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LDB-P

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1. LDB-P Series

Large format industrial meters for process signals

Large format meters for long distance reading, for industrial applications. Different formats available with 4 and 6 digits, with 60 mm and 100 m digit height. Front keypad to access the configuration menu, and optional remote keypad.

Models to measure process signals in mA and Vdc. Provides excitation voltage configurable from +5 Vdc to +20 Vdc (max. 35 mA) to power up transducers. Scalable reading with selectable decimal point position.

Output and control options with 1, 2 and 3 relays, transistor outputs, controls for SSR relays, isolated analog outputs, communications in Modbus RTU, RS485 ASCII and RS232.

Sturdy metal housing with full IP65 protection. Internal connections by plug-in screw clamp terminals, and output through cable glands. Housing prepared for panel, wall and hanging mount.

- Configurable '**Fast access**' to selected functions with key 'UP' (▲) *(see section 1.12.11)*
- '**On power up**' for system protection on 'cold' start-up and / or activation of automatic tare *(see section 1.12.12)*
- up to 20 segments for signal linearization *(see section 1.12.8)*
- '**Field correction**' for fast and easy 'on the field' correction of offsets and signal drifts *(see section 1.12.3)*
- alarms with 1 or 2 setpoints, independent activation and deactivation delays, hysteresis, manual unlocking, ... *(see section 1.12.4)*
- '**Tare**' function for weight applications *(see section 1.12.14)*
- '**Peak & Hold**' for test break applications *(see section 1.12.9)*

Multiple display filters, memory of maximum and minimum reading, password protection, 5 brightness levels.

1.1 How to use this manual

If this is the first time you are configuring a large format meter, below are the steps to follow to install and configure the instrument.

1. Identify the instrument format *(see section 1.4)*
2. Power and signal connections
   - open the instrument *(see section 1.5)*
   - connect the power *(see section 1.7)*
   - connect the signal and select jumper mA/Vdc *(see section 1.8)*
   - close the instrument *(see section 1.5)*
3. Configure the instrument *(see section 1.12)*
   - select the signal range, the decimal point position and scale the reading *(see section 1.12.2)*
4. Advanced configuration (optional)
   - configure the instrument alarms *(see section 1.12.4)*
   - configure the display filters *(see section 1.12.7)*
   - configure the fast access *(see section 1.12.11)*
   - configure the excitation voltage *(see section 1.12.15)*
   - configure other functions : segment linearization *(1.12.8),* 'on power up' *(1.12.12)*, key 'LE' *(1.12.13)*, tare *(1.12.14)*, password *(1.12.16)*

Read all the manual sections in order to have a full and clear view of the characteristics of the instrument. Do not forget to read the installation precautions at section *1.17*.

5. If the instrument includes analog output (AO) or serial communications (RTU, S4, S2)
   - to include an option to an instrument see section *1.6*
   - to configure an installed option, access the option configuration menu *(see section 1.12.20)*
   - see section *2* for information regarding the output and control options available
6. Install the instrument
   - mount on panel, wall or hanging *(see section 1.16)*
   - adjust the brightness level according to your environmental needs *(see section 1.12.19)*

1.2 How to order

Format	Model	Power	Color	Option 1	Option 2	Option 3*	Others
LDB-24	P	H					

Format
- LDB-24 *(60 mm, 4 digits)*
- LDB-26 *(60 mm, 6 digits)*
- LDB-44 *(100 mm, 4 digits)*
- LDB-46 *(100 mm, 6 digits)*

Power
- -H *(85-265 Vac and 120-370 Vdc)*
- -L *(11-36 Vdc isolated)*

Color
- -R *(red led)*
- -G *(green led)*

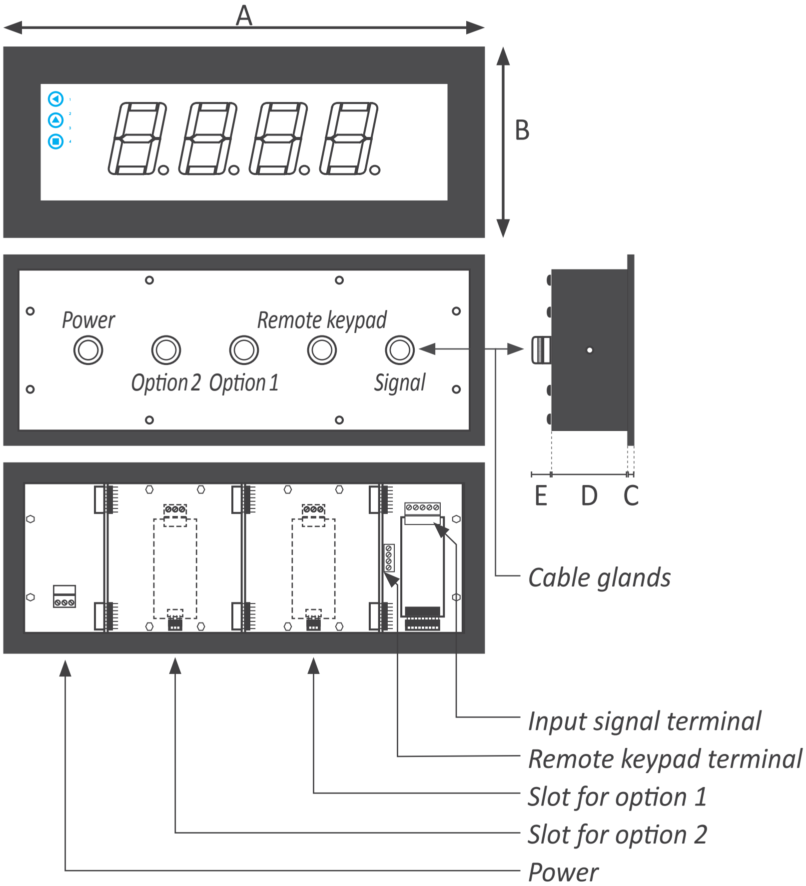
Option 1, Option 2, Option 3*
- -R1 *(1 relay)*
- -AO *(analog output)*
- -RTU *(Modbus RTU)*
- -S4 *(RS-485)*
- -S2 *(RS-232)*
- -T1 *(1 transistor)*
- -SSR *(1 control SSR)*
- -0 *(empty)*

**Option 3 available with formats LDB-26 and LDB-46*

1.3 Index

1.4 Sizes and formats

1.4.1 Format LDB-24

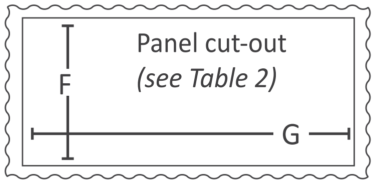


Size A	*340 mm*
Size B	*135 mm*
Size C	*3 mm*
Size D	*55 mm*
Size E	*25 mm*

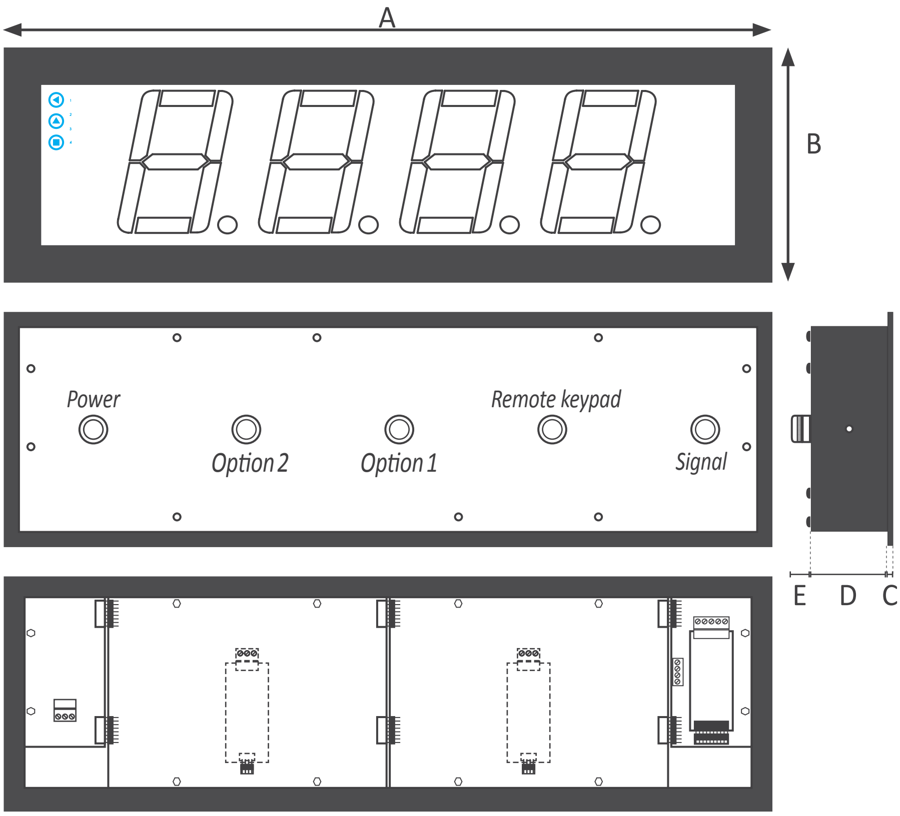
Table 1 - Sizes LDB-24

Cut-out G	*322 mm (±1)*
Cut-out F	*117 mm (±1)*

Table 2 - Panel cut-out LDB-24



1.4.2 Format LDB-44

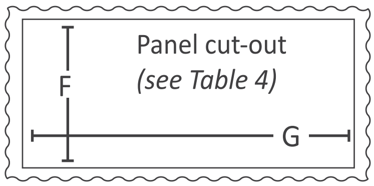


Size A	*542 mm*
Size B	*166 mm*
Size C	*3 mm*
Size D	*55 mm*
Size E	*25 mm*

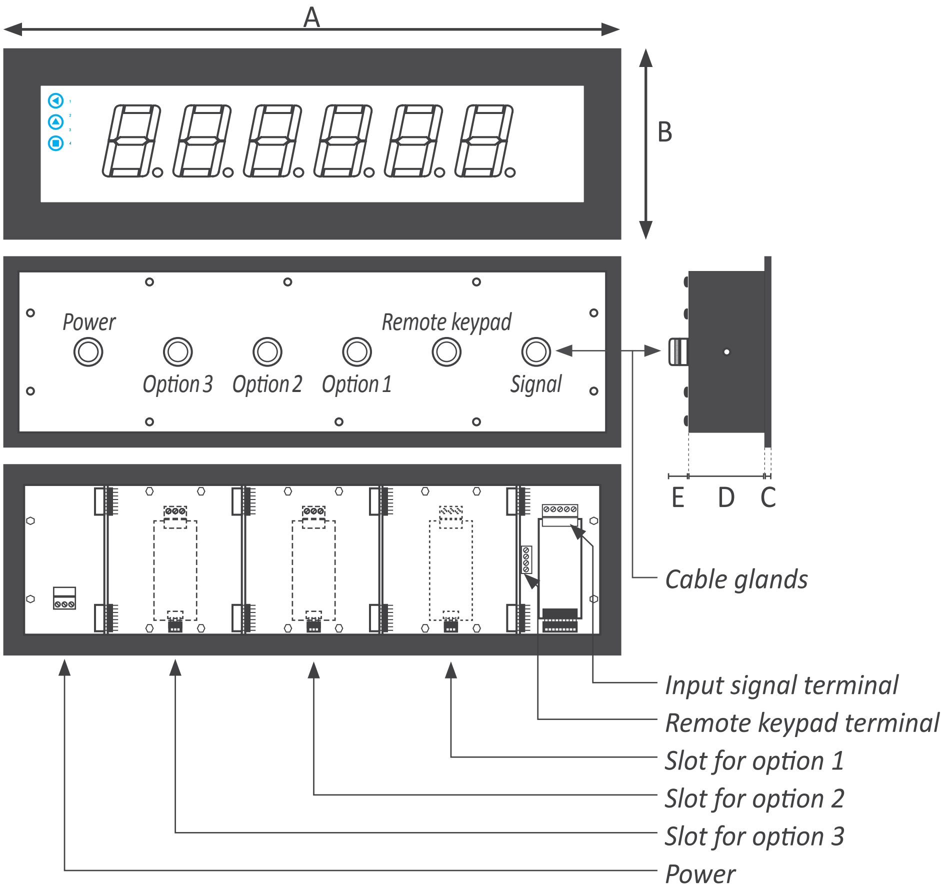
Table 3 - Sizes LDB-44

Cut-out G	*524 mm (±1)*
Cut-out F	*148 mm (±1)*

Table 4 - Panel cut-out LDB-44



1.4.3 Format LDB-26

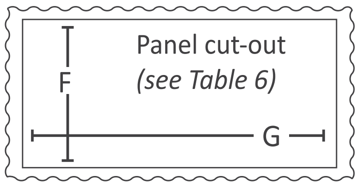


Size A	*436 mm*
Size B	*135 mm*
Size C	*3 mm*
Size D	*55 mm*
Size E	*25 mm*

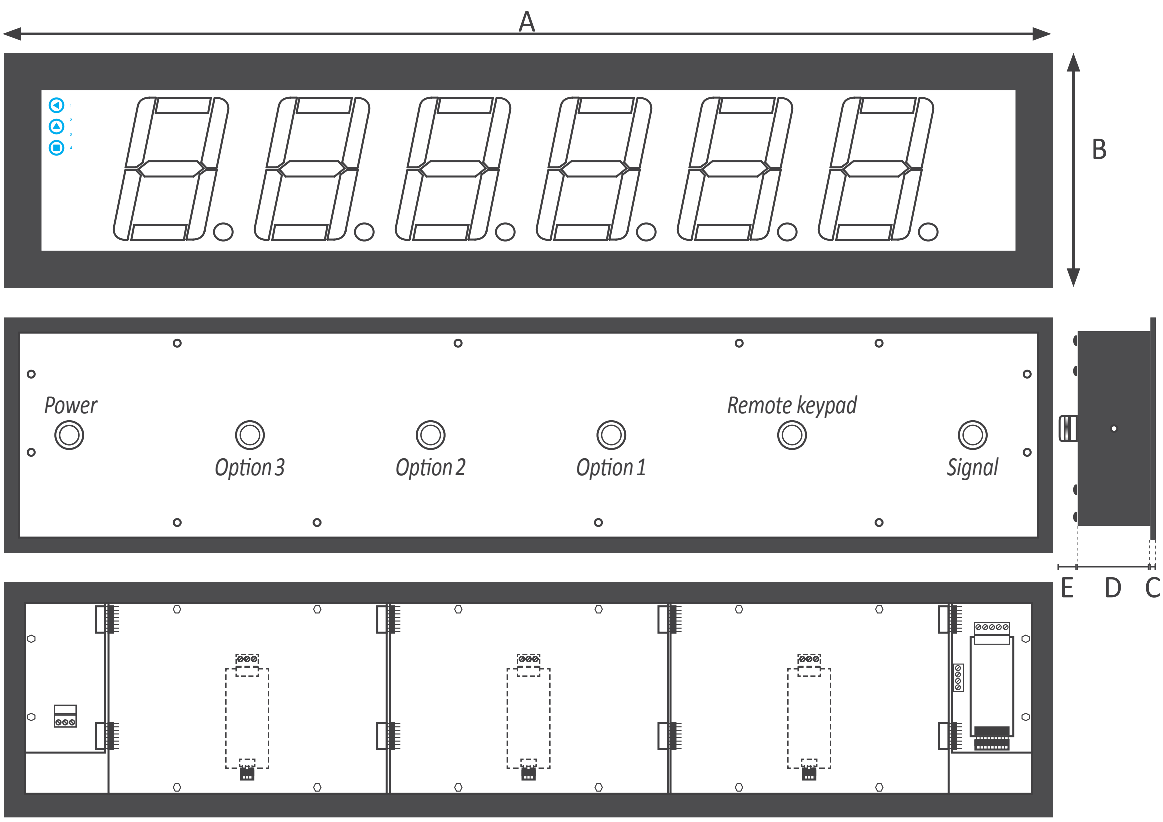
Table 5 - Sizes LDB-26

Cut-out G	*418 mm (±1)*
Cut-out F	*117 mm (±1)*

Table 6 - Panel cut-out LDB-26



1.4.4 Format LDB-46

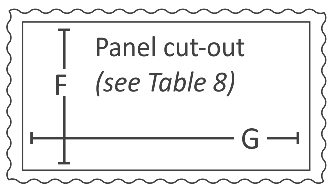


Size A	*740 mm*
Size B	*166 mm*
Size C	*3 mm*
Size D	*55 mm*
Size E	*25 mm*

Table 7 - Sizes LDB-46

Cut-out G	*722 mm (±1)*
Cut-out F	*148 mm (±1)*

Table 8 - Panel cut-out LDB-46



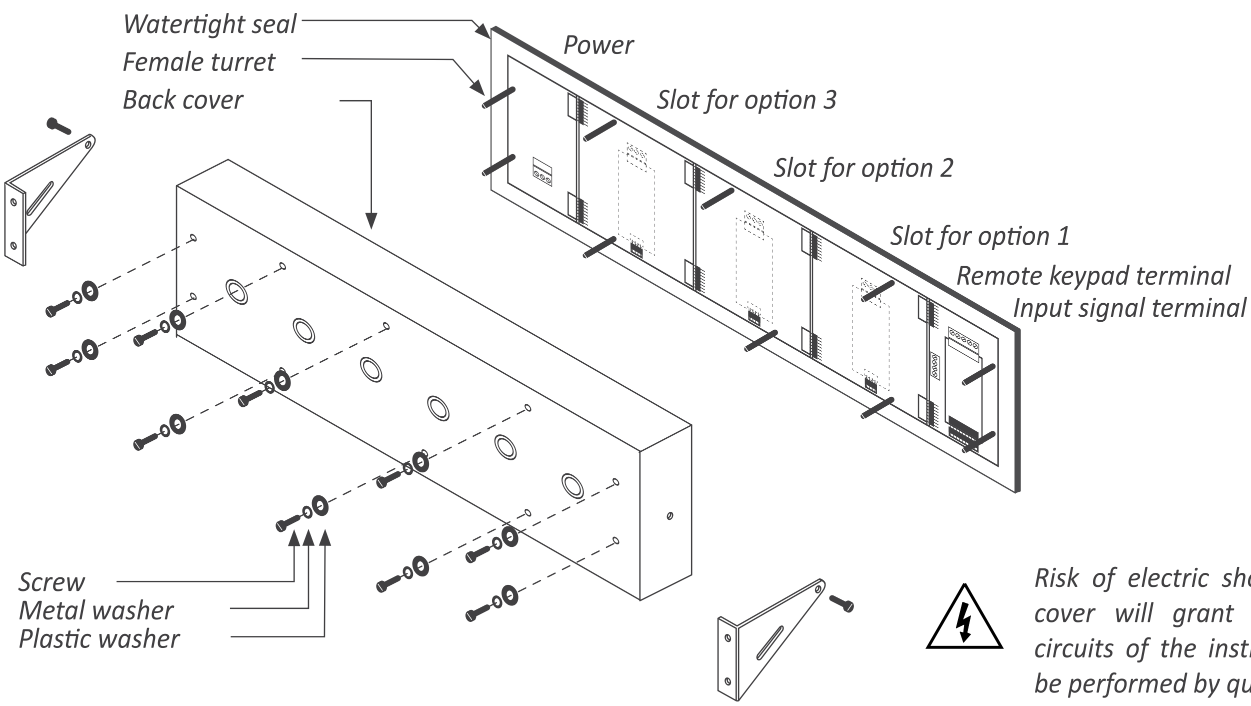
1.5 To access the instrument

To open the housing, remove the screws from the back cover. With each screw there is a metal washer and a plastic washer. Once the screws are out, remove the back cover.

The figure below shows the instrument internal structure for a LDB-26 format. It shows the location of the 3 slots for optional output and control modules, the power terminal and the input signal terminal.

To close the instrument, place the back cover, the screws, the metal washer and the plastic washer. The plastic washer is in contact with the back cover. Confirm that the screws are correctly turning inside the internal female screws.

To ensure a correct IP65 protection tighten the back cover screws with a strength between 30 and 40 Ncm, with the help of a dynamometer screwdriver.



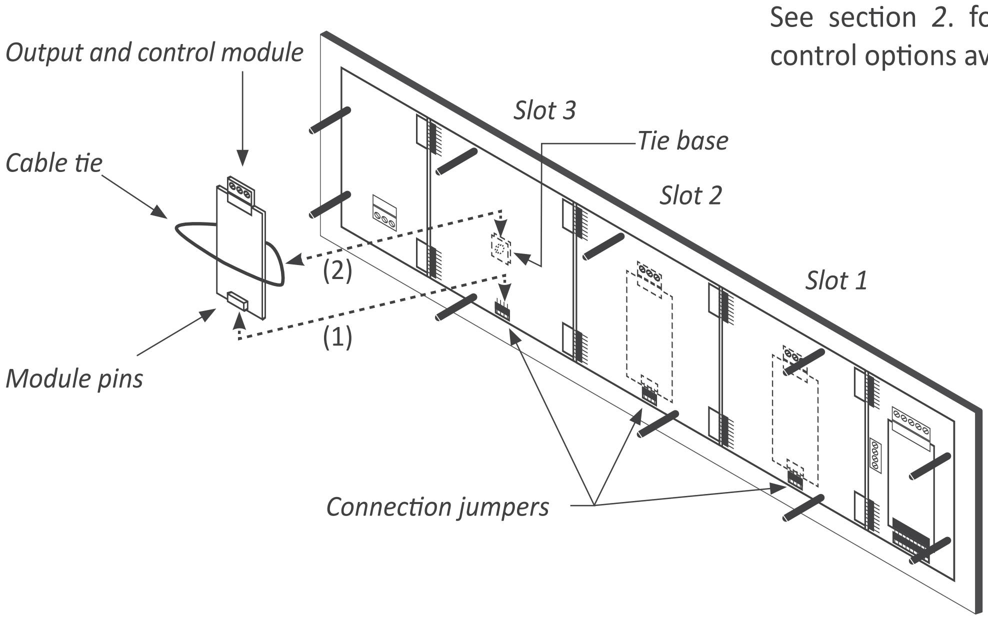
Risk of electric shock. Removing the back cover will grant access to the internal circuits of the instrument. Operation must be performed by qualified personnel only.

1.6 Modular system

Large format meters are designed with an internal modular architecture. The output and control modules are independent and can be installed by accessing the internal circuits of the instrument, and connecting the module to the connection jumpers of the selected slot.

Each module is provided with a cable tie to fix the module to the tie base. The input signal modules defines the instrument function and are exchangeable, switching a temperature meter to an impulse counter only by replacing the input signal module.

See section *2.* for information regarding the output and control options available



To install an output and control module

(1) insert the ‘module pins’ into the ‘connection jumpers’ in one of the free slots

(2) place the ‘cable tie’ into the ‘tie base’ and embrace the ‘module’ firmly, until it is fixed

1.7 Power connections and protective earth

1. Unscrew the screws from the back cover and remove the back cover *(see section 1.5).*
2. Pass the power cable through the power cable gland *(see section 1.4).*
3. Prepare the power cables so that the earth wire is 20 cm longer than the other cables *(see Figure 1).*

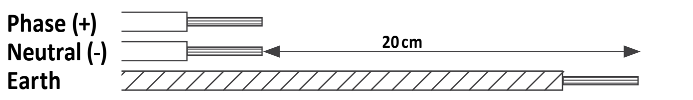


Figure 1 - Longer earth wire

4. Connect the earth wire to the internal fixed screw 'PE' *(see Figure 2)* located at the inside of the back cover. The instrument internally connects the back cover metallic structure with the front metallic structure through an internal green-yellow cable. *(dotted cable at Figure 3).*
5. Connect phase and neutral (in AC power) or positive and negative (in DC power) to the internal power terminal.
6. The connections label attached to the outside of the instrument has some free space left to write the color or local code for each cable.
7. To comply with security regulation 61010-1, add to the power line a protection fuse acting as a disconnection element, easily accessible to the operator and identified as a protection device.

Power 'H'	500 mA time-lag fuse
Power 'L'	1000 mA time-lag fuse

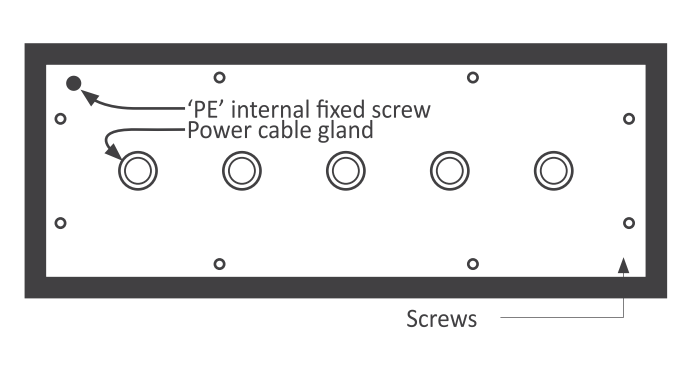


Figure 2 - Location of the internal 'PE' fixed screw and power cable gland

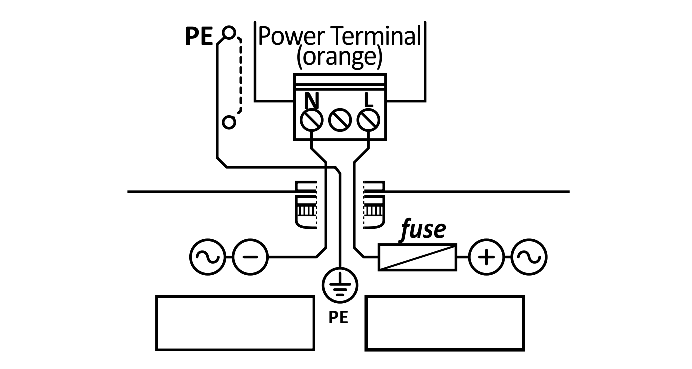
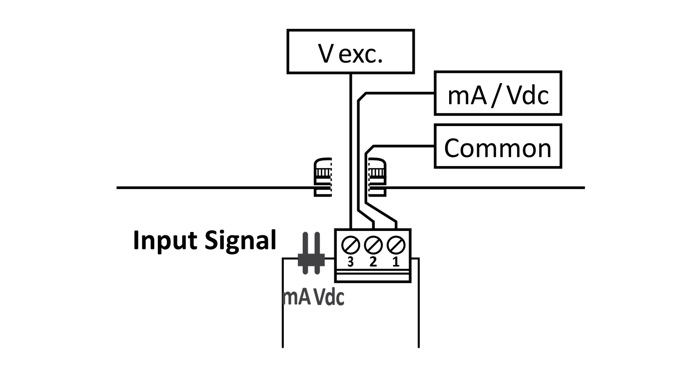


Figure 3 - Power connections

1.8 Input signal connections

1. Unscrew the screws from the back cover and remove the back cover *(see section 1.5).*
2. Locate the input signal terminal *(see section 1.4).* For signal connection examples see section 1.8.1
3. Pass the signal cable through the signal cable gland *(see section 1.4).*
4. Connect the input signal cables *(see Figure 4)* and select the appropriate jumper 'mA' or 'Vdc'.
5. The connections label attached to the outside of the instrument has some free space left to write the color or local code for each cable.



mA / Vdc	Input signal in mA or Vdc
Vexc	Excitation voltage to power the transducer
Common	
Jumper mA	Close for mA signals (and open Vdc)
Jumper Vdc	Close for Vdc signals (and open mA)

Figure 4 - Signal connections

1.8.1 Connection examples

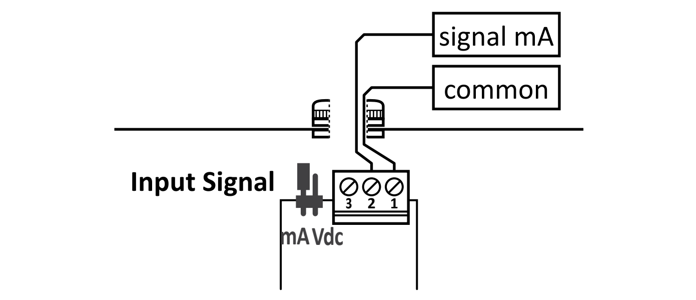


Figure 5 - Connections for active 4/20 mA signals (or ±20 mA)

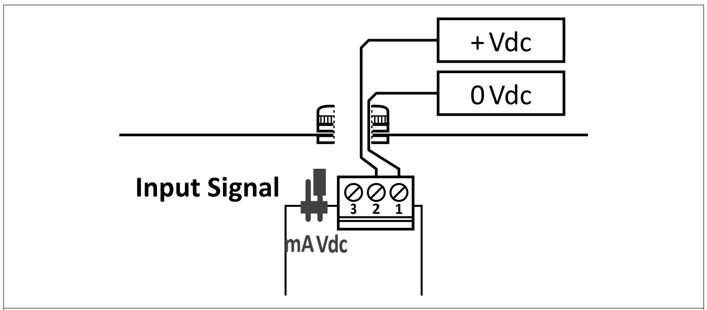


Figure 6 - Connections for active 0/10 Vdc signals (or ±10 Vdc)

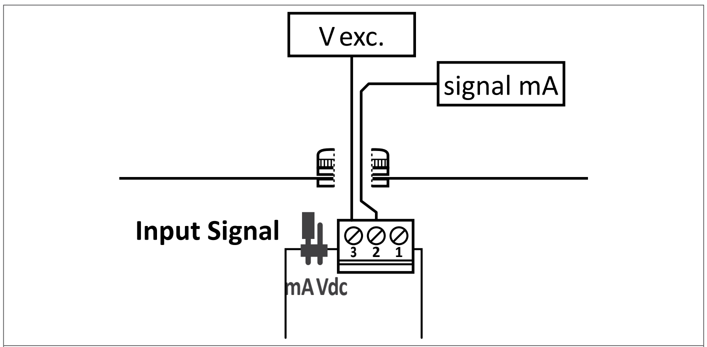


Figure 7 - Connections for passive 4/20 mA signals (or ±20 mA)

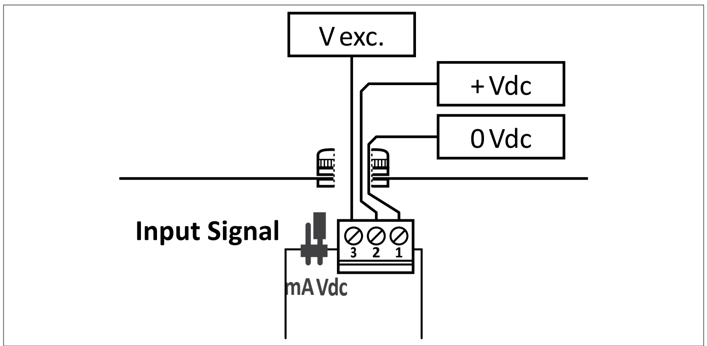
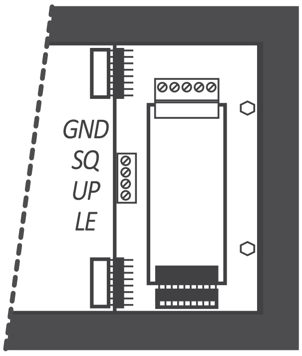


Figure 8 - Connections for passive 0/10 Vdc signals (or ±10 Vdc)

1.9 Connections for remote keypad

The 4 pin terminal located beside the input signal module allows to replicate a remote version of the front keypad. Connect 4 cables for front keys 'SQ' (■), 'UP' (▲) and 'LE' (◄) and for the common. Pass these cables through the 'remote keypad' cable gland *(see section 1.4).*



1.10 Functions included

Functions included		***Section***
Fast access menu	*yes, configurable*	*1.12.11*
Segment linearization	*up to 20 segments*	*1.12.8*
Display filters	*recursive 'steps' fixed digits left zeros*	*1.12.7*
'On Power Up'	*yes*	*1.12.12*
Excitation voltage	*configurable*	*1.12.15*
'Measure'	*yes*	*1.12.11*
Alarms	*simple or double setpoint activation delays deactivation delays hysteresis inverted relays locked alarms*	*1.12.4*
Field correction	*yes, for high and low signals*	*1.12.3*
'Peak & Hold'	*yes*	*1.12.7*
Tare function	*yes*	*1.12.14*
Memory	*maximum, minimum*	*1.12.11*
Password	*configuration locked*	*1.12.16*
Brightness	*configurable, 5 levels*	*1.12.19*

Table 9 - Functions included

1.11 Technical specifications

Digits

number of digits	4 or 6 *(see Table 10)*
digit	7 segments
view angle	120º
color	red or green
digit height	*(see Table 10)*

Reading

max., min.	*(see Table 10)*
decimal point	configurable
overrange / underrange	flash reading
acquisitions	*(see Table 10)*
display refresh	*(see Table 10)*
step response	*(see Table 10)*

Input signal

signal ranges	4/20 mA, ±20 mA 0/10 Vdc, ±10 Vdc
maximum oversignal	100 mA or 100 Vdc
input impedance	11 R en mA, 932 K en Vdc
accuracy	0.05 % o 0.03 % *(see Table 10)*
thermal drift offset	10 ppm / ºC
thermal drift span*	25 ppm / ºC *(*included offset thermal drift)*
wire section	max. 0.5 mm^2

Excitation voltage

voltage output	+20 Vdc, +15 Vdc, +10 Vdc, +5 Vdc selectable by menu
accuracy	±5 %
maximum current	35 mA
protection	against short circuit

Power

power 'H'	85 to 265 Vac and 120 to 370 Vdc isolated (isolation 2500 Vac)
power 'L'	11 to 36 Vdc isolated (isolation 1500 Vdc)
consumption	*(see Table 10)*
fuses	*(see section 1.7)*
wire section	max. 2.5 mm^2

Configuration	front keypad with 3 keys remote keypad *(see section 3.1)*
Output and control options	relay output, analog retransmission, Modbus RTU, ... *(see section 2)*

Mechanical

IP protection	full IP65 housing
mounting	panel, wall , hanging *(see section 1.16)*
connections	cable gland outputs internal plug-in screw terminals
housing material	textured iron, black painted methacrylate front filter
weight	*(see Table 10)*
front sizes	*(see section 1.4)*
panel cut-out	*(see section 1.4)*
depth	*(see section 1.4)*

Temperature

operation	from 0 to +50 ºC
storage	from -20 to +70 ºC
warm-up time	15 minutes

	Format LDB-24	*Format LDB-44*	*Format LDB-26*	*Format LDB-46*
Number of digits	*4*	*4*	*6*	*6*
Digit height	*60 mm*	*100 mm*	*60 mm*	*100 mm*
Reading distance	*25 meters*	*50 meters*	*25 meters*	*50 meters*
Accuracy (% F.S.)	*0.05 %*	*0.05 %*	*0.03 %*	*0.03 %*
Acquisitions / second	*15*	*15*	*3.5*	*3.5*
Refresh / second	*15*	*15*	*3.5*	*3.5*
Step response (0 % to 99 % of signal)	*120 mSec.*	*120 mSec.*	*300 mSec.*	*300 mSec.*
Slots for output and control options	*2*	*2*	*3*	*3*
Maximum / minimum reading	*9999 / -1999*		*999999 / -199999*	
Consumption (without options installed)	*3 W*	*5.25 W*	*3.5 W*	*5.5 W*
Consumption (with options installed)	*5 W*	*6.75 W*	*5.5 W*	*7 W*
Weight	*2200 gr.*	*2500 gr.*	*3500 gr.*	*4500 gr.*

Table 10 - Technical specifications associated to format

1.12 Configuration

1.12.1 How to operate the menus

The instrument has two menus accessible to the user :

'*Configuration menu*' (key 'SQ') (■)

'*Fast access*' menu (key 'UP') (▲)

Configuration menu

The '*configuration menu*' modifies the configuration parameters to adapt the instrument to the application needs. To access the '*configuration menu*' press for 1 second the 'SQ' (■) key. This access can be blocked by activating the '**Password**' ('**PASS**') function. While operating the '*configuration menu*', the alarm status is 'hold' to the status it had before accessing the menu, and the output and control modules remain in '*error*' state. When leaving the '*configuration menu*', the instrument applies a system reset, followed by a brief disconnection of the alarms and the output and control modules. Functionality is then recovered.

For a detailed explanation on the '*configuration menu*' see the following sections, and for a full view of the '*configuration menu*' see section *1.15*.

'*Fast access*' menu

The '*fast access*' menu is an operator configurable menu, providing fast and direct access to the most usual functions of the instrument with a single key pad stroke. Press key 'UP' (▲) to access this menu.

See section *1.12.11* for a list of selectable functions for the '*fast access*' menu in this instrument. The '**Password**' ('**PASS**') function does not block access to this menu. Accessing and modifying parameters in the '*fast access*' menu does not interfere with the normal functionality of the instrument, and it does not generate any system reset when validating the changes.

Operating with the front keypad inside the menus

Key 'SQ' (■) - press the 'SQ' (■) key for 1 second to access the '*configuration menu*'. Inside the menu, the 'SQ' (■) key acts as an '*ENTER*'. It enters into the menu option selected, and when entering a numerical value, it validates the number.

Key 'UP' (▲) - press the 'UP' (▲) key to access the '*fast access*' menu. Inside the menu,the 'UP' (▲) key sequentially moves through the available parameters and menu entries. When entering a numerical value, it modifies the digit selected by increasing its value to 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

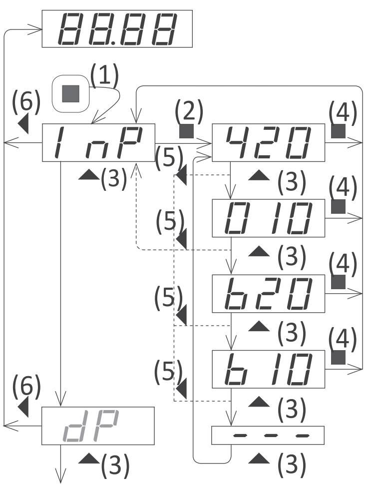
Key 'LE' (◀) - press the 'LE' (◀) key to activate the configured special functions associated to this key. Inside the menu, the 'LE' (▲) acts as an 'ESCAPE'. It leaves the selected menu level and eventually, by leaving all menu levels, it leaves from the configuration menu. Then changes are applied and the instrument is back to normal function. When entering a numerical value, it selects the active digit, and the value is then modified by key 'UP' (▲).

'Rollback'

After 30 seconds without interaction from the operator, the instrument will rollback and leave the '*configuration menu*' or the '*fast access*' menu. All changes will be discarded.

Instruments with 4 and 6 digits

The configuration menus included in this document show values for a 6 digit instrument. In case of 4 digit instruments, note that maximum reading values should be 9999 instead of 999999 to 9999 and minimum reading values should be -1999 instead of -199999.



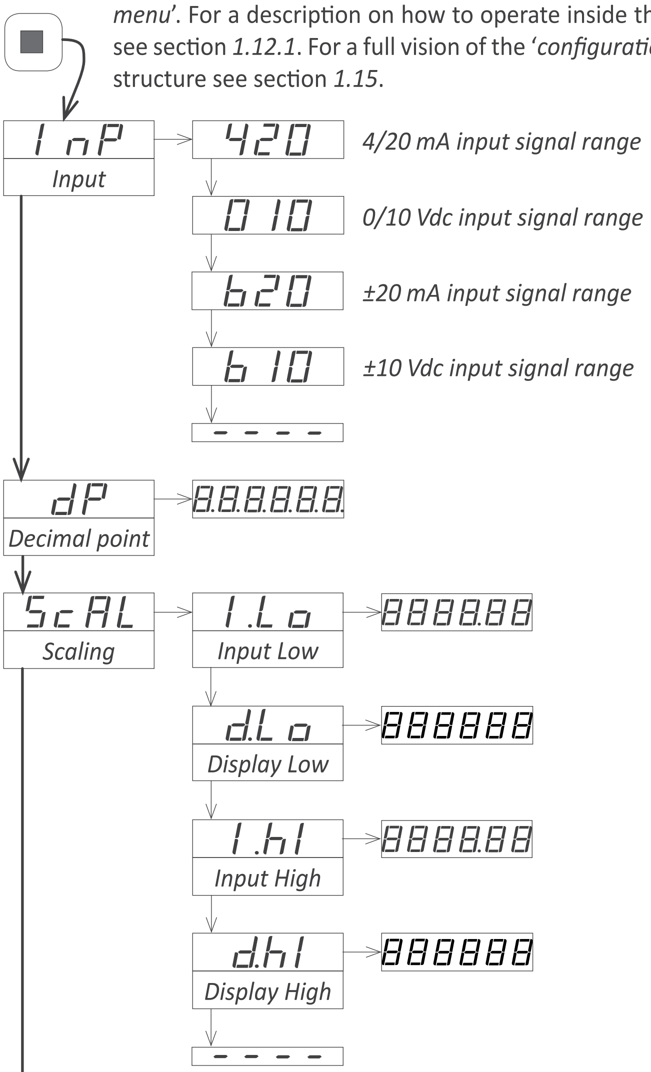
Example of operation inside the '*configuration menu*'.

1. The (■) key enters into the 'configuration menu'.
2. The (■) key enters into the '**InP**' menu.
3. The (▲) key moves through the menu options.
4. The (■) key selects the desired range and returns to the '**InP**' menu.
5. The (◀) key leaves the actual menu level and moves to the previous menu level.
6. The (◀) key leaves the 'configuration menu'. Changes are applied and saved at this moment.

Figure 9 - Example of operation inside the 'configuration menu'

1.12.2 Initial set-up

Press 'SQ' (■) for 1 second to access the '*configuration menu*'. For a description on how to operate inside the menus see section *1.12.1*. For a full vision of the '*configuration menu*' structure see section *1.15*.



To configure the initial set up of the instrument, select the input signal range, the decimal point position, and scale the reading.

At the '**Input**' ('**Inp**') parameter, select the input signal range.

- select '**420**' for 4/20 mA signals. Close the 'mA' jumper *(see section 1.8)*. It accepts active and passive signals. See connections at section *1.8.1*.
- select '**010**' for 0/10 Vdc signals. Close the 'Vdc' jumper *(see section 1.8)*. It accepts active and passive signals. See connections at section *1.8.1*.
- select '**b20**' for ±20 mA signals. Close the 'mA' jumper *(see section 1.8)*. It accepts active and passive signals. See connections at section *1.8.1*.
- select '**b10**' for ±10 Vdc signals. Close the 'Vdc' jumper *(see section 1.8)*. It accepts active and passive signals. See connections at section *1.8.1*.

At the '**Decimal point**' ('**dP**') parameter, select the decimal point position. Move the decimal point with the 'LE' (◂) key.

At the '**Scaling**' ('**ScAL**') menu, configure the reading fot the input signal range selected. The parameters are:

- at the '**Input Low**' ('**I.Lo**') parameter configure the low input signal, in mA or Vdc, with two decimals.
- at the '**Display Low**' ('**d.Lo**') parameter configure the reading associated to the low input signal configured before.
- at the '**Input High**' ('**I.hI**') parameter configure the high input signal, in mA or Vdc, with two decimals.
- at the '**Display High**' ('**d.hI**') parameter configure the reading associated to the high input signal configured before.

Range	*Input Low ('I.Lo')*	*Display Low ('d.Lo')*	*Input High ('I.hI')*	*Display High ('d.hI')*
4/20 mA	*4.00 mA*	*0*	*20.00 mA*	*1000*
0/10 Vdc	*0.00 Vdc*	*0*	*10.00 Vdc*	*1000*
±20 mA	*-20.00 mA*	*-1000*	*20.00 mA*	*1000*
±10 Vdc	*-10.00 Vdc*	*-1000*	*10.00 Vdc*	*1000*

Table 11 - Scaling parameter default values for each signal range

1.12.3 Field correction

The '**Field correction**' ('**F.cor**') function corrects the instrument reading once installed on the field. Reading offsets and deviations can occur due to inaccuracies on the real signal. The 'field correction' function offers a fast and easy way to compensate for this inaccuracies.

Generate the low input signal and if the reading is not as desired, activate the 'low level' field correction function. The instrument will configure itself so that with the actual input signal, the reading is as indicated at the '**d.Lo**' parameter. Field correction can be applied to the low input signal and to the high input signal.

Example: a 0/10 Bar pressure transmitter provides a 4/20 mA output signal. At installation, the operator detects that the reading at 0 Bar is 0.34 Bar and that at 10 Bar the reading is 10.72 Bar.

Apply the 'Field correction' / 'F.Lo' function while reading is 0.34 Bar and the instrument will automatically correct the reading to 0.00 Bar. Afterwards, apply the 'Field correction' / 'F.Hi' function while reading is 10.72 Bar and the instrument will automatically correct the reading to 10.00 Bar.

1.12.4 Alarms

The instrument manages 3 independent internal alarms, each one controlling the activation of an optional relay, transistor or control SSR output.

Optional modules *(see section 2)* are installed at the free slots inside the instrument *(see section 1.4)*. LDB-24 and LDB-44 formats have 2 free slots for output and control modules, while LDB-26 and LDB-46 formats have 3 free slots for output and control modules.

The instrument has 3 front leds that reflect the state of the 3 internal alarms. These leds are only for local help during installation, as they are not appropriate for long distance reading.

Each alarm controls the activation of the relay, transistor or control SSR installed on its associated slot, and the front led.

• **Configurable parameters**

Each alarm has several parameters for configuration, starting with the usual setpoint, hysteresis and maximum (alarm active when reading is higher than setpoint) or minimum (alarm active when reading is lower than minimum) alarm types *(see Figure 10)*.

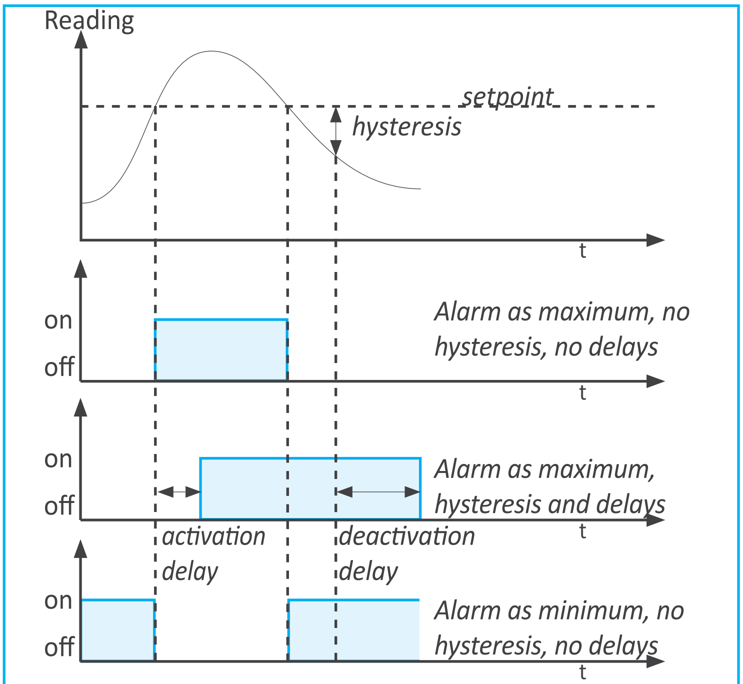


Figure 10 - Examples of alarm with 1 setpoint

• **Activation and deactivation delays**

Each alarm can configure independent activation and deactivation delays. These delays affect the alarm as a whole, and the delay will affect the front led and the associated relay.

• **Second setpoint**

Configuring a second setpoint creates 'windowed alarms'. The windowed alarm controls with a single relay output if the reading is inside or outside the values defined *(see Figure 11)*.

• **Inverted relay**

Activate the 'inverted relay' function to invert the activation logic of the associated relay.

• **'Locked alarms'**

Activate the 'locked alarms' function will force the operator to interact with the instrument when an alarm has been activated. Once activated, the alarm will remain locked at active state, even if the reading returns to a value below setpoint, until the operator manually unlocks the alarms pressing the front key 'LE' (or the remote key 'LE', see section *3.1*).

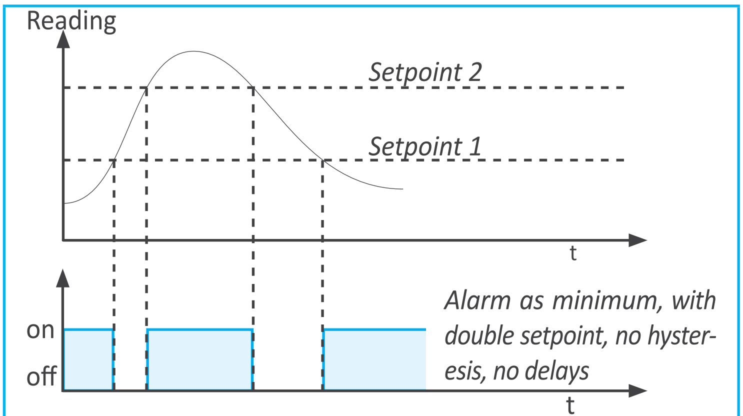
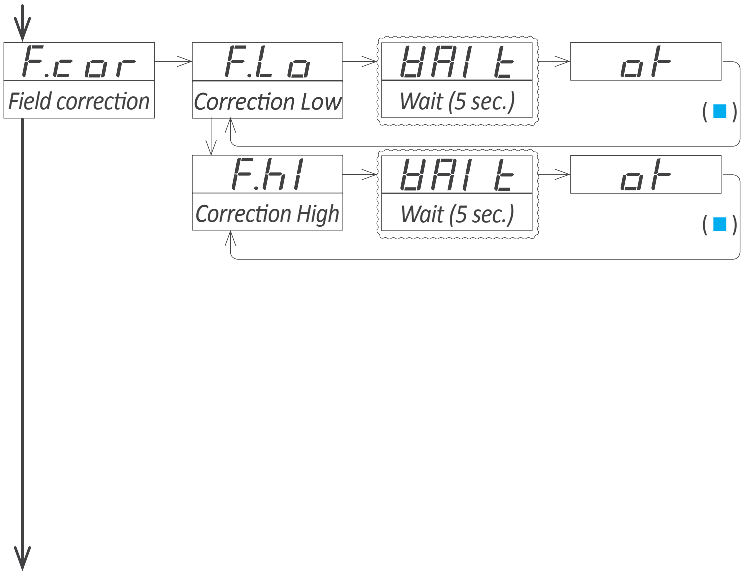


Figure 11 - Example of alarm with 2 setpoints

1.12.5 Field correction menu



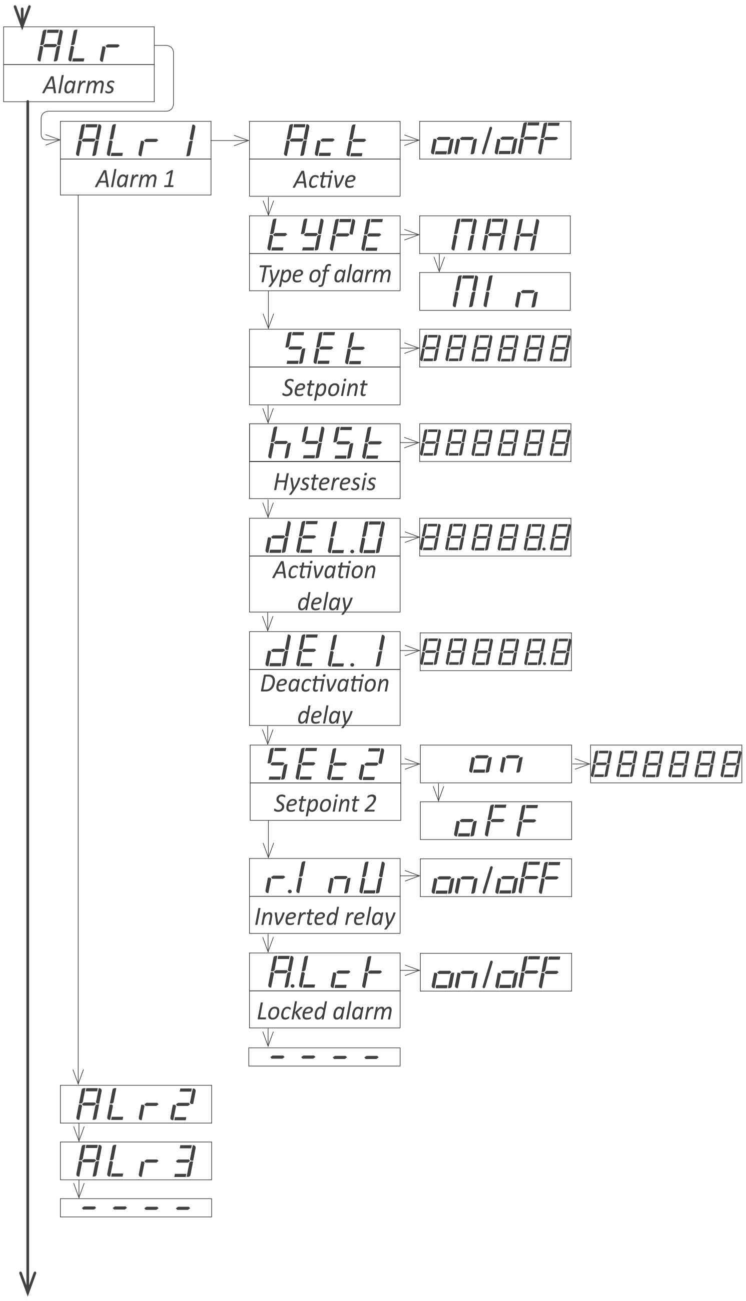
To operate the '**Field Correction**' ('**F.cor**') function for the offset, generate the low input signal and access the '**Field Low**' ('**F.Lo**') function. The instrument starts the correction process:

- message with the measurement type ('**mA**' or '**Vdc**')
- message '**wait**' ('**WAIt**') in flash mode
- after 5 seconds, message '**ok**' ('**oK**')
- at this point, press key 'SQ' (■)
- the menu returns to menu entry '**Field Low**' ('**F.Lo**')

The instrument has read the input signal value and automatically applies the value to the '**Input Low**' ('**I.Lo**') parameter.

For the high signal, repeat the process generating the high input signal and access the '**Field High**' ('**F.hI**') function. The instrument reads the input signal value and automatically applies the value to the '**Input high**' ('**I.hI**') parameter.

1.12.6 Alarms configuration menu



To configure the alarm, access the alarm menu ('**ALr1**', '**ALr2**' or '**ALr3**') and configure the following parameters :

- at the '**Active**' ('**Act**') parameter select '**on**'
- at the '**Type of alarm**' ('**TypE**') parameter select '**MAX**' for maximum alarm (activates when reading is higher than setpoint), or '**MIn**' for minimum alarm (activates when reading is lower than setpoint).
- at the '**Setpoint**' ('**SEt**') parameter configure the alarm activation point. Parameter value is accessible through 'fast access' *(see section 1.12.11).*
- at the '**Hysteresis**' ('**hySt**') parameter select the hysteresis value. Hysteresis applies to the alarm deactivation. Alarm deactivates once the reading is beyond the setpoint plus the hysteresis value. Hysteresis prevents relay switching in case of signal fluctuations close to the setpoint value.
- at the '**Activation delay**' ('**dEL.0**') parameter configure the delay to apply before the alarm is activated. Delay starts to count once the setpoint is reached. Value from 0.0 to 99.9 seconds.
- at the '**Deactivation delay**' ('**dEL.1**') parameter configure the delay to apply before the alarm is deactivated. Delay starts to count once the setpoint is reached plus the hysteresis value. Value from 0.0 to 99.9 seconds.
- to work with 'windowed alarms' *(see Figure 11)* activate '**Setpoint 2**' ('**SEt2**') to '**on**' and then configure the desired second setpoint value. Second setpoint must always be higher in value than the first setpoint.
- at the '**Inverted relay**' ('**r.Inv**') parameter select '**on**' to invert the activation logic of the relay. Relay is inactive when alarm is active, and relay is active when alarm is inactive.
- at the '**Locked alarm**' ('**A.Lck**') parameter select '**on**' to block the automatic alarm deactivation. Alarm deactivation must be performed manually, by pressing the 'LE' front button *(see section 1.12.13)*.

1.12.7 Display filters

The instrument provides several functions to personalize the reading of the instrument, in order to stabilize the measure and minimize the signal noise. The available functions are:

- the ‘**Fixed Digits**’ (‘**FIX.d**’) allows to fix each digit to a fixed value. Usually one or more digits to the right are fixed to ‘0’. To fix a digit. To fix a digit, all digits to its right must be also fixed. Value ‘-’ means that the digit is not fixed.

- the ‘**Average filter**’ (‘**AVr**’) applies a recursive filter to the reading function, in order to reading oscillations due to noisy signals.

- the ‘**Steps**’ (‘**StEP**’) function defines the reading to be done in steps of 1, 2, 5, 10, 20 or 50 counts.

  Example - selecting a step of 20 configures the reading to change in steps of 20 counts (‘1420’, ‘1440’, ‘1460’, ...).

- the ‘**Left Zero**’ (‘**LZEr**’) function lights all zeros to the left.

- the ‘**Memory of maximum**’ (‘**MAX**’) function displays the maximum reading value stored in memory and allows to reset this value. This parameter is directly accessible using key ‘UP’ (▲) *(see section 1.12.11).*

- the ‘**Memory of minimum**’ (‘**MIn**’) function displays the minimum reading value stored in memory and allows to reset this value. This parameter is directly accessible using key ‘UP’ (▲) *(see section 1.12.11).*

- the ‘**Peak & hold**’ (‘**P.hLd**’) function visualizes and holds the maximum reading. For test-break applications, where the meter always increases its value until the unit under test breaks and the signal falls down. The meter maintains the maximum reading before the signal fell down. Press any front key to free the reading or configure automatic release of the reading after a predefined time.

To free the ‘hold’ reading, press any of the front key pad or wait the time configured at the ‘**time**’ parameter.

Time 0	hold disabled (‘Off’)
Time 1 a 3999	seconds waiting
Time 4000	infinite hold

While ‘hold’ is active, the instrument alarms are still associated to the input signal, therefore still providing control to disconnect the application once the test has finished.

Example: to test a container, a fluid under pressure is inserted into the container. A pressure transducer provides a 4/20 mA proportional to the pressure applied. When the container breaks, the measured pressure drops sharply. The ‘Peak&Hold’ function retains the maximum reading on display.

1.12.8 Segment linearization

The instrument provides a segment linearization function that allows up to 20 segments to linearize non linear signals.

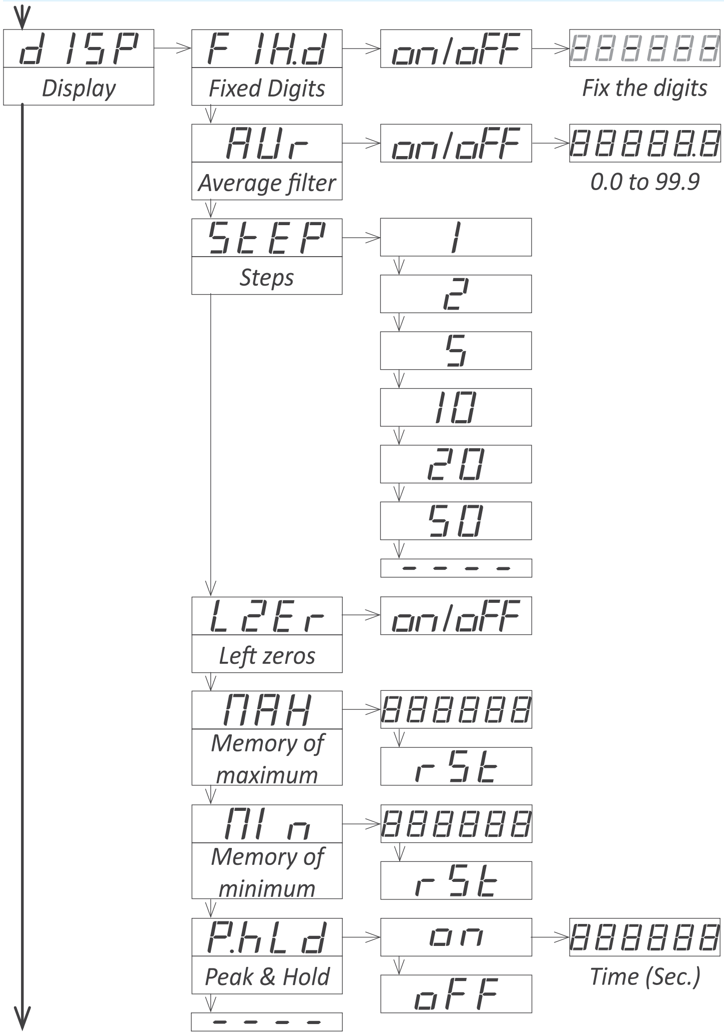
Example: a tank with a non regular shape is used for water storage. The tank has a pressure transducer, and it provides a signal proportional to the level of water in the tank. Using the segment linearization function the reading can be scaled to provide information related to the volume of water in the tank, instead of the height of water in the tank.

The operator needs to define the number of segments to be used, between 2 and 20. Then the operator must define the signal and reading value for each of the points. Once all the points are entered, activate the linearization and the instrument will check the consistency of the data entered.

If the instrument detects problems with the data introduced, an error message will appear together with the point were the error was found. The function will not be activated until all errors have been solved.

The configuration can be erased activating the function ‘reset’.

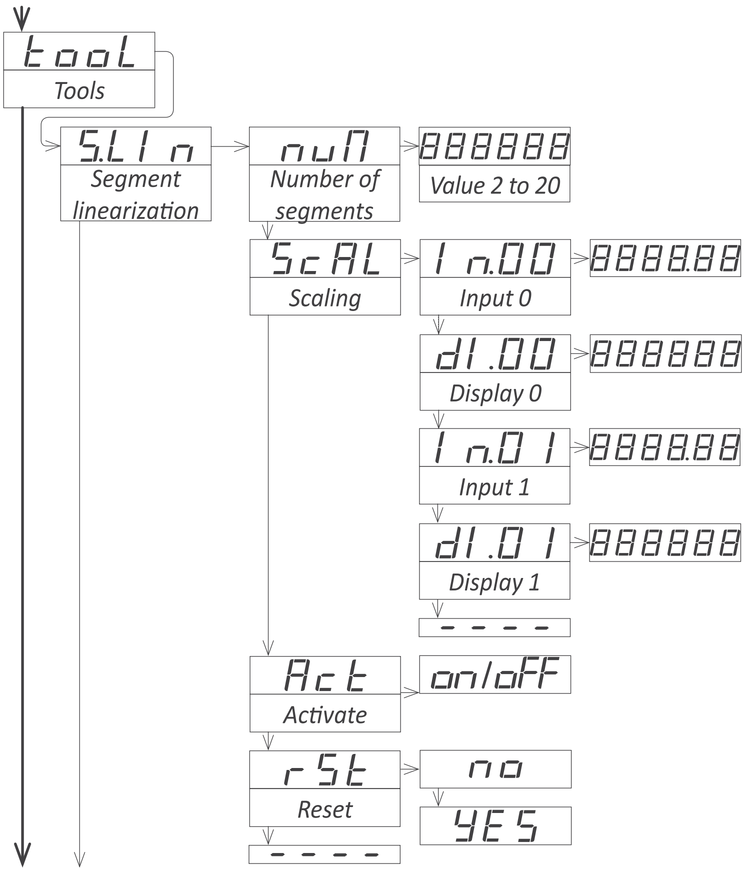
1.12.9 Display filters configuration menu



All display functions are grouped under the '**Display**' menu. For more information relating the functions listed below see section *1.12.7.*

- at the '**Fixed Digits**' ('**FIX.d**') parameter, fix the digits to a fixed value. The '-' value means that the digit is not fixed.
- at the '**Average filter**' ('**Avr**') parameter select '**on**' and configure the filter strength between '0.0' and '99.9'. Higher values activate stronger filter. Stronger filters slow down the reading changes.
- at the '**Steps**' ('**StEP**') parameter configure the value for the steps reading changes.
- at the '**Left Zeros**' ('**LZEr**') parameter select '**on**' to activate the left zeros.
- the '**Memory of maximum**' ('**MAX**') and '**Memory of minimum**' ('**MIn**') are access to the memory values. To reset the value, select the '**rSt**' entry and press 'SQ' (■).
- at the '**Peak & hold**' ('**P.hLd**') menu select '**on**' to activate the function and configure the 'hold' time.

1.12.10 Tools configuration menu



Inside the '**Tools**' ('**tooL**') menu several different functions are grouped.

At the '**Segment Linearization**' ('**S.LIn**') define up to 20 segments to linearize non-linear signals. See section *1.12.8* for more information.

- at the '**Number of segment**' ('**nuM**') parameter introduce the number of segments. Value between '2' and '20'.
- at the '**Scaling**' ('**ScAL**') parameter introduce the input signal valur ('**Input**') and the associated reading value ('**Display**') for each point, starting at point '0', up to the total number of segments previously defined..
- select '**Activate**' ('**Act**') to '**on**' to activate the segments previously configured. Select '**oFF**' to disable the segment linearization and return to standard scaling *(see section 1.12.2)*
- select '**Reset**' ('**rSt**') to '**yES**' deletes the actual segment linearization.

1.12.11 Fast access

The '*fast access*' is an operator configurable menu. The operator can access this menu with a single press of the front key 'UP' (▲). The configured menu entries will be accessible. Eligible parameters to be accessed by this menu are:

• access to the alarm setpoints through the 'UP' (▲) key allows to read and modify the values.

• access to the maximum and minimum alarms through the 'UP' (▲) key allows to read and reset the values. To reset the memory values: visualize the value on display, press the 'UP' (▲) key, when the '**rSt**' message appears, press 'SQ' (■) . The instrument will return to the memory visualization. Press the 'LE' (◀) key to exit his menu.

• access to the 'tare' parameter through the 'UP' (▲) key allows to visualize the value (in display counts) of the tare applied *(see section 1.12.14)*.

• access to the 'measure' function through the 'UP' (▲) key visualizes the actual signal at input terminals, without scaling, directly in mA or Vdc value. The 'measure' function provides a direct 'voltmeter' or 'miliammeter' integrated into the instrument, to be used for troubleshooting. It helps to easily confirm if the received signal is correct or not.

The '*fast access*' menu is not affected by the password function. This means that the configuration menu can be password blocked, while some configured functions or parameters can still be accessible to the operator through the '*fast access*' menu.

• **Super fast access**

If only a single function is selected for the '*fast access*' menu, pressing the the 'UP' (▲) key will shortly display the function name and then automatically jump to the function value.

1.12.12 'on power up' function

The '**On Power Up**' ('**on.Pu**') functions allows to define a series of actions to activate when the instrument restarts after a power loss. Functions available are a delay so the instrument waits a defined time before starting to measure and control, and an automatic tare of the reading. The functions will apply only after a restart due to power-loss, they will not apply after a restart due to changes in configuration.

Delaying the measure and control functions gives additional time to elements of the system who are slower, so they can start completely before the instrument begins to acquire signal and control the outputs.

While on delay mode, the instrument shows all decimal points lightened and flashing, all alarms are deactivated, and there is no signal acquisition or communications control. When the delay time is over, the instrument starts its normal functioning.

1.12.13 'LE' key

The 'LE' (◀) key at the front of the instrument can be configured to activate several functions. Only one function can be assigned to the 'LE' (◀) key. Eligible functions are the 'tare' function *(see section 1.12.14)* and the alarm unlock function *(see section 1.12.4)*.

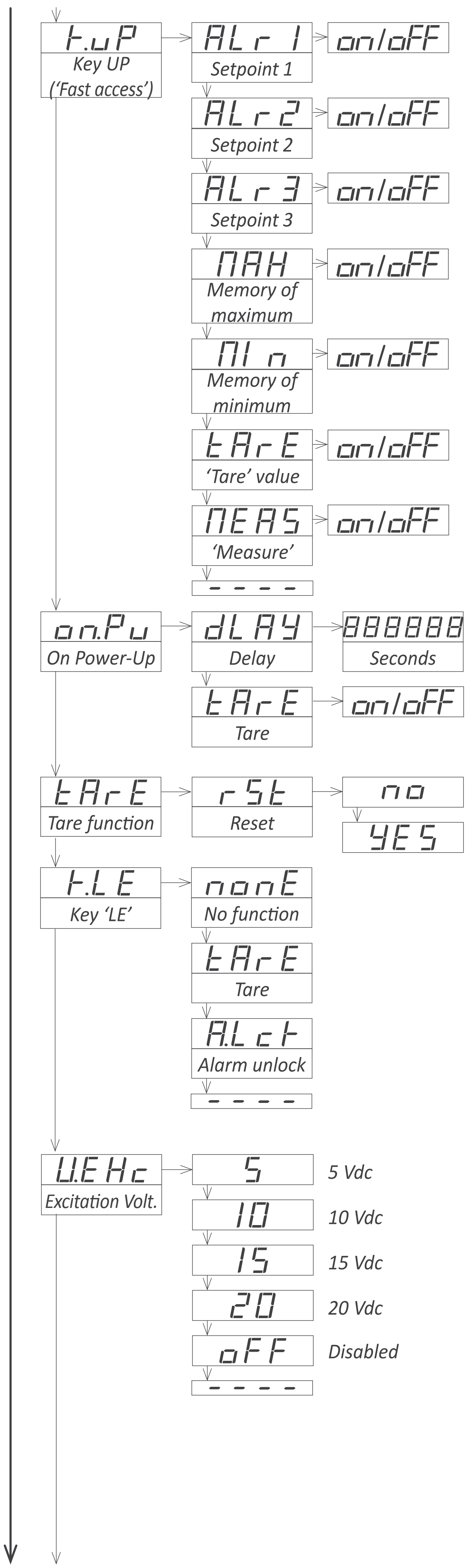
1.12.14 'Tare' function

The '**Tare function**' ('**tArE**') allows to use the instrument with weight applications. The tare function assigns the actual input signal value to a display of '0', by means of an internal offset. The scaling of the instrument is not modified, only additional counts are added to the offset.

The tare function is accessible through the front 'LE' (◀) key *(see section 1.12.13)*. The actual value of the tare is accessible through the front 'UP' (▲) key *(see section 1.12.11)*. To reset the tare to '0' counts activate the 'reset' parameter of the 'tare' menu

1.12.15 Excitation voltage

The '**Excitation Volt**' ('**V.EXc**') allows to select the excitation voltage value to 5 Vdc, 10 Vdc, 15 Vdc or 20 Vdc. Select '**oFF**' to disable the excitation voltage.



At the '**Key UP ('fast access')**' ('**K.uP**') menu configure which functions and parameters will be accessible through the 'fast access' menu. Select '**on**' to activate each function. For more information see section *1.12.11.*

- the '**Setpoint 1**' ('**ALr1**') function allows to visualize and modify the alarm 1 setpoint through the 'fast access' menu.
- the '**Setpoint 2**' ('**ALr2**') function allows to visualize and modify the alarm 2 setpoint through the 'fast access' menu.
- the '**Setpoint 3**' ('**ALr3**') function allows to visualize and modify the alarm 3 setpoint through the 'fast access' menu.
- the '**Memory of maximum**' ('**MAX**') or '**Memory of minimum**' ('**MIn**') functions allow to visualize the maximum or minimum reading value stored in memory.
- the '**tare value**' ('**tArE**') allows to visualize the value of the applied tare.
- the '**Measure**' ('**MEAS**') function allows to visualize the actual input signal in mA or Vdc, without scaling.

The '**On Power Up**' ('**on.Pu**') menu assigns functions to be applied when the instrument starts after a power loss. For more information see section *1.12.12.*

- at the '**Delay**' ('**dLAy**') parameter configure the time the instrument will wait before starting normal functionality. Time between 0 and 200 seconds.
- at the '**tare function**' ('**tArE**') parameter select '**on**' to activate an automatic tare every time the instrument starts after a power loss..

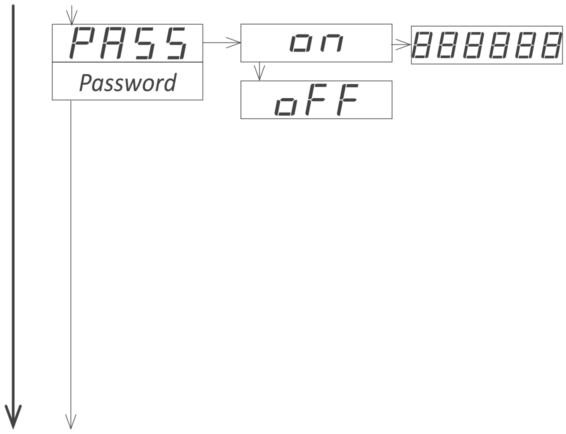
- the '**Tare**' ('**tArE**') allows to reset the value of the tare. See section *1.12.14* for more information on the 'tare' function..

The 'LE' (◂) key at the front of the instrument can be configured to activate several functions. For more information see section *1.12.13.*

- the '**No function**' ('**nonE**') parameter assigns no function.
- the '**Tare**' ('**tArE**') parameter assigns the tare function.
- the '**Alarm unlock**' ('**A.Lck**') parameter assigns the manual alarm unlocking, when the '**Locked alarms**' ('**A.Lck**') is active *(see section 1.12.4)*.

At the '**Excitation Volt.**' ('**V.EXc**') menu select the excitation voltage of the instrument. For more information see section *1.12.15.*

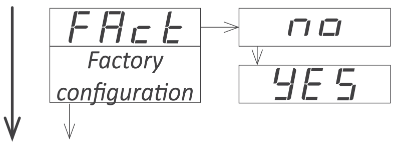
1.12.16 Password configuration



The password function blocks access to the configuration menu. The '*fast access*' menu is not affected by the password function. This means that the configuration menu can be password blocked, while some configured functions or parameters can still be accessible to the operator through the '*fast access*' menu.

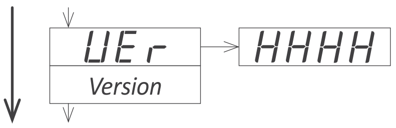
To active the '**Password**' function select '**on**' and introduce the 6 digits code. The code will be requested when trying to access the 'configuration menu' (front key 'SQ' (■)).

1.12.17 Default factory configuration



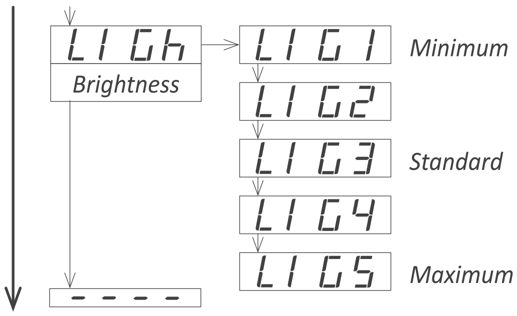
At the '**FActory configuration**' ('**FAct**') menu select '**yes**' to activate the default factory configuration. See section *1.13* for a list of default parameters.

1.12.18 Firmware version



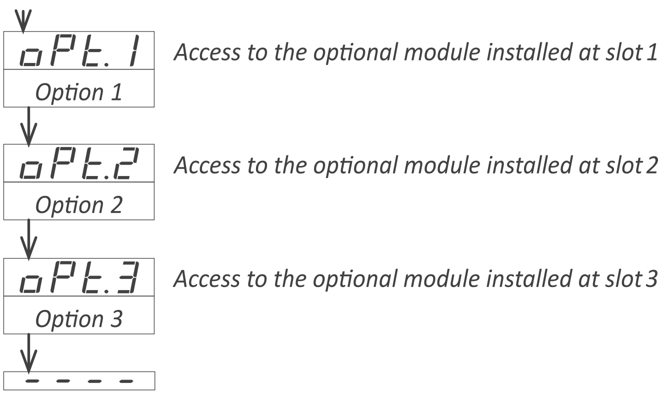
The '**Version**' ('**VEr**') menu informs about the firmware version installed on the instrument.

1.12.19 Brightness configuration



At the '**Brightness**' ('**LIGh**') menu select the intensity level for the display . Use this function to adapt the brightness to match other instruments in the vicinity or to the darkness or clarity of your environment.

1.12.20 Access to the options configuration menu



The output and control options are optional modules that can be installed at the instrument. Formats LDB-24 and LDB-44 have 2 free slots for output and control options, while formats LDB-26 and LDB-46 have 3 free slots *(see section 1.4)*.

Several of these optional modules have their own configuration menu embedded. The '**OPt.1**', '**OPt.2**' and '**OPt.3**' menu entries give access to the configuration menu of the option installed.

See section *2* for a list of available output and control modules

1.13 Factory configuration

Range	4/20 mA
Scaling and decimal point	4/20 mA = 0/100.0
Alarms 1,2 and 3	
Active	off (disabled)
Type	as maximum
Setpoint	1000
Hysteresis	0 counts
Activation delay	0.0 seconds
Deactivation delay	0.0 seconds
Setpoint 2	off
Inverted relay	off
Locked alarms	off
Display	
Fixed digits	off
Average	off
'Steps'	off
Left zeros	off
Maximum memory	-199999
Minimum memory	999999
'Peak&Hold'	off
Tools	
Segment linearization	off
Fast access	off
'On Power Up'	
Delay	0 seconds
Tare	off
Ley 'LE'	no function
Excitation voltage	+20 Vdc
Password	off
Brightness	3

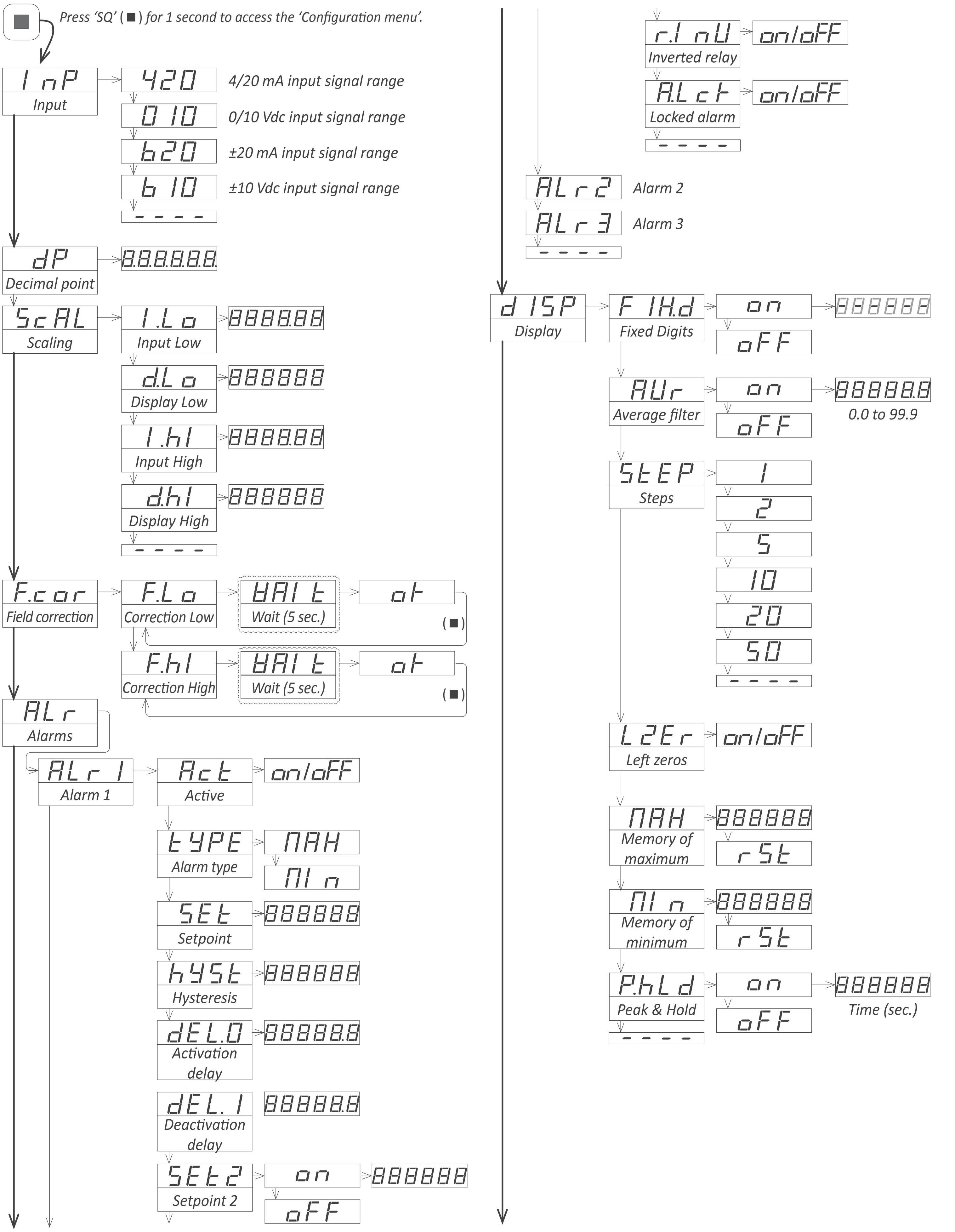
1.14 Messages and errors

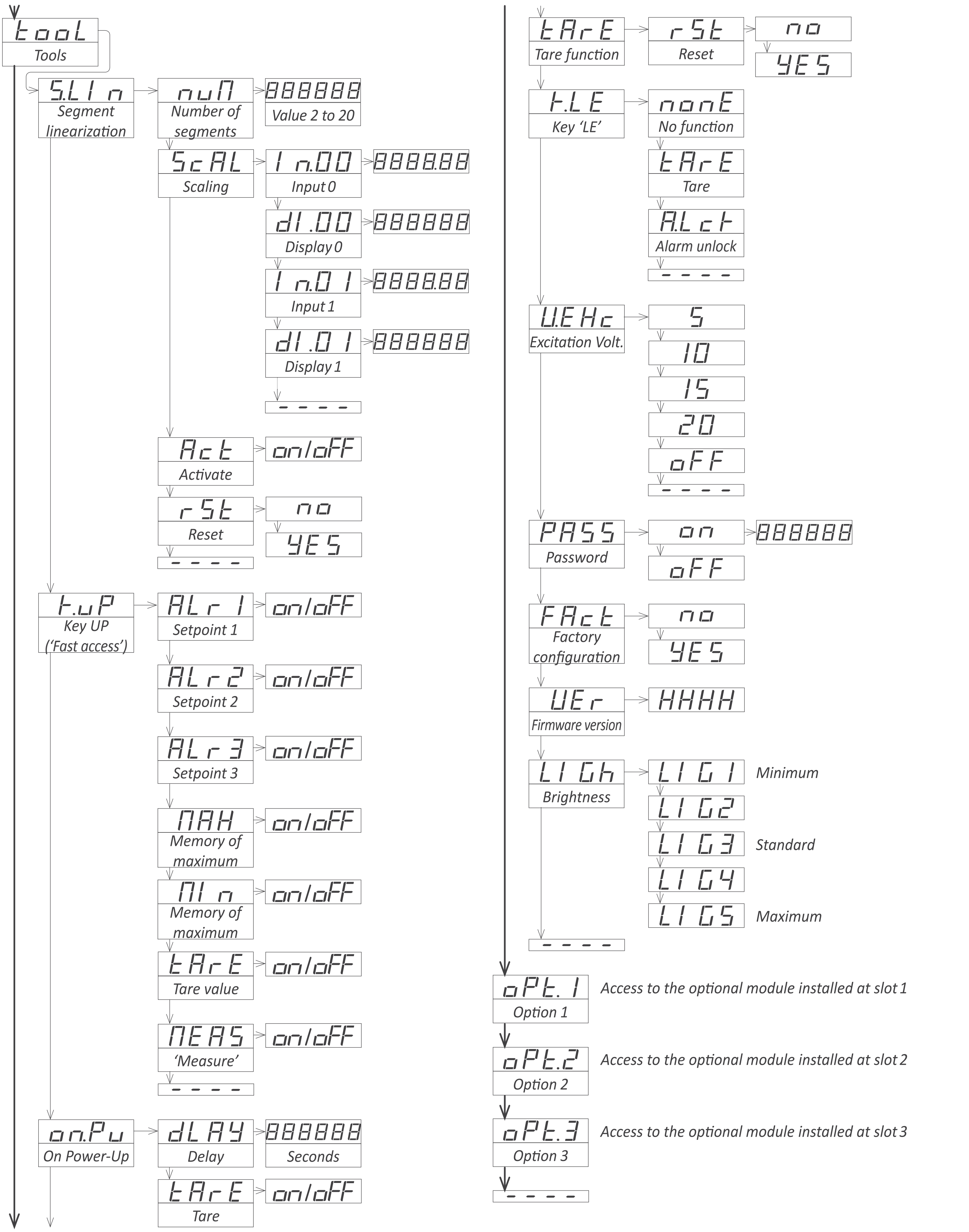
Error messages are informed flashing on display (examples for 6 digit formats).

Messages and errors	
'h.udr' *'h.oVr'*	hardware underrange ('**h.udr**') / overrange ('**h.ovr**'). Input signal is lower / higher than the minimum / maximum signal the instrument can detect.
'd.udr' *'d.oVr'*	display underrange ('**d.udr**') / overrange ('**d.ovr**'). The display is displaying the maximum / minimum value possible (-199999 / 999999).
'hoLd'	the '**hold**' function is active. Display is on hold.
'P.hLd'	the '**Peak&Hold**' function is active.
*'Err.0'**	at the '**scaling**' ('**ScAL**') menu entry, the defined slope is higher than '5000' (slope almost vertical) or higher than 10000 for 6 digit formats. Default values are activated. **Slope= [(dhI-dLo)/(IhI-ILo)]*
'Err.1'	incorrect password.
'Err.2'	when accessing an '**oPt.X**' menu entry, the installed module can not be recognized.
'Err.3'	at '**segment linearization**' ('**SLin**') menu entry, the input signal values are not in growing succession.
*'Err.5'**	at the '**segment linearization**' ('**SLin**') menu entry, the defined slope of one segment is higher than '5000' (slope almost vertical) or higher than 10000 for 6 digit formats. **Slope= [(dhI-dLo)/(IhI-ILo)]*
'Err.8'	excitation voltage overload.

Table 12 - Messages and error codes

1.15 Full configuration menu




tool
Tools
S.Lin
Segment linearization
nuM
Number of segments
888888
Value 2 to 20
ScAL
Scaling
In.00
Input 0
8888.88
dI.00
Display 0
888888
In.01
Input 1
8888.88
dI.01
Display 1
888888
- - - -
Act
Activate
on/oFF
rSt
Reset
no
YES
- - - -
t.uP
Key UP
('Fast access')
ALr1
Setpoint 1
on/oFF
ALr2
Setpoint 2
on/oFF
ALr3
Setpoint 3
on/oFF
MAH
Memory of maximum
on/oFF
MIn
Memory of maximum
on/oFF
tArE
Tare value
on/oFF
MEAS
'Measure'
on/oFF
- - - -
on.Pu
On Power-Up
dLAY
Delay
888888
Seconds
tArE
Tare
on/oFF
tArE
Tare function
rSt
Reset
no
YES
t.LE
Key 'LE'
nonE
No function
tArE
Tare
A.Lct
Alarm unlock
- - - -
U.EHc
Excitation Volt.
5
10
15
20
oFF
- - - -
PASS
Password
on
888888
oFF
FAct
Factory configuration
no
YES
UEr
Firmware version
HHHH
LIGh
Brightness
LIG1
Minimum
LIG2
LIG3
Standard
LIG4
LIG5
Maximum
- - - -
oPt.1
Option 1
Access to the optional module installed at slot 1
oPt.2
Option 2
Access to the optional module installed at slot 2
oPt.3
Option 3
Access to the optional module installed at slot 3
- - - -

1.16 Mounting

The instrument fixations are designed to allow panel mount, wall mount, or hanging mount. For each type of mounting, see the position of the fixations at the images below.

- Panel mount. Apply the cut-out to the panel as seen on section *1.4.* Remove the side fixations. Introduce the instrument into the panel cut-out. Mount the side fixations as shown *(see Figure 12).* Slightly loosen the fixation screw of one side and press the instrument against the panel. Tighten the fixation screw so it presses the panel and maintains the fixation. Repeat with the opposite side fixation. For IP65 protection at the panel junction, see the IPB accessories at section *3.*

- Wall mount. Mount the side fixations against the wall, as shown *(see Figure 14)*. Each fixation has 2 holes with 4,5 mm diameter and a separation between hole centers of 30 mm. Once the side fixations are secured against the wall, place the instrument and press the fixation screws slightly. Tilt the instrument to the desired viewing angle and firmly screw the fixation screws.

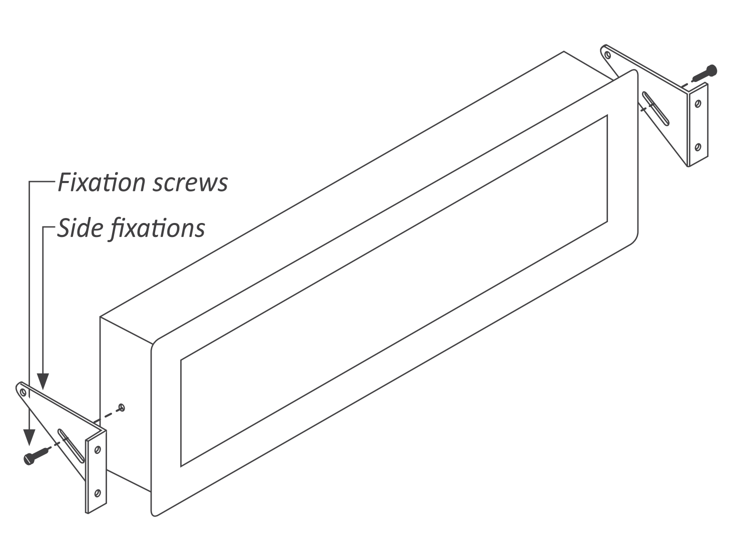


Figure 12 - Panel mount

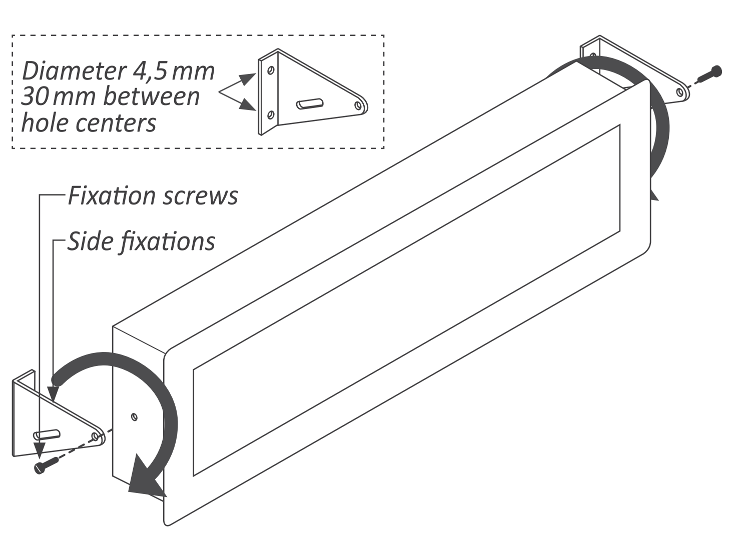


Figure 14 - Wall mount

- Hanging mount. Mount the side fixations as shown *(see Figure 13)*. Each fixation has 2 holes with 4,5 mm diameter and a separation between hole centers of 30 mm. Instrument can be hanged using cable, threaded rod, ...

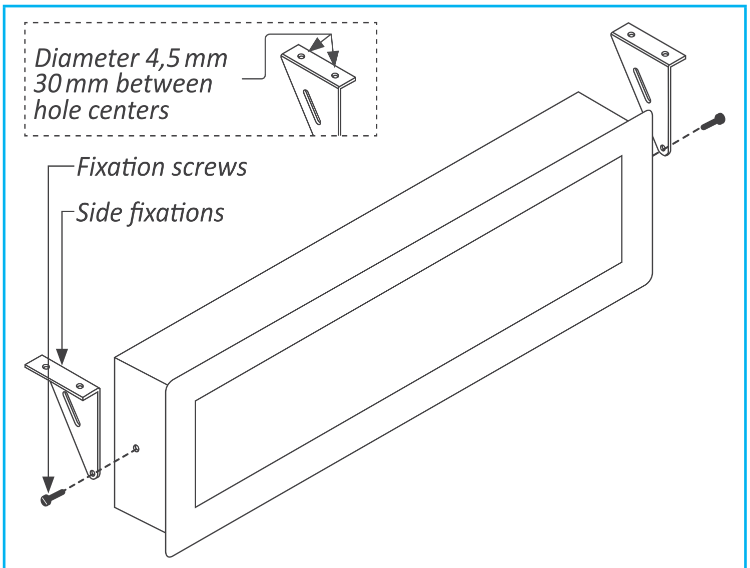


Figure 13 - Hanging mount

1.17 Installation precautions

Risk of electrical shock. Instrument terminals can be connected to dangerous voltage.

Instrument conforms to CE rules and regulations.

This instrument has been designed and verified conforming to the 61010-1 CE security regulation, for industrial applications. Installation of this instrument must be performed by qualified personnel only. This manual contains the appropriate information for the installation. Using the instrument in ways not specified by the manufacturer may lead to a reduction of the specified protection level. Disconnect the instrument from power before starting any maintenance and / or installation action.
The instrument does not have a general switch and will start operation as soon as power is connected. The instrument does not have protection fuse, the fuse must be added during installation.
An appropriate ventilation of the instrument must be assured. Do not expose the instrument to excess of humidity. Maintain clean by using a humid rag and do NOT use abrasive products such as alcohols, solvents, etc.
General recommendations for electrical installations apply, and for proper functionality we recommend : if possible, install the instrument far from electrical noise or magnetic field generators such as power relays, electrical motors, speed variators, ... If possible, do not install along the same conduits power cables (power, motor controllers, electrovalves, ...) together with signal and/or control cables.
Before proceeding to the power connection, verify that the voltage level available matches the power levels indicated in the label on the instrument.
In case of fire, disconnect the instrument from the power line, fire alarm according to local rules, disconnect the air conditioning, attack fire with carbonic snow, never with water.

1.18 Warranty

Please see the last page for Omega’s warranty Disclaimer

1.19 CE declaration of conformity

Supplier	Omega Engineering
Products	LDB-P

The manufacturer declares that the instruments indicated comply with the directives and rules indicated below.

Electromagnetic compatibility directive 2014/30/EU
Low voltage directive 2014/65/EU
Directive ROHS 2011/65/EU
Directive WEEE 2012/19/EU

Security rules EN-61010-1

Instrument	Fixed, Permanently connected
Pollution degree 1 and 2 (without condensation)	
Isolation	Basic + Protective union
Category	CAT-II

Electromagnetic compatibility rules EN-61326-1

EM environment: Industrial

Immunity levels

EN-61000-4-2	By contact ±4 KV	Criteria B
	By air ±8 KV	Criteria B
EN-61000-4-3		Criteria A
EN-61000-4-4	On AC power lines: ±2 KV	Criteria B
	On DC power lines: ±2 KV	Criteria B
	On signal lines : ±1 KV	Criteria B
EN-61000-4-5	Between AC power lines ±1 KV	Criteria B
	Between AC power lines and earth ±2 KV	Criteria B
	Between DC power lines ±1 KV	Criteria B
	Between DC power lines and earth ±2 KV	Criteria B
	Between signal lines and earth ±1 KV	Criteria B
EN-61000-4-6		Criteria A
EN-61000-4-8	30 A/m at 50/60 Hz	Criteria A
EN-61000-4-11	0 % 1 cycle	Criteria A
	40 % 10 cycles	Criteria A
	70 % 25 cycles	Criteria B
	0 % 250 cycles	Criteria B

Emission levels

CISPR 11	Instrument Class A, Group 1	Criteria A

According to directive 2012/19/EU, electronic equipment must be recycled in a selective and controlled way at the end of its useful life.

2. Output and control modules

2.1 Module R1

The R1 module provides 1 relay output to install in large format industrial meters from LDB series. Formats LDB-26 and LDB-46 accept up to 3 relays, and formats LDB-24 and LDB-44 accept up to 2 relays.
Configuration is performed from the front keypad of the instrument, by setting the alarm parameters. Check the alarm menu parameters at the instrument user's manual for full information.
Modules R1 can be provided factory installed into instrument, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

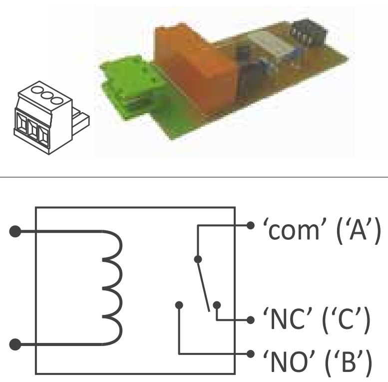
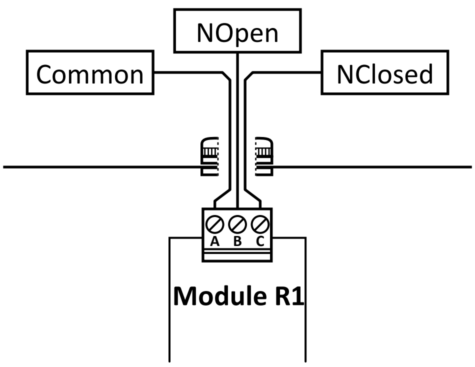


Figure 15 - Module 'R1' and internal schematic

Type of relay	3 contacts (Com, NO, NC)
Max. current	3 A (resistive load)
Voltage	250 Vac continuous
Isolation	3500 Veff
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	Common
B	NO (Normally Open)
C	NC (Normally Closed)

Figure 16 - Connections for 'R1' relay output module

2.2 Module T1

The T1 module provides 1 transistor output to install in large format industrial meters from LDB series. Formats LDB-26 and LDB-46 accept up to 3 transistor outputs, and formats LDB-24 and LDB-44 accept up to 2 transistor outputs.
Configuration is performed from the front keypad of the instrument, by setting the alarm parameters. Check the alarm menu parameters at the instrument user's manual for full information.
Modules T1 can be provided factory installed instrument, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

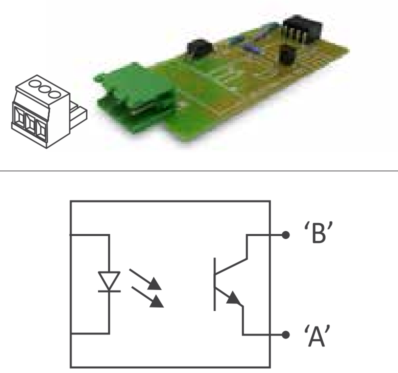
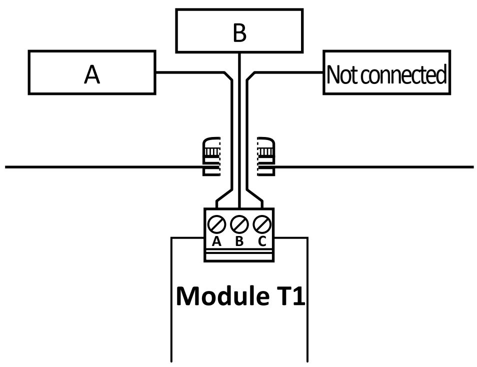


Figure 17 - Module 'T1' and internal schematic

Type of output	transistor
Max. voltage	35 Vdc
Max. current	50 mA
Isolation	3500 Veff, optoisolated
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	Emitter
B	Collector
C	Not connected

Figure 18 - Connections for 'T1' transistor output module

2.3 Module SSR

The SSR module provides 1 output for SSR relay control, to install in large format industrial meters from LDB series. Formats LDB-26 and LDB-46 accept up to 3 SSR control outputs, and formats LDB-24 and LDB-44 accept up to 2 SSR control outputs.

Configuration is performed from the front keypad of the instrument, by setting the alarm parameters. Check the alarm menu parameters at the instrument user's manual for full information.

Modules SSR can be provided factory installed instrument, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

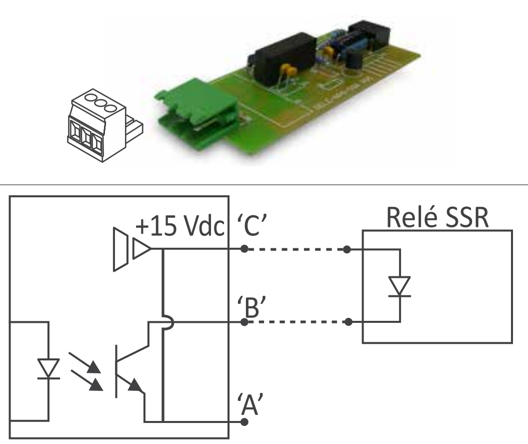
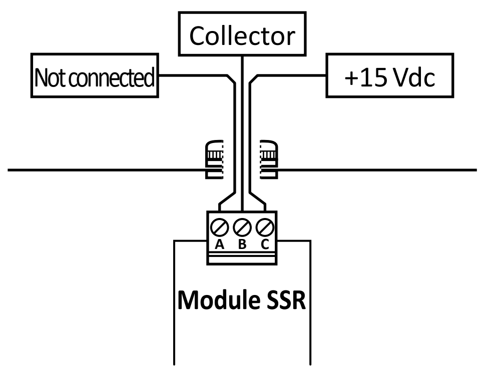


Figure 19 - Module 'SSR' and internal schematic

Type of output	for SSR relay control
Output voltage	+15 Vdc
Max. current	45 mA
Isolation	1000 Vdc
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	Not connected
B	Collector (-)
C	+15 Vdc (+)

Figure 20 - Connections for 'SSR' control module

2.4 Module AO

The AO module provides 1 analog output, configurable for 4/20 mA or 0/10 Vdc signal, to install in large format industrial meters from LDB series. Formats LDB-26 and LDB-46 accept up to 3 analog outputs, and formats LDB-24 and LDB-44 accept up to 2 analog outputs.

Output signal is fully scalable, both with positive and negative slopes, and is proportional to the reading. The mA output can be configured for active loops (the instrument provides the power to the mA loop) or passive loops (the loop power is external to the instrument).

Configuration is performed from the front keypad of the instrument, by accessing the menu entries 'Opt.1', 'Opt.2' or 'Opt.3', according to the slot where the module is installed.

AO modules can be provided factory installed into the LDB series instrument, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

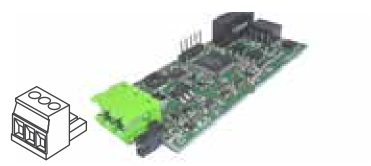
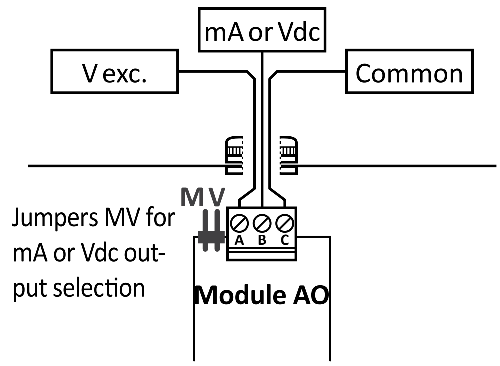


Figure 21 - Module 'AO'

Signal output	4/20mA, 0/10Vdc (active and passive)
Accuracy	0.1% FS
Isolation	1000 Vdc
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	Excitation voltage
B	Signal in mA or Vdc
C	Common
Jumper M	Jumper closed for mA output
Jumper V	Jumper closed for Vdc output

Figure 22 - Connections for 'AO' analog output module

2.5 Module RTU

The RTU module provides an isolated Modbus RTU communications port, to install in large format industrial meters from LDB series.

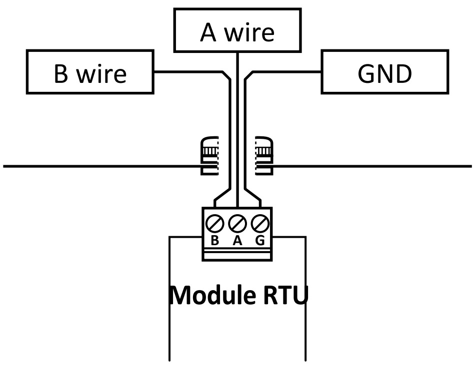
The RTU module implements function ‘4’ (‘*Read Input Registers*’) of the Modbus RTU protocol, to access the instrument registers (reading value, alarm status, memory of maximum and minimum, ...).

Configuration is performed from the front keypad of the instrument, by accessing the menu entries ‘Opt.1’, ‘Opt.2’ or ‘Opt.3’, according to the slot where the module is installed.

Modules RTU can be provided factory installed into the LDB series, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

Figure 23 - Communications module ‘RTU’

Protocol	Modbus RTU
Bus	RS-485, up to 57.6 Kbps
Isolation	1000 Vdc
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	Bus signal A
B	Bus signal B
G	GND

Figure 24 - Connections for Modbus ‘RTU’ communications module

2.6 Module S4

The S4 module provides an isolated RS485 ASCII communications port, to install in large format industrial meters from LDB series.

The S4 module implements a MASTER / SLAVE protocol, with up to 31 addressable slaves. In SLAVE mode allows access to reading values, alarm status, memory of maximum and minimum, ...

Configuration is performed from the front keypad of the instrument, by accessing the menu entries ‘Opt.1’, ‘Opt.2’ or ‘Opt.3’, according to the slot where the module is installed.

Modules S4 can be provided factory installed into the LDB series, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

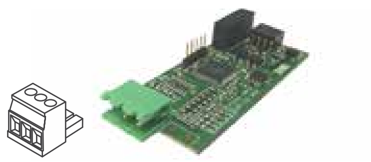
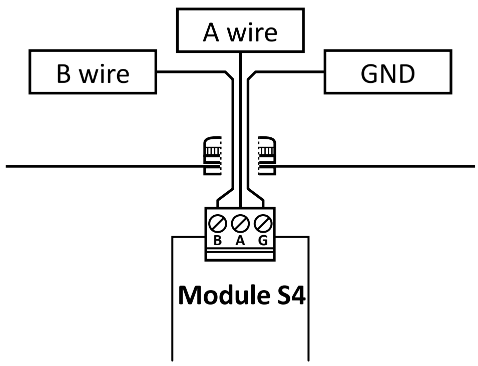


Figure 25 - Communications module ‘S4’

Protocol	ASCII
Bus	RS-485, up to 57.6 Kbps
Isolation	1000 Vdc
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	Bus signal A
B	Bus signal B
G	GND

Figure 26 - Connections for RS-485 ‘S4’ communications module

2.7 Module S2

The S2 module provides an isolated RS232 ASCII communications port, to install in large format industrial meters from LDB series.

The S2 module implements a MASTER / SLAVE protocol, with up to 31 addressable slaves, with 'daisy-chain' connection. In SLAVE mode allows access to reading values, alarm status, memory of maximum and minimum, ...

Configuration is performed from the front keypad of the instrument, by accessing the menu entries 'Opt.1', 'Opt.2' or 'Opt.3', according to the slot where the module is installed.

Modules S2 can be provided factory installed into the LDB series, or standalone for delayed installation. No soldering or special configuration is required. See section *1.6* on how to install output and control modules.

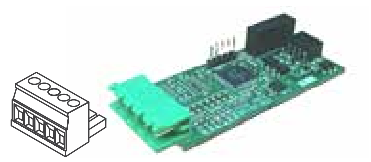
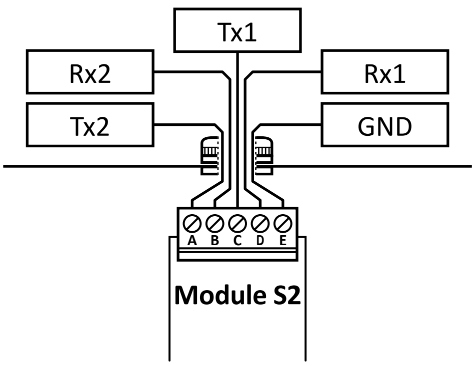


Figure 27 - Communications module Module 'S2'

Protocol	ASCII
Bus	RS-232, up to 57.6 Kbps
Isolation	1000 Vdc
Terminal	plug-in screw clamp, pitch 5.08 mm
Installation allowed at	slot 1, slot 2, slot 3



A	'Daisy chain' Tx data transmission
B	'Daisy chain' Rx data reception
C	Tx data transmission
D	Rx data reception
E	GND

Figure 28 - Connections for RS-232 'S2' communications module

Options and Accessories

Index

1.1 Read this first

All modules mentioned in this document are compatible with large format meters from LDB series has 4 formats, and each format differ in the number of digits, the digit height and the number of output and control options they can accept.
This document assumes the following :

Format	Digits	Digit height	Options
LDB-24	4	60 mm	2
LDB-44	4	100 mm	2
LDB-26	6	60 mm	3
LDB-46	6	100 mm	3

- inside the programming menus, when a 6 digits value is shown, it is assumed that only 4 digits apply to formats LDB-24 and LDB-44
- when this document explains that a maximum of 3 output and control modules are installable, it is assumed that the maximum is 2 modules for formats LDB-24 and LDB-44

The output and control modules mentioned in this document, are covered by the warranty of the instrument where they are installed. Check the user’s manual of the instrument for more information related to warranty.

The user’s manual of the instrument where the module is installed, has important information related to installation that applies also to the output and control modules mentioned in this document. Check the user’s manual of the instrument for more information related to installation precautions.

The output and control modules mentioned in this document are covered by the ‘CE declaration of conformity’ of the instrument where they are installed. Check the user’s manual of the instrument for more information related to the CE declaration of conformity.

1.2 Modular architecture

Large displays from the LDB series are designed following a modular architecture that allows the operator to install any of the output and control modules mentioned in this document. Each module is supplied with 1 cable tie, 1 square self adhesive tie base and 1 female connector.

1.3 Installation and start-up

To install an optional output and control module into a large display:

1. remove the rear cover of the instrument *(see section 1.4)*
2. install the module at one of the free slots *(see section 1.5)*
3. place the squared tie base at the free slot selected. Location to place the tie base is clearly indicated on the PCB *(see section 1.5)*.
4. pass the cable tie through the tie base *(see section 1.5)*
5. place the output and control module at the slot connection jumpers *(see section 1.5)*
6. use the cable tie to firmly fix the module *(see section 1.5)*
7. if needed, configure the appropriate jumpers at the output and control module
8. pass the connection wires through the housing cable gland
9. connect the signal wires to the terminals of the output and control module
10. place and close the rear cover of the instrument *(see section 1.4)*
11. configure the parameters at the ‘Configuration menu’.
    - modules R1, T1 and SSR are configured from the alarms menu of the instrument
    - other modules are configured from from menu entries ‘Opt.1’, ‘Opt.2’ or ‘Opt.3’, depending on the slot where the module has been installed.

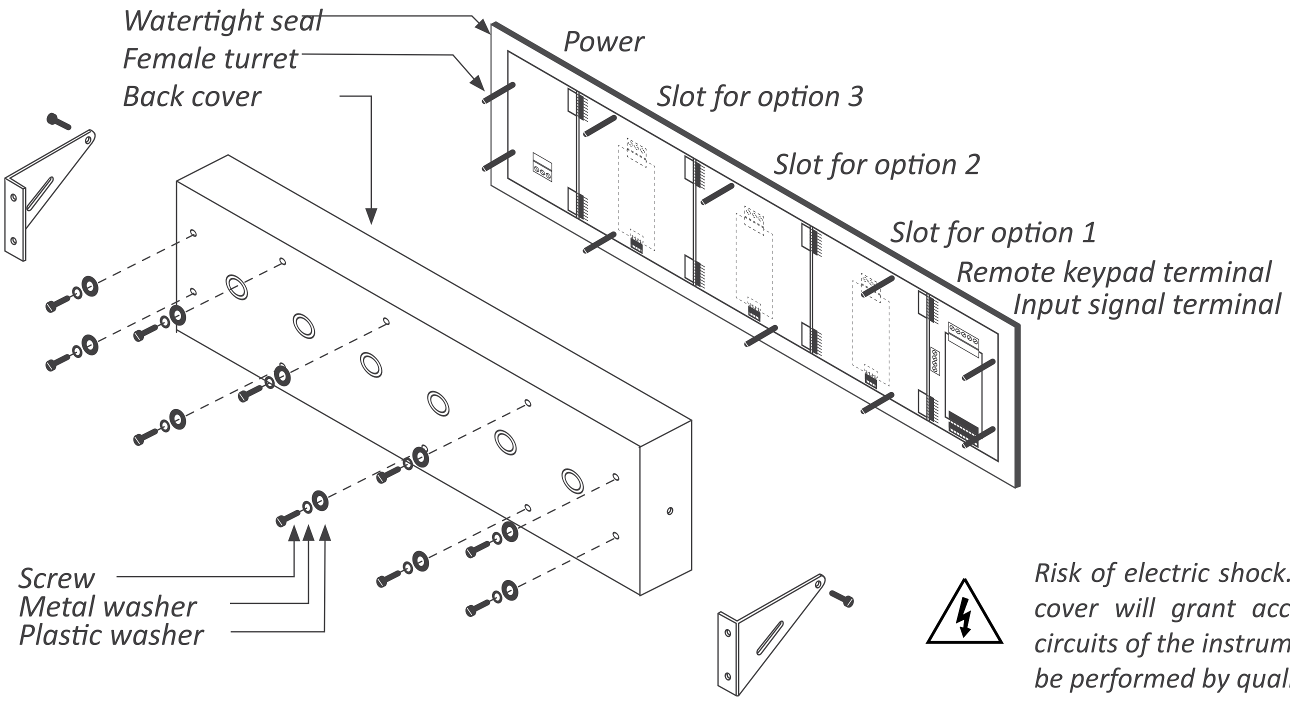
1.4 To access the instrument

To open the housing, remove the screws from the back cover. With each screw there is a metal washer and a plastic washer. Once the screws are out, remove the back cover.

The figure below shows the instrument internal structure for a LDB-26 format. It shows the location of the 3 slots for optional output and control modules, the power terminal and the input signal terminal.

To close the instrument, place the back cover, the screws, the metal washer and the plastic washer. The plastic washer is in contact with the back cover. Confirm that the screws are correctly turning inside the internal female screws.

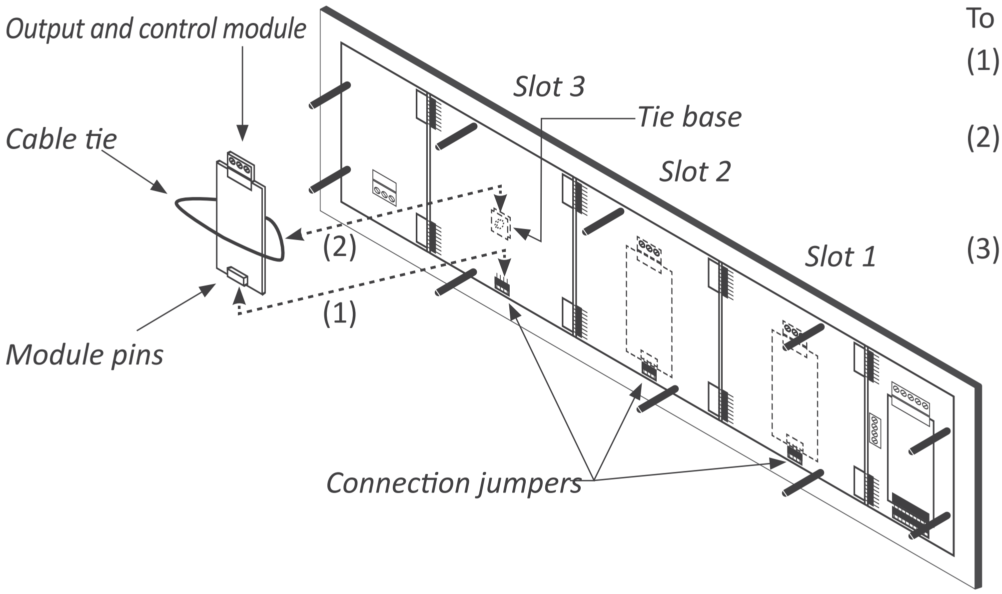
To ensure a correct IP65 protection tighten the back cover screws with a strength between 30 and 40 Ncm, with the help of a dynamometer screwdriver.



Risk of electric shock. Removing the back cover will grant access to the internal circuits of the instrument. Operation must be performed by qualified personnel only.

1.5 Modular system

Large format meters are designed with an internal modular architecture. The output and control modules are independent and can be installed by accessing the internal circuits of the instrument, and connecting the module to the connection jumpers of the selected slot. Each module is provided with a cable tie to fix the module to the tie base. A cable gland to install at the back cover is also provided, in order to enable an output for the connection wires.



To install an output and control module

(1) insert the 'module pins' into the 'connection jumpers' in one of the free slots

(2) place the 'cable tie' into the 'tie base' and embrace the 'module' firmly, until it is fixed

(3) an additional white cable tie is provided to fix as indicated below. Only needed in case of vibrations or heavy transportation.

1. Options R1, T1 and SSR

The R1, T1 and SSR modules provide 1 digital 'on/off' output. The output is configured from the instrument alarms menu ('ALr.1', 'ALr.2' o 'ALr.3').
The menu allows to configure the setpoint, hysteresis, independent activation and deactivation delays, and a second setpoint to create windowed alarms.
The R1, T1 and SSR output modules are isolated between them and between all other circuits of the instrument.

1.1 Module R1

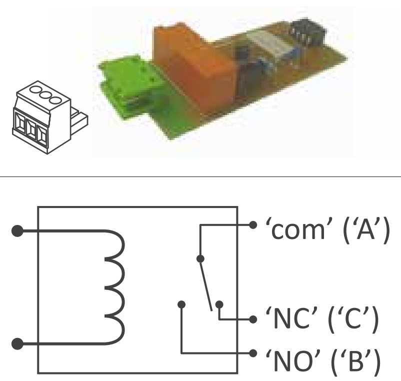


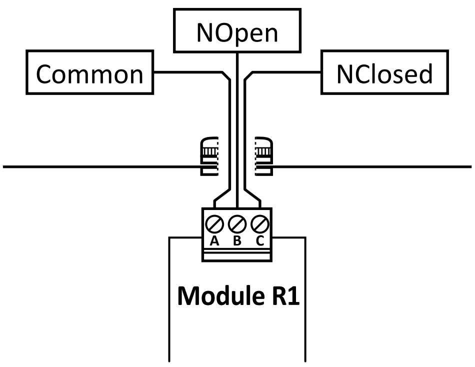
Figure 1 - Detail for the 'R1' module and internal schematic

Option	**R1**
Type of output	relay
Type of relay	3 contacts (Com, NO, NC)
Max. current	3 A (resistive load)
Voltage	250 Vac continuous

(max. 150 Vac if switching power network with Overvoltage category III)

Isolation	3500 Veff
Type of terminal	plug-in screw clamp pitch 5.08 mm

Installation allowed at slot 1, slot 2, slot 3



A	Common
B	NO (Normally Open)
C	NC (Normally Closed)

Figure 2 - Connections for the 'R1' relay output module

1.2 Module T1

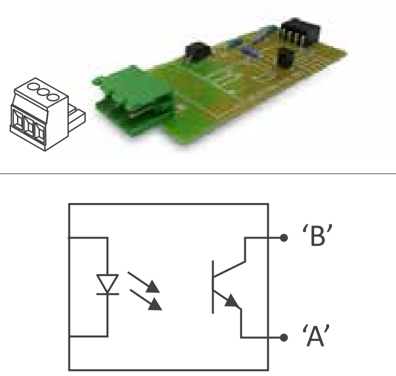
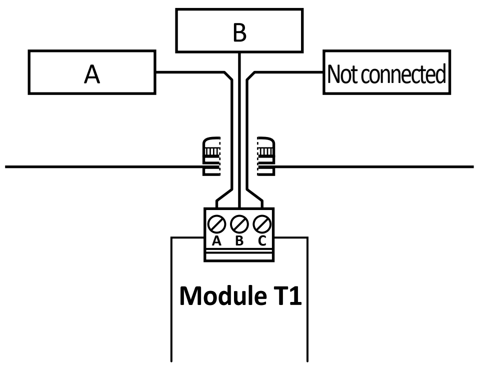


Figure 3 - Detail for the 'T1' module and internal schematic

Option	**T1**
Type of output	transistor
Max voltage	35 Vdc
Max. current	50 mA
Isolation	3500 Veff, optoisolated
Type of terminal	plug-in screw clamp pitch 5.08 mm

Installation allowed at slot 1, slot 2, slot 3



A	Emitter
B	Collector
C	Not connected

Figure 4 - Connections for the 'T1' transistor output module

1.3 Module SSR

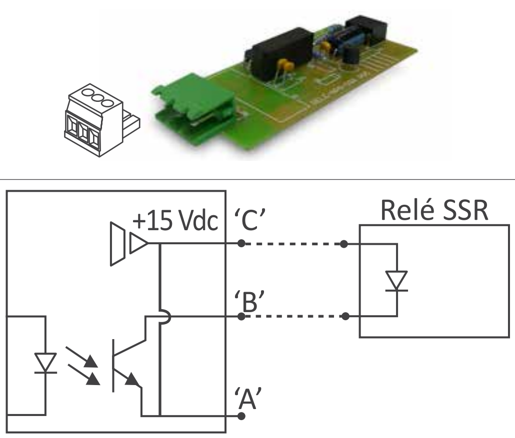
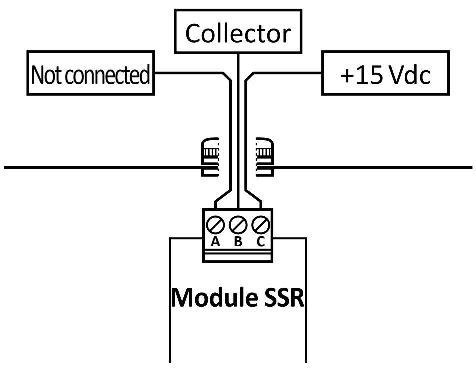


Figure 5 - Detail for the 'SSR' module and internal schematic

Option	**SSR**
Type of output	to control SSR relay
Output voltage	+15 Vdc
Max. current	45 mA
Isolation	1000 Vdc
Type of terminal	plug-in screw clamp pitch 5.08 mm

Installation allowed at slot 1, slot 2, slot 3



A	Not connected
B	Collector (-)
C	+15 Vdc (+)

Figure 6 - Connections for the SSR control output module

2. Option AO

The AO modules provide 1 analog output, configurable for 4/20 mA or 0/10 Vdc signal. The analog output is configured from the options menu entry (‘Opt.1’, ‘Opt.2’ or ‘Opt.3’) of the instrument.

Option	**AO**
Type of output	analog output
Signal output	4/20 mA active 4/20 mA passive 0/10 Vdc
Max. signal	22 mA, 10.5 Vdc
Min. signal	0 mA, -50 mVdc
Scaling	proportional to the reading positive or negative slopes
Vexc (terminal A)	+13.8 Vdc ± 0.4 Vdc (max. 25 mA) protection against shortcircuit
Load impedances	≤350 Ohm (for 4/20 mA active) ≤800 Ohm (for 4/20 mA passive) *(for 24 Vdc external Vexc) (maximum voltage 27 Vdc between ‘B’ and ‘C’)* ≥10 KOhm (en 0/10 Vdc)
Accuracy (at 25 ºC)	<0.1 % FS
Thermal stability	60 ppm/ºC in mA 50 ppm/ºC in Vdc
Step response (0% to 99% of the signal)	<75 mSeconds + step response of the reading
Isolation	1000 Vdc
Warm up	15 minutes
Type of terminal	plug-in screw clamp pitch 5.08 mm
Factory configuration	‘Mode mA’ ‘Scaling 0/9999 = 4/20 mA’ ‘On error ‘to_h’
Installation allowed at	slot 1, slot 2, slot 3

The output signal is proportional to the reading, and it is scalable both in positive or negative slopes. The mA output can be configured for active loops (the instrument provides the power to the mA loop) or passive loops (the loop power is external to the instrument.

The AO analog output modules are isolated between them and between all other circuits of the instrument.

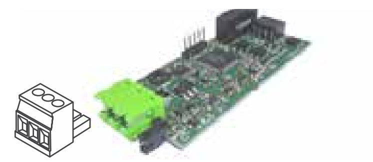
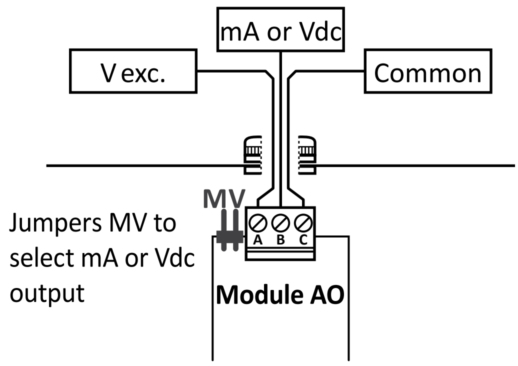


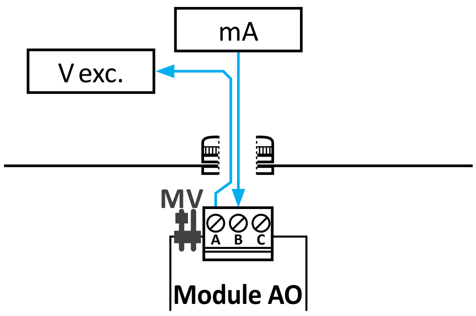
Figure 7 - Detail for the ‘AO’ module



A	Excitation voltage
B	Signal in mA or Vdc
C	Common
Jumper M	Jumper closed for mA output
Jumper V	Jumper closed for Vdc output

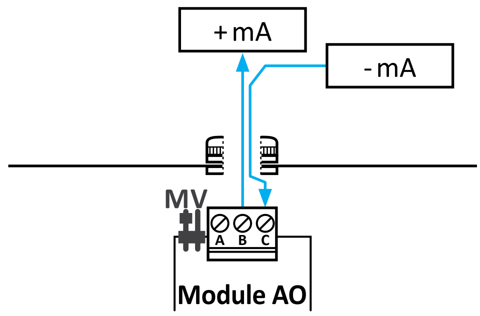
Figure 8 - Connections for ‘AO’ analog output module

2.1 Connection examples



Jumper M	Jumper closed
Jumper V	Jumper open

Figure 9 - Connections for active 4/20 mA. The current loop is internally powered from the ‘AO’ module



Jumper M	Jumper closed
Jumper V	Jumper open

Figure 10 - Connections for passive 4/20 mA. The current loop is externally powered.

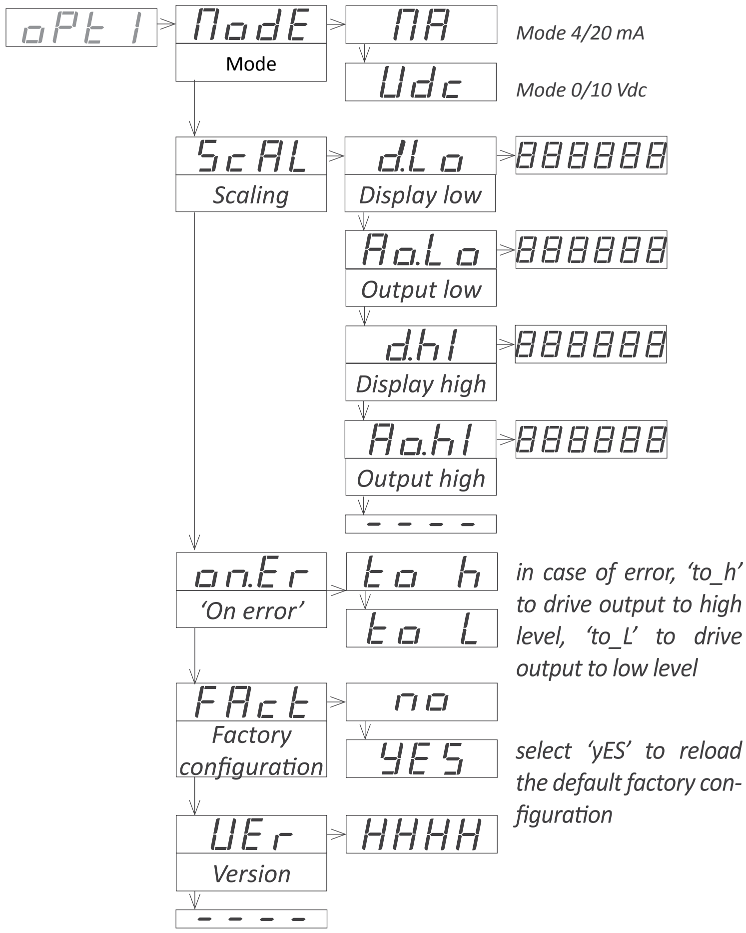
2.2 Configuration menu

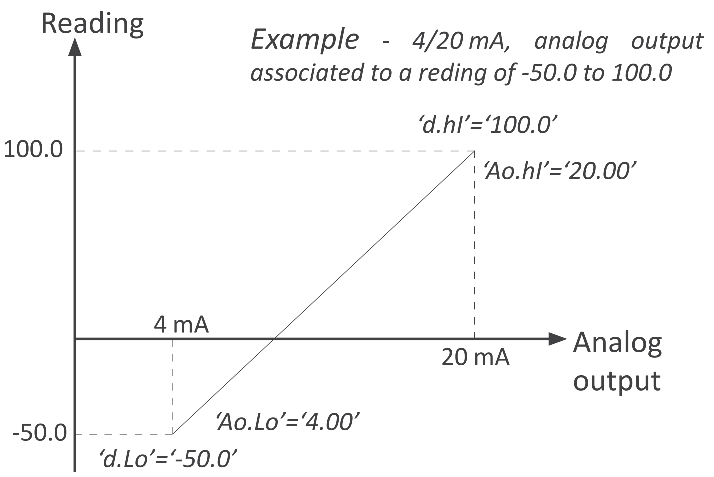
At the '**Mode**' ('**ModE**') menu configure the type of output '**4/20 mA**' ('**mA**') or '**0/10 Vdc**' ('**Vdc**'). Position for jumpers 'V' and 'M' must be according to the range selected.

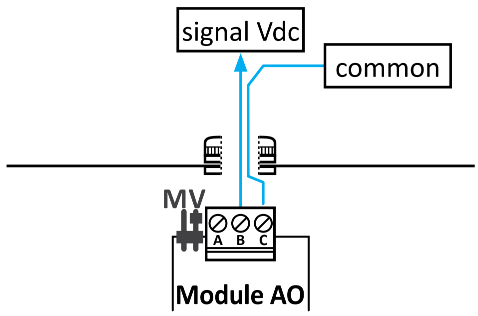
At the '**Scaling**' ('**ScAL**') menu enter the values that define the two points of the slope:

- the lower point, defined by the '**Low Display**' ('**d.Lo**') and '**Low Output**' ('**Ao.Lo**')
- the upper point, defined by the '**High Display**' ('**d.hI**') and '**High Output**' ('**Ao.hI**')

Analog output values are shown with 'XX.XX' format. acceptable values are '0.00' to '10.00' Vdc for voltage, and '0.00' to '20.00' mA for current.







Jumper M	Jumper open
Jumper V	Jumper closed

Figure 11 - Connections for 0/10 Vdc.

2.3 Error codes

'Er.34' output signal configured to value lower than 0 Vdc or 0 mA

'Er.35' output signal configured to a value higher than 10 Vdc or 20 mA

'Er.36' configured slope points are not acceptable, such as :

'd.Hi'='d.Lo'

'Ao.Hi'='Ao.Lo'

('Ao.Hi'-'Ao.Lo')>('d.Hi'-'d.Lo')

3. Option RTU

The RTU modules provide 1 port for communications in Modbus RTU protocol. Use function '4' ('*Read Input Registers*') of the Modbus RTU protocol, to access the instrument registers (reading value, alarm status, memory of maximum and minimum, setpoint values, ...).

Option	**RTU**
Type of output	Modbus RTU communication
Function implemented	4 (Read_Input_Registers)
Addresses	01 to 247
Exception codes	see section 3.3
Registers*	see section 3.1

**available registers can vary for different instruments*

Bus	RS-485	
Speed	57.6 Kbps to 600 bps	
Data format	8e1 (standard), 8o1, 8n2	
Bus terminator	not included	
Isolation	1000 Vdc	
Temperature	operation from 0 to 50 ºC storage from -20 to +70 ºC	
Factory configuration	'Address	1'
	'Speed	19.2 Kbps'
	'Format	8e1'
	'Decimal point	Auto'
Installation allowed at	slot 1, slot 2, slot 3	

The communication parameters are configured from the options menu entry ('Opt.1', 'Opt.2' or 'Opt.3') of the instrument.

The RTU modules are isolated between them and between all other circuits of the instrument.

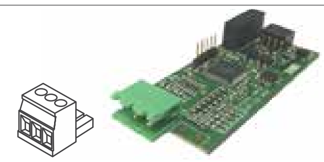
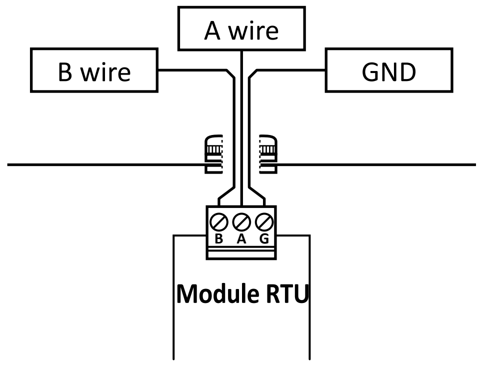


Figure 12 - Detail for the 'RTU' module



A	Bus signal A
B	Bus signal B
G	GND

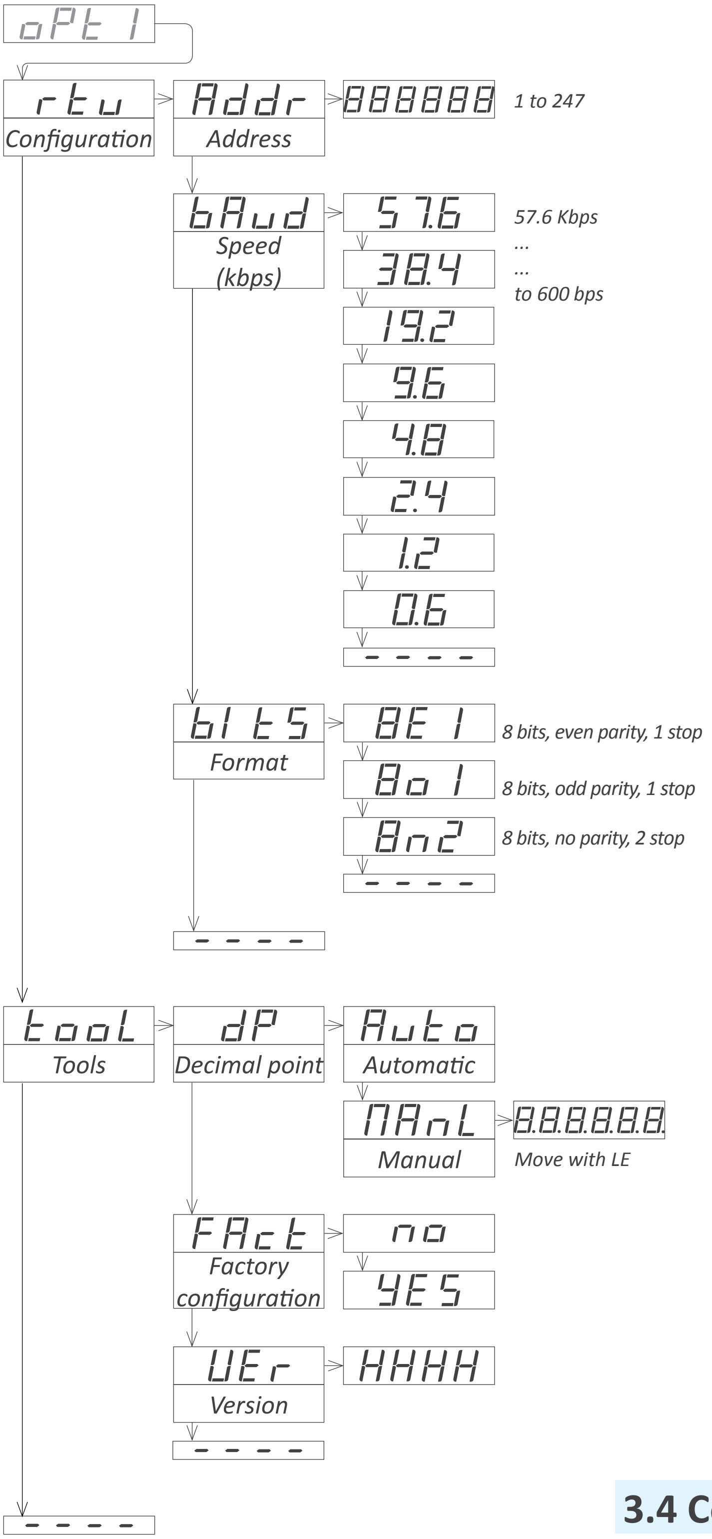
Figure 13 - Connections for Modbus 'RTU' module

3.1 Registers accessible through Modbus RTU

Register	*Name*	*Description*	*Size*	*Refresh*	*6 Digit Models (LDB-26 y LDB-46)*	*4 Digit Models (LDB-24 y LDB-44)*
0	*DISPLAY1_L*	*Display value*	*16 bits*	*same as display*	*999999 to -199999*	*9999 to -1999*
1	*DISPLAY1_H*		*16 bits*			
2	*DECIMALES1*	*Decimals on display*	*16 bits*		*0 to 6*	*0 to 4*
3	*MAXMEM_L*	*Memory of maximum*	*16 bits*	*every 30 seconds*	*999999 to -199999*	*9999 to -1999*
4	*MAXMEM_H*		*16 bits*			
5	*MINMEM_L*	*Memory of minimum*	*16 bits*		*999999 to -199999*	*9999 to -1999*
6	*MINMEM_H*		*16 bits*			
7	*SETPOINT1_L*	*Setpoint 1 value*	*16 bits*	*every 2 seconds*	*999999 to -199999*	*9999 to -1999*
8	*SETPOINT1_H*		*16 bits*			
9	*SETPOINT2_L*	*Setpoint 2 value*	*16 bits*		*999999 to -199999*	*9999 to -1999*
10	*SETPOINT2_H*		*16 bits*			
11	*SETPOINT3_L*	*Setpoint 3 value*	*16 bits*		*999999 to -199999*	*9999 to -1999**
12	*SETPOINT3_H*		*16 bits*			
13	*STATUS*	*Alarm status* *Instrument status*	*16 bits*	*same as display*	*bit 0...7 alarm status* *bit 8...16 instrument status*	
14 a 16	*Reserved*	*Reserved*	*16 x 3 bits*		*Not accessible*	*Not accessible*

Table 1 - Registers accessible through MODBUS-RTU. Registers codified as binary numbers. Negative values codified in two's complement. Available registers can vary for different instruments. Register 11 is not accessible for instruments with formats LDB-24 and LDB-44 (slot 3 is not available).

3.2 Configuration menu



At the '**Configuration**' ('**rtu**') menu, configure the '**Address**' ('**Addr**') parameter with the address value between '1' and '247', at the '**Speed**' ('**bAud**') parameter select the bus speed (in Kbps) and at the '**Format**' ('**bItS**') parameters select the data format.

Inside the '**Tools**' ('**TooL**') menu, special tools and functions are grouped.

- the '**Decimal point**' ('**dP**') menu is provided for compatibility with ancient hardware that does not support decimal point retransmission. By default, select '**Automatic**' ('**Auto**'). If your instrument does not transmit the decimal point position, select '**Manual**' ('**MAnL**') and fix the position of the decimal point manually.
- at the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument.

the '**Version**' ('**VEr**') menu informs of the current firmware version installed in the module.

3.3 Exception codes

The Modbus RTU protocol defines the following scenarios when a 'Master' is sending a frame to a 'Slave':

• the 'Slave' device receives the frame correctly and replies with the requested data

• the 'Slave' devices detects a CRC error, parity error, or other. and discards the frame without generating a reply frame. The 'Master' will detect a 'TIMEOUT' condition due to the absence of reply.

• the 'Slave' device receives the frame correctly, but replies with an 'EXCEPTION_CODE' as it can not process the function or register requested.

The 'EXCEPTION_CODES' configured in the RTU module are :

Exception code	*Name*	*Description*
0	ILLEGAL_FUNCTION	*Requested function is not supported*
1	ILLEGAL_DATA_ADDRESS	*Requested register is not supported*

Table 2 - Exception codes

3.4 Compatible versions

Formats LDB-26, LDB-46	*Firmware version*	*Formats LDB-24, LDB-44*	*Firmware version*
---	---	*LDB24-P, LDB44-P*	*41.57*
LDB26-P, LDB46-P	*50.00*	---	---
---	---	*LDB24-T, LDB44-T*	*44.05*
---	---	*LDB24-R, LDB44-R*	*45.05*
LDB26-C1, LDB46-C1	*27.08*	*LDB24-C1, LDB44-C1*	*47.07*
LDB26-CR, LDB46-CR	*28.02*	*LDB24-C1, LDB44-C1*	*48.05*

Table 3 - Firmware versions compatible with the indicated registers

3.5 Description and example of registers

Registers R0 and R1 (DISPLAY1_L y DISPLAY1_H)

Contains the display value of the instrument, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified at register R2.

Example R0=FBF1 (hex) and R1=0009 (hex)

Register value = 0009 FBF1 (hex)

Reading value = 654321

Register R2 (DECIMALS1)

Contains the number of decimals of the display, codified in a single register of 16 bits. Possible values are from 0 to 6.

Example R2=0002 (hex)

Number of decimals = 2 = 6543.21

Register R3 and R4 (MAXMEM_L and MAXMEM_H)

Contains the memory of maximum reading of the instrument, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R3 and R4.

Registers R5 and R6 (MINMEM_L and MINMEM_H)

Contains the memory of minimum reading of the instrument, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R5 and R6.

Registers R7 and R8 (SETPOINT1_L and SETPOINT1_H)

Contains the setpoint value of alarm 1, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R7 and R8.

Registers R9 and R10 (SETPOINT2_L and SETPOINT2_H)

Contains the setpoint value of alarm 2, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R9 and R10.

Registers R11 and R12 (SETPOINT3_L and SETPOINT3_H)

Contains the setpoint value of alarm 3, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R11 and R12.

Register R13 (STATUS)

Information bit-by-bit, for the alarm status (on / off) and instrument status. See below for a description.

Bit 0 Alarm 1 status (0 = inactive, 1 = active)
Bit 1 Alarm 2 status (0 = inactive, 1 = active)
Bit 2 Alarm 3 status (0 = inactive, 1 = active)
Bit 3 to 7 Reserved
Bit 8 Display overrange
Bit 9 Display underrange
Bit 10 Lost communication with the main processor
Bit 11 to 15 Reserved

Registers R14, R15 and R16

Reserved

4. Option S4

The S4 modules provide 1 port for communications RS485 ASCII protocol. Protocol with ‘master’ - ‘slave’ architecture, addressable up to 31 modules. Frames codified in representable ASCII characters (codes 32 to 255), which are visible using ‘hyperterminal’ or similar programs. Instrument registers are accessible through the RS-485 ASCII port (reading value, alarm status, memory of maximum and minimum, setpoint values, ...). The communication parameters are configured from the options menu entry (‘Opt.1’, ‘Opt.2’ or ‘Opt.3’) of the instrument. The S4 modules are isolated between them and between all other circuits of the instrument.

Option	**S4**	
Type of output	RS-485 ASCII communication	
Bus	RS-485	
Speed	57.6 Kbps to 600 bps	
Data format	8n1 (standard), 8o1, 8n2, 8e1	
Bus terminator	not included	
Protocol	ASCII	
Architecture	‘master - slave’	
Addresses	01 to 31	
‘Broadcast’ address	128	
Registers*	see section *4.1*	
**available registers can vary for different instruments*		
Isolation	1000 Vdc	
Temperature	operation from 0 to 50 ºC	
	storage from -20 to +70 ºC	
Factory configuration	‘Mode	Slave’
	‘Address	1’
	‘Speed	19.2 Kbps’
	‘Format	8n1’
	‘Decimal point	Auto’
Configuration ‘Master’	‘Destination address	31’
	‘Frequency	0.5 sec.’
Tools	‘Decimal point	Auto’
	‘Legacy	Off’
	‘Answer delay	0 mSec.’
Installation allowed at	‘Opt.1’, ‘Opt.2’, ‘Opt.3’	

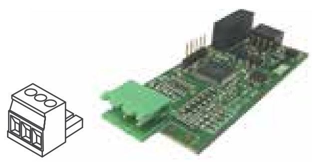
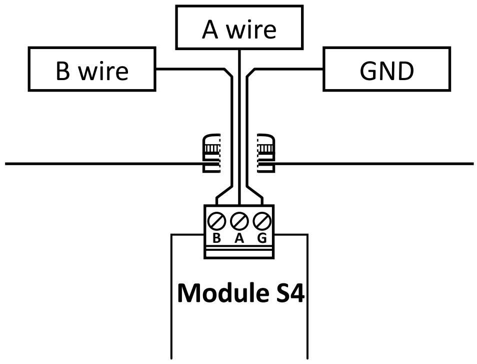


Figure 14 - Detail for the ‘S4’ module



A	Bus signal A
B	Bus signal B
G	GND

Figure 15 - Connections for ‘S4’ module

4.1 Accessible registers

Display values (DISPLAY1, MAXMEM, MINMEM, AL1, AL2, AL3) are codified with a minimum of 6 digits (left zeros are added if necessary), polarity and decimal point.

Register	*Name*	*Description*
0	*DISPLAY1*	*Display1 value*
1	*MAXMEM*	*Memory of maximum*
2	*MINMEM*	*Memory of minimum*
3	*AL1*	*Setpoint 1 value*
4	*AL2*	*Setpoint 2 value*
5	*AL3*	*Setpoint 3 value*
6	*STATUS*	*Alarm status*

Table 4 - Accessible registers for ASCII protocol.

Register 0 - DISPLAY1
Contains the display value of the instrument, in ASCII code, including polarity (positive / negative) and decimal point.
Example 1 - R0=’+’ ‘0’ ’6’ ‘5’ ‘4’ ‘3’ ‘.’ ‘2’ Display value = 6543.2
Example 2 - R0=’-’ ‘0’ ‘0’ ‘0’ ‘4’ ‘.’ ‘5’ ‘2’ Display value = -4.52

Register 1 - MAXMEM
Contains the value for memory of maximum, in ASCII code, including polarity (positive / negative) and decimal point.

Register 2 - MINMEM
Contains the value for memory of minimum, in ASCII code, including polarity (positive / negative) and decimal point.

Register 3 - AL1
Contains the value for alarm 1 setpoint, in ASCII code, including polarity (positive / negative) and decimal point.

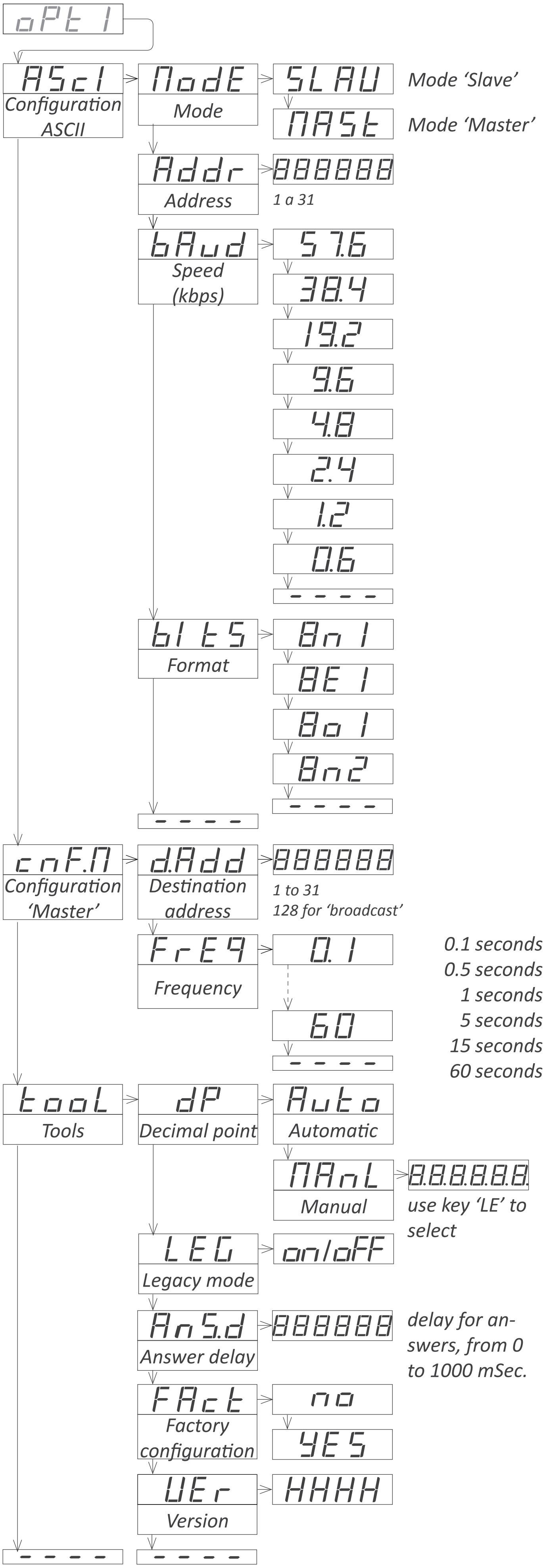
Register 4 - AL2
Contains the value for alarm 2 setpoint, in ASCII code, including polarity (positive / negative) and decimal point.

Register 5 - AL3
Contains the value for alarm 3 setpoint, in ASCII code, including polarity (positive / negative) and decimal point.

Register 6 - STATUS
Contains the alarm status (on/off).

Bit 0	Alarm 1 status (0 = inactive, 1 = active)
Bit 1	Alarm 2 status (0 = inactive, 1 = active)
Bit 2	Alarm 3 status (0 = inactive, 1 = active)
Bit 3 to 15	Reserved

4.2 Configuration menu



At the '**Configuration ASCII**' ('**AScI**') menu, configure the '**Mode**' ('**ModE**') parameter to select the 'slave' or the 'master' mode, at the '**Address**' ('**Addr**') parameter configure the local port address between '1' and '31', at the '**Speed**' ('**bAud**') parameter select the bus speed (in Kbps) and at the '**Format**' ('**bItS**') parameter select the data format.

When working as 'master', the instrument continuously transmits the display value data frame. The local module address is '0'. Configure at menu '**Configuration Master**' ('**cnF.M**') the '**Destination address**' ('**d.Add**') parameter from '1' to '31' or use value '128' for a broadcast message. At parameter '**Frequency**' ('**FrEq**') select the how often the frame with the reading value will be transmitted.

Special tools are grouped inside the '**Tools**' ('**TooL**') menu.

- the '**Decimal point**' ('**dP**') menu is provided for compatibility with ancient hardware that does not support decimal point retransmission. By default, select '**Automatic**' ('**Auto**'). If your instrument does nos transmit the decimal point position, select '**Manual**' ('**MAnL**') and fix the position of the decimal point manually.
- the '**Legacy mode**' ('**LEG'**) parameter is provided to maintain compatibility with instruments with older communication protocols. Select '**on**' to activate this mode.
- the '**Answer delay**' ('**AnS.d'**) parameter applies only to 'Slave' mode. The local module delays the answer frame. Configure for applications where the 'Master' needs additional time to switch between 'transmit' and 'receive' modes. Enter a numeric value between '0' and '1000' mSeconds.
- at the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument.

the '**Version**' ('**VEr**') menu informs of the current firmware version installed in the module.

4.3 Compatible versions

Formats LDB-26, LDB-46	*Version firmware*	*Formats LDB-24, LDB-44*	*Version firmware*
Instruments with access to registers 0, 1, 2, 6			
		LDB24-P, LDB44-P	*41.57*
LDB26-P, LDB46-P	*50.00*	---	---
		LDB24-T, LDB44-T	*44.05*
		LDB24-R, LDB44-R	*45.05*
LDB26-C1, LDB46-C1	*27.08*	*LDB24-C1, LDB44-C1*	*47.07*
LDB26-CR, LDB46-CR	*28.02*	*LDB24-CR, LDB44-CR*	*48.05*

Table 5 - Firmware versions compatible with the indicated registers

4.4 Frame types

The ASCII protocol defines the following frames:

- Frame 'read' ('**RD**'). Id code 36. Request data frame. The requested register is indicated into the 'REG' byte ('Header' section).
- Frame 'answer' ('**ANS**'). Id code 37. Response frame to a request data frame. The requested register is indicated into the 'REG' byte' ('Header' section). Data of the requested register is indicated into data bytes 'D0' to 'Dn' ('Data' section).
- Frame 'error' ('**ERR**'). Id code 38. Response frame to a request data frame. Indicates that an error has occurred. Error code is codified into the 'REG' byte ('Header' section).
- Frame 'ping' ('**PING**'). Id code 32. Used to confirm the existence of the remote instrument.
- Frame 'pong' ('**PONG**'). Id code 33. Response to a 'ping' frame. It confirms the existence of the remote instrument.

4.5 Frame structure

Header								Data				Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	D0	D1	...	Dn	CRC	ETX
2	x	32	x	x	x	32	n+1	[data]				x	3
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*...*	*n+7*	*n+8*	*n+9*

Protocol frames have a structure made of 'Header', 'Data' and 'Trail'.

Section 'Header'

Contains the start byte ('STX'), the frame identifier ('ID'), the origin address ('FROM') and the destination address ('TO'), the register id ('REG') and the length ('LONG') of the 'Data' section.

Section 'Data'

Contains data for the requested register ('REG').

Section 'Trail'

Contains the 'CRC' code and the end of frame byte ('ETX').

'Real value' and 'Frame value'

To use representable ASCII values, the real values are codified before being sent into the frame. The following definitions apply :

- 'real value' is the value of the field without codification
- 'frame value' is the value of the field, codified

Field	*Description*	*Size*	*Position*	*Real value*	*Frame value*
STX	*Start of frame*	*1 byte*	*0*	*does not apply*	*2*
ID	*Frame type*	*1 byte*	*1*	*(see section 4.4)*	*real_value*
RSV	*Reserved*	*1 byte*	*2*	*0*	*32*
FROM	*Origin address*	*1 byte*	*3*	*0 ('Master') / 1 to 31 ('Slave')*	*32 + real_value*
TO	*Destination address*	*1 byte*	*4*	*0 ('Master') / 1 to 31 ('Slave')* *128 ('broadcast')*	*32 + real_value*
REG	*Register identification*	*1 byte*	*5*	*(see section 4.1)*	*32 + real_value*
RSV	*Reserved*	*1 byte*	*6*	*0*	*32*
LONG	*Length of 'Data' section*	*1 byte*	*7*	*n (between 0 and 32)*	*32 + real_value*
D0 ... Dn	*Data*	*n bytes*	*8 to n+7*	*number 0 to 9* *decimal point* *polarity (+/-)*	*ASCII code of the number (48 to 57)* *ASCII code of decimal point (46)* *ASCII code of '+' (43)* *ASCII code of '-' (45)*
CRC	*CRC calculation*	*1 byte*	*n+8*	*does not apply*	*(see section 4.7)*
ETX	*End of frame*	*1 byte*	*n+9*	*does not apply*	*3*

Table 6 - Description of the bytes for the ASCII frame

4.6 Error codes

Frames 'ERR' contain within the 'REG' field, the error code. Available error codes are :

error 1	unknown register
error 2	display overrange
error 3	display underrange
error 4	CRC error
error 5	internal error

4.8 Frame examples

4.8.1 Frames ‘RD’ (36) and ‘ANS’ (37)

Example - ‘Master’ (address ‘0’) requests the value of register ‘0’ (display value) to the ‘Slave’ at address ‘28’ (‘RD’ frame) and the ‘Slave’ replies to the ‘Master’ with a reply frame (‘ANS’ frame) containing the requested data (765.43).

**Instruments with 4 digits also send reading values formatted with 6 digits : value -321.5 is transmitted as -00321.5*

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	36	32	32	60	32	32	32	58	3
Start	RD	---	0	28	0	---	0	CRC	Stop

Header								Data								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	D0	D1	D2	D3	D4	D5	D6	D7	CRC	ETX
2	37	32	60	32	32	32	40	43	48	55	54	53	46	52	51	15	3
Start	ANS	---	28	0	0	---	8	+0765.43								CRC	Stop

4.8.2 Frames ‘ERR’ (38)

Example - ‘Slave’ at address ‘11’ replies to the ‘Master’ (address ‘0’) with an error frame (‘ERR’ frame) indicating that the requested register number is unknown (‘UNKNOWN_REGISTER’, error code ‘1’). The error code is codified into the ‘REG’ byte. For a list of error code see section 4.6.

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	38	32	43	32	33	32	32	46	3
Start	ERR	---	11	0	1	---	0	CRC	Stop

4.7.1 Frames ‘PING’ (32) and ‘PONG’ (33)

Example - ‘Master’ (address ‘0’) requests confirmation of existence to the ‘Slave’ at addrress ‘22’ (‘PING’ frame) and the ‘Slave’ replies to the ‘Master’ with a ‘PONG’ frame.

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	32	32	32	54	32	32	32	52	3
Start	Ping	---	0	22	0	---	0	CRC	Stop

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	33	32	54	32	32	32	32	53	3
Start	Pong	---	22	0	0	---	0	CRC	Stop

4.7 CRC calculation

The ‘frame value’ for the CRC byte is calculated applying a XOR function to the ‘frame value’ *(see section 4.5)* of all bytes in sections ‘Header’ and ‘Data’, from byte ‘0’ (‘STX’) to the last data byte (‘Dn’).

• if the calculated CRC value is lower than ‘32’, it is normalized by applying the ‘one’s complement’ function .

CRC0=STX ^ ID ^ RSV ^ FROM ^ TO ^ REG ^ RSV ^ LONG ^ D0 ^...^ Dn

- if (CRC0<32) -> CRC=!CRC0 (one’s complement function)
- if (CRC0>31) -> CRC=CRC0

```
//example of CRC calculation in C language
int8 Calculate_CRC(int8 CRC_Position)
{
 int8 i,CRC=0;
  for(i=0;c<CRC_Position;c++)
  {
     crc=crc ^ frame[i];
  }
 if(crc<32) CRC=~CRC;
 return(CRC);
}
```

5. Option S2

The S2 modules provide 1 port for communications RS232 ASCII protocol. The S2 modules use the same protocol as the S4 modules *(see section 4)*, the only difference is the physical layer of the bus, that is RS232 for the S2.

S2 modules allow for point-to-point communication over RS232 and also allow for multinode communication over RS232 using a 'Daisy-Chain' type of connection.

Terminals RX1 and TX1 are for the main communication with the RS232 bus. Terminals RX2 and TX2 are for the multinode connection, so all frames received at RX1 with destination address different from the local address, will be retransmitted through TX2. On the same way, frames received at RX2 with destination address different from the local address, will be retransmitted through TX1.

Option	**S2**
Type of output	RS-232 ASCII communication
Bus	RS-232
Speed	57.6 Kbps a 600 bps
Data format	8n1 (standard), 8o1, 8n2, 8e1
Protocol	ASCII
Architecture	'master - slave'
Address	01 to 31
'Broadcast' address	128
Registers*	see section for S4 module

**available registers can vary for different instruments*

Isolation	1000 Vdc
Temperature	operation from 0 to 50 ºC storage from -20 to +70 ºC
Installation allowed at	'Opt.1', 'Opt.2', 'Opt.3'

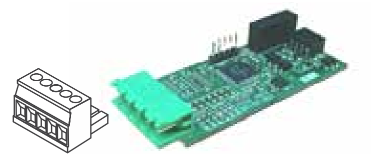
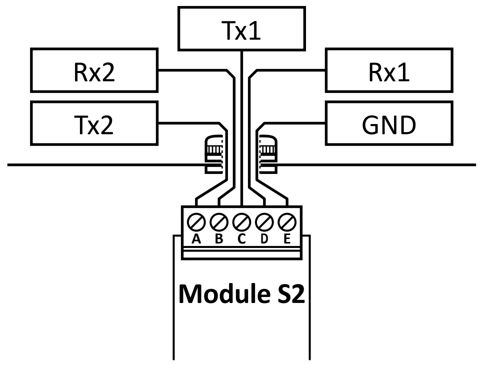


Figure 16 - Detail for the 'S2' module



A	GND
B	Rx data reception
C	Tx data transmission
D	'Daisy chain' Rx data reception
E	'Daisy chain' Tx data transmission

Figure 17 - Connections for 'S2' module

1. Remote keypad LDB-RKB

Industrial keypad with 3 push buttons to connect to large format meters from LDB series. It allows to replicate the front keypad of the instrument to a remote location.

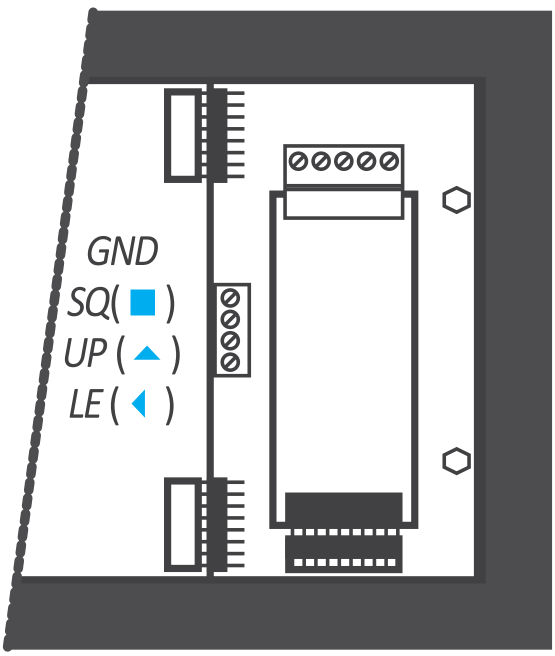
A RKB remote keypad allows the operator to access the advanced control functions from the large format meters, such as fast access to alarm setpoints, preset value modification, access to maximum and minimum reading values, signal tare for load applications, front reset, manual alarm unlock, ...

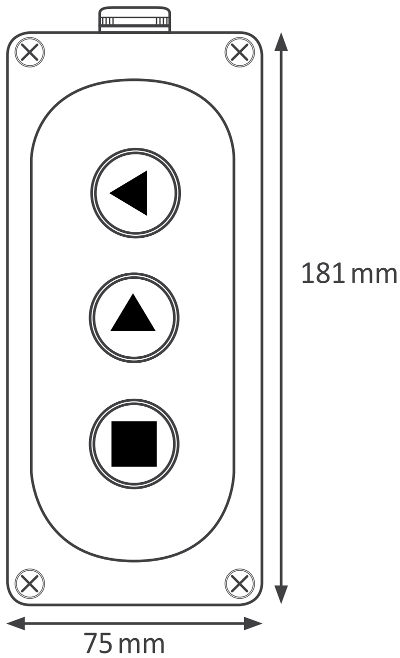
All these features are accessible while maintaining the main feature of these instruments, which is the installation in heights for long distance reading.

The RKB remote keypad is provided with an industrial IP65 protected housing, with cable gland output, aligned with the technical specifications of the LDB series. The RKB remote keypad can be easily installed against wall. The push buttons are 25 mm size for easy use even with protection gloves.

The RKB remote keypad is provided with labeled push buttons and does not included cable.

Normal button state	open
Recommended wire	0.25 mm2
Protection	IP65
Output	by cable gland
Mounting	accepts wall mount
Color	grey
Material	plastic
Weight	200 gr





Connect the wire to the 4 pole terminal located close to the input signal module. Connect 4 wires for keys 'SQ' (■), 'UP' (▲), 'LE' (◀) and common. Pass the wires through the cable gland identified as 'remote keypad' *(see Figure 2)* and connect the other end to the internal RKB push buttons.

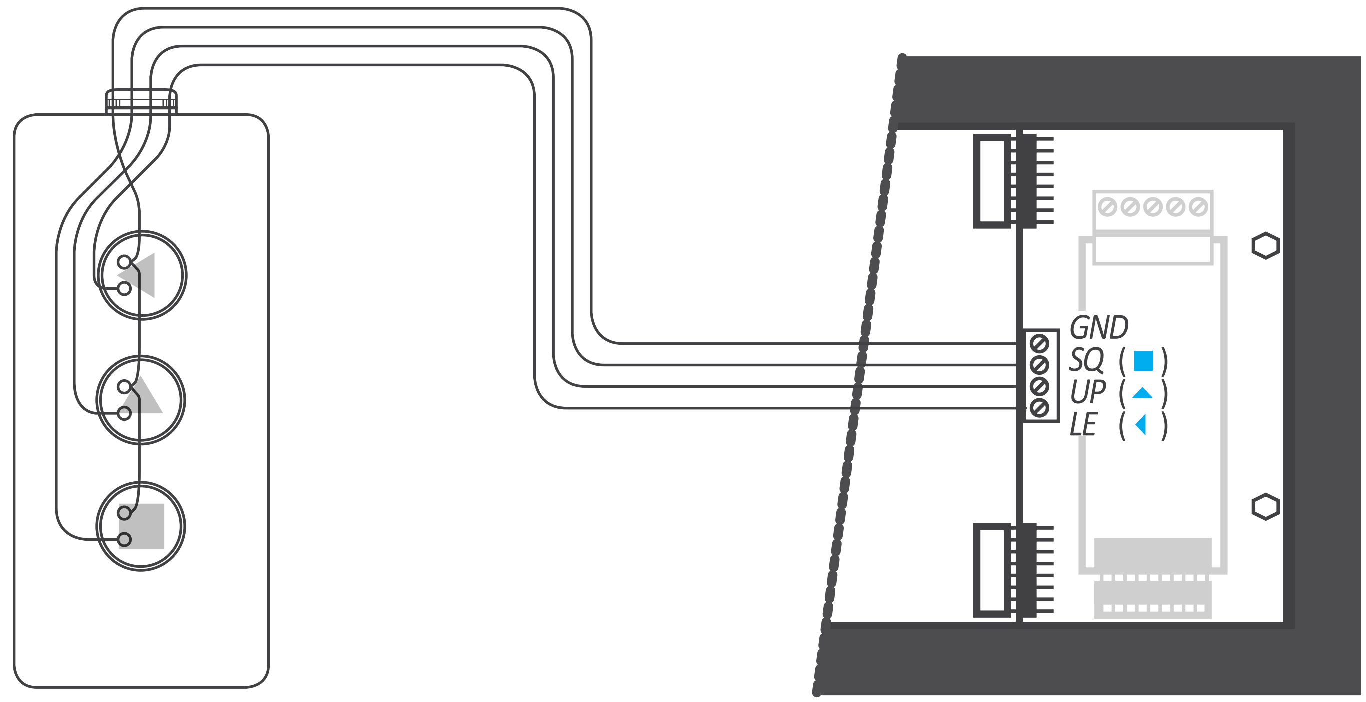


Figure 1 - Connections from RKB to the internal 4 pole terminal

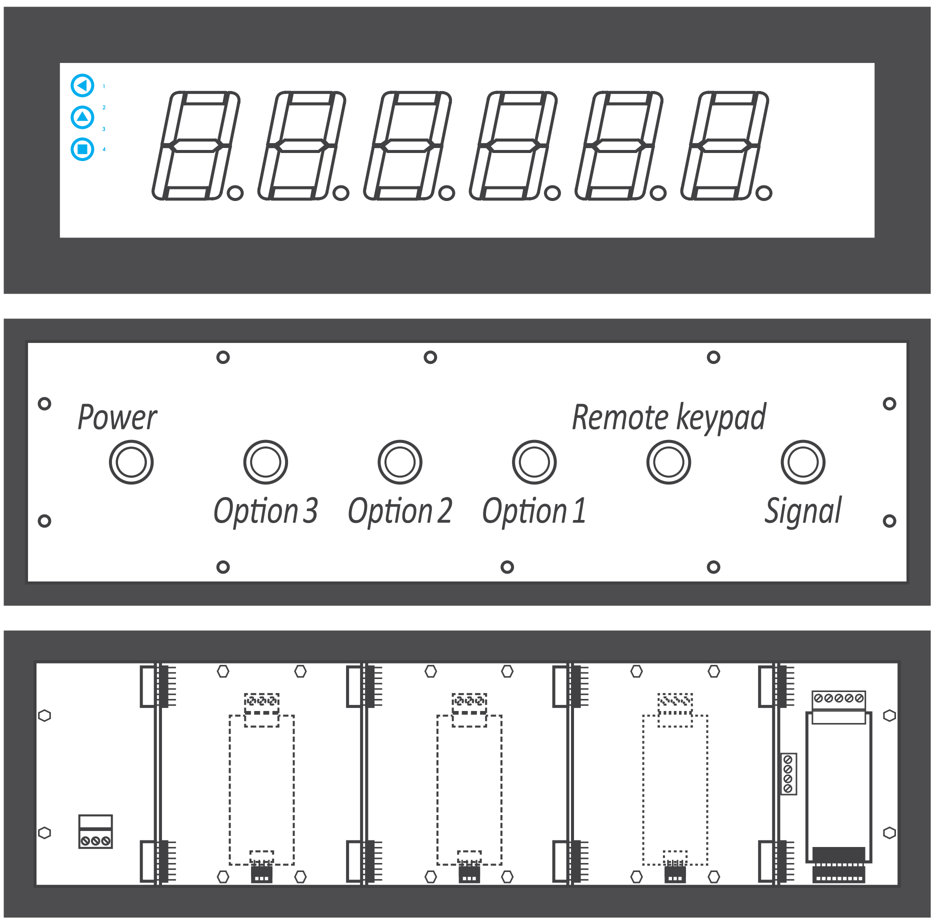


Figure 2 - LDB-26 instrument front view (top), rear view (middle) and internal view (bottom).

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **61 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **five (5) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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