on the display given in Engineering Units associated to zero scale of the output signal, and Eng High is the indication on the display given in Engineering Units associated to full scale of the output signal.

The Analog Output Module must be installed in MOD1 connector (Output 1) on the Power Supply Board and have the jumpers placed properly: no jumpers for 4-20mA output, jumper 1 for 1-5V and jumper 2 for 0-10V.

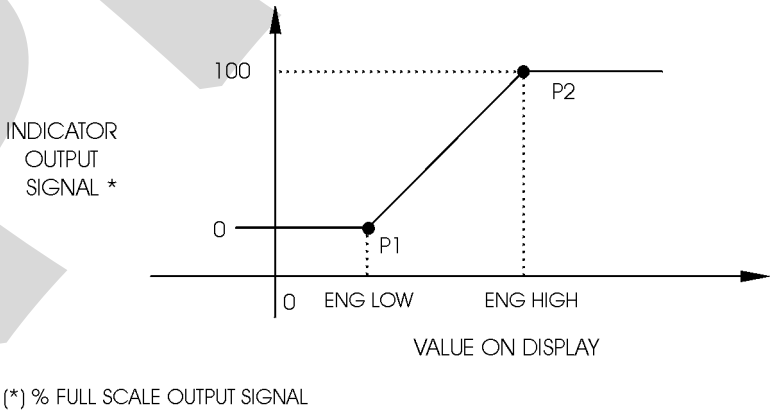


Fig. 19 - Analog output configuration

Level 5 - Calibration

DMY-2030 *Light* Indicator is accurately calibrated in factory and does not need periodic calibration in normal conditions. When calibration is required, follow the procedure below.

Disconnect the process signals of I/O terminals.

Before calibrating the instrument, keep it turned on for at least 30 minutes to warm up.

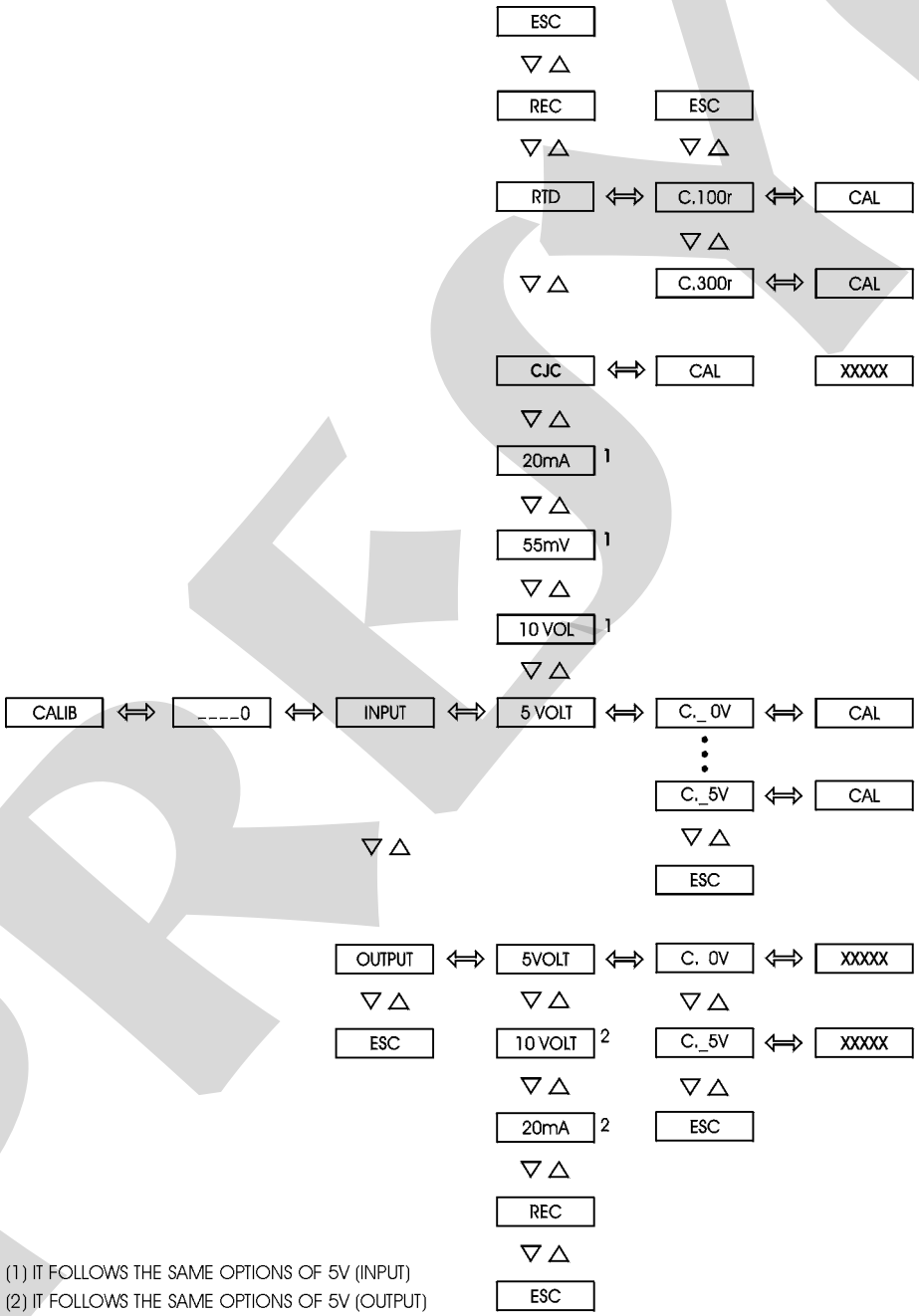


Fig. 20 - CALIBRATION level options

Input Calibration

Enter level 5 of Calibration and provide the password. **The password for entering this level is number 5.**

Select the input type to be calibrated. The display shows the mnemonics related to the references required for the calibration process. Apply the reference which corresponds to the mnemonic on the display and press ENTER (see the Connection Diagram). The Indicator performs the calibration process while the mnemonic CAL blinks on the display. The reference must remain connected to the input until the display stops blinking and presents the mnemonic corresponding to the reference.

Change to the next reference and press DOWN to select another point. Wait 1 minute at least and then press ENTER to start the calibration. Calibrate all references related to the input type being calibrated.

In order to return to normal operation mode move down through the configuration levels until reaching level zero.

Calibration of voltage input (5V, 55mV and 10V) or current (20mA)

Connect a voltage source or a current source to the appropriated input terminals (see the Connection Diagram) and apply the 6 voltage or current references asked by the Indicator in the calibration level.

Calibration of thermocouple input

The calibration of thermocouple input is divided in two steps. First calibrate the 0 to 55mV input and the 1 to 5V input. After the mV and V calibrations, select the CJC mnemonic in the calibration level to start the automatic calculation of the cold junction temperature. Meanwhile the CAL mnemonic blinks on the display. After a few seconds, the temperature is displayed in °C. This value is a first approximation of the cold junction temperature. The user must measure the temperature on the terminals for thermocouple connection and correct the value presented.

Calibration of 3-wire RTD input

When calibrating the 3-wire RTD input connect the 100 or 300 ohms precision resistances when asked by the Indicator.

Output Calibration

The retransmitter output can be calibrated by using the Indicator input.

Configure the jumper on the optional Analog Output Module according to the type of output (no jumpers for 20mA output, jumper 1 for 5V and jumper 2 for 10V) and make the connections from the output terminals to the input terminals corresponding to the type of output to be calibrated (see the Connection Diagram).

Enter level 5 of Calibration, choose the type of output (4 to 20mA, 1 to 5V or 0 to 10V) and press ENTER.

The display will show the mnemonic related to the first point of calibration. There are only two points for output calibration.

Press ENTER after the display shows the mnemonic related to first or second point of calibration, so that the display starts to show the output value. Then use the UP and DOWN keys to set the output value to the electric level indicated by the mnemonic. During the first point calibration (0mA, 0V) be careful not to saturate the output signal.

Finally, return to normal mode by moving down through the levels until reaching level zero.

Return to factory calibration

Enter level 5 of Calibration, select the REC option and press ENTER in order to recover the values from factory.

Level 6 - RS

Refer to the communication manual.