

KOSMOS SERIE

CODE: 30727004 EDITION: 27-09-2010

1 of 2



MODEL BETA-M



FIRMWARE
2.00
VERSION

**MOD
BUS**

**FAIL
SAFE**

**SENSOR
BREAK
ALARM**



FIRMWARE
2.00
VERSION

**Version Firmware 2.00
or later**

**MOD
BUS**

Compatible Modbus
See page 86

**FAIL
SAFE**

Fail Safe Function
See page 108

**SENSOR
BREAK
ALARM**

Sensor Break Alarm
See page 107

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See page 67



Programming parameters lockout
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Linearization by segments
See page 36

TARE

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INTRODUCTION TO THE KOSMOS SERIE

This catalogue does not constitute a formal agreement.

All information given in this manual is subject to change without notice.

The KOSMOS SERIE brings a new philosophy in digital panel instrumentation which is expressed by multipurpose, modular-concept devices providing a rich array of basic functions and advanced capabilities.

With a fully MODULAR DESIGN, it is possible to implement a wide variety of applications by only adding the adequate options.

Intelligence within allows the meter to recognize the options installed and ask for the necessary parameters to properly function within desired margins. The basic instrument without output options omits these data in the program routines.

The instrument's CALIBRATION is made at the factory eliminating the need for adjustment potentiometers.

Any circuit or option that may need any adjust incorporates a memory where calibration parameters are stored, making it possible the optional cards be totally interchangeable without need of any subsequent adjust.

Custom CONFIGURATION for specific applications can be made quickly and easily through five front panel keys, following structured choice menus aided by display prompts at each programming step.

Other features of the KOSMOS family include:

- CONNECTIONS via plug-in terminal blocks without screws and CLEMP-WAGO clips cable retention system.
- DIMENSIONS
Models ALPHA & BETA 96x48x120 mm DIN 43700
Models MICRA & JR/JR20 96x48x60 mm DIN 43700
- CASE MATERIAL UL-94 V0-rated polycarbonate.
- PANEL INSTALLATION by means of single part fingertip without screws.

To guarantee the meter's technical specifications, it is advised to check its calibration at periodical intervals according to the ISO9001 standards for the particular application operating criteria. Calibration should be performed at the factory or in a qualified laboratory.

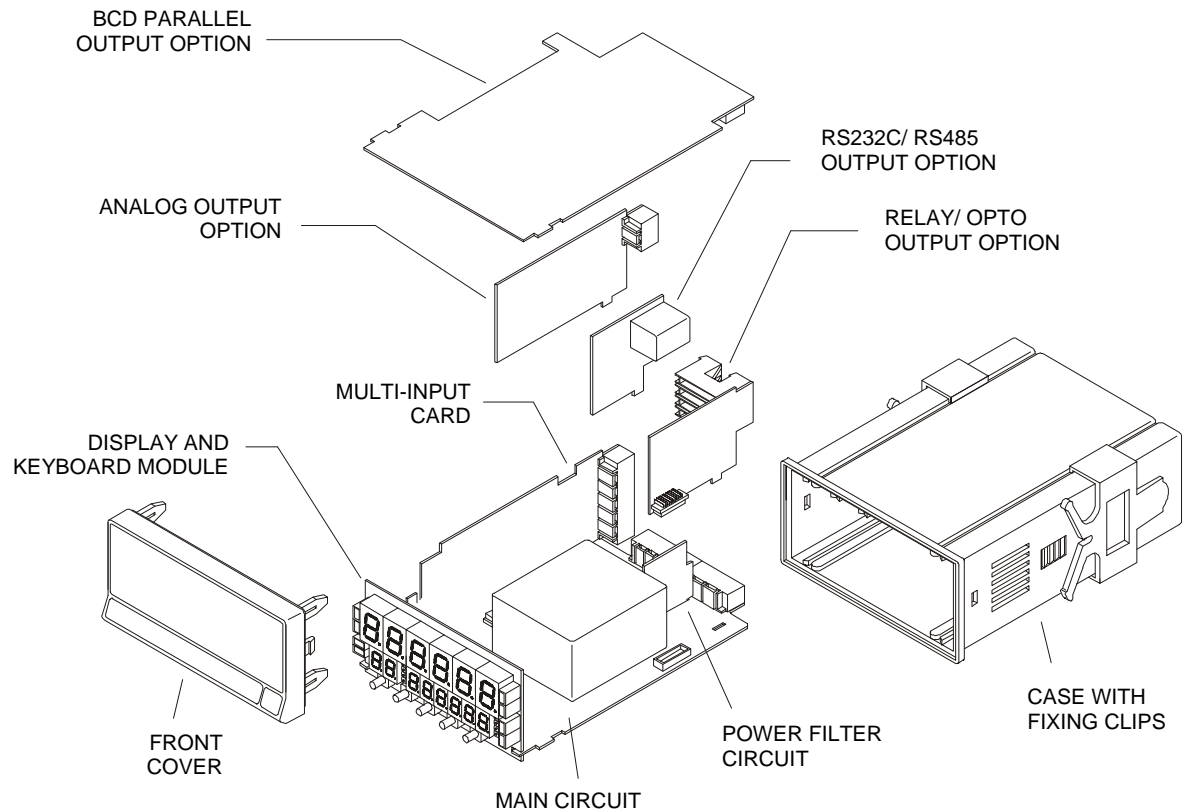
MODEL BETA-M

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1. MODEL BETA-M

The BETA-M model incorporates new technical and functional characteristics including more filtering options, software lockout, a variety of programmable remote inputs and many other performance capabilities that provide an extraordinary flexibility to adapt to a wide range of indication and control needs.

The BETA-M model is a digital multifunction instrument whose input stage admits, as selected by the user the following configurable input types:

- PROCESS (V, mA)
- LOAD CELL (mV/V)
- Pt100 SENSOR
- THERMOCOUPLE (J, K, T, R, S, E)
- POTENTIOMETER

The input card allows direct connection to a wide variety of transducers, transmitters or primary sensors without need for changing any component or circuit. The meter's configuration for a particular input type is made entirely by software.

An optional 8-digit totalizer/integrator accumulates time dependent quantities using a timebase or either stores batch readings.

Standard features of the basic instrument include the reading of the input variable plus a selectable second variable in the lower display, max and min readings detection, remote hold, tare operation and a full complement of programmable logic functions.

Special software capabilities are program lock-out for individual menus or the entire program parameters, as well as the possibility to restore factory configuration at any time.

In addition, a variety of plug-in output cards can be installed at any time to meet further system requirements: analog or digital control via 0-10V/ 4-20mA or relay/ transistor outputs and communication via serial RS232C/ RS485 or BCD parallel. Each option has a separate programming module to configure relating parameters, which is activated when the card is installed.

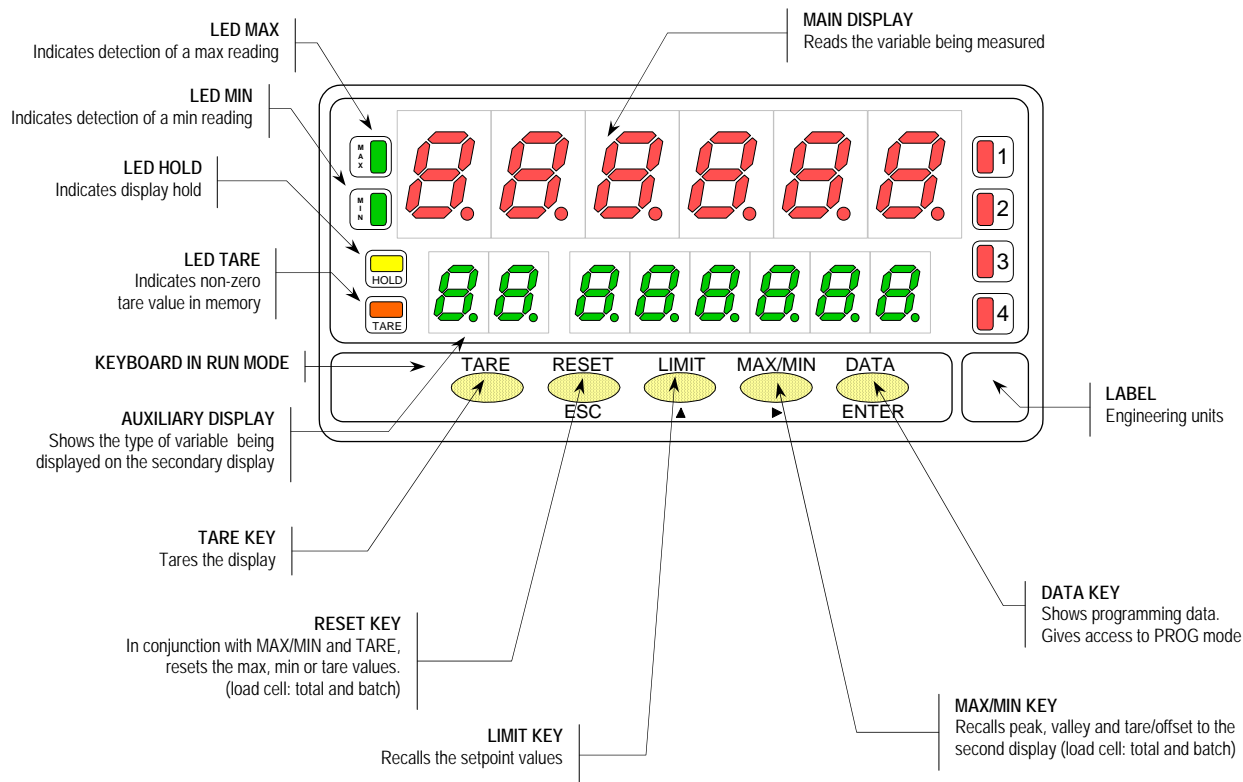
All output options are optoisolated from input signal and power supply.

The basic instrument is a soldered assembly composed of the main board, the display and keyboard module, the power filtering circuit and the multi-input card (see page 6).

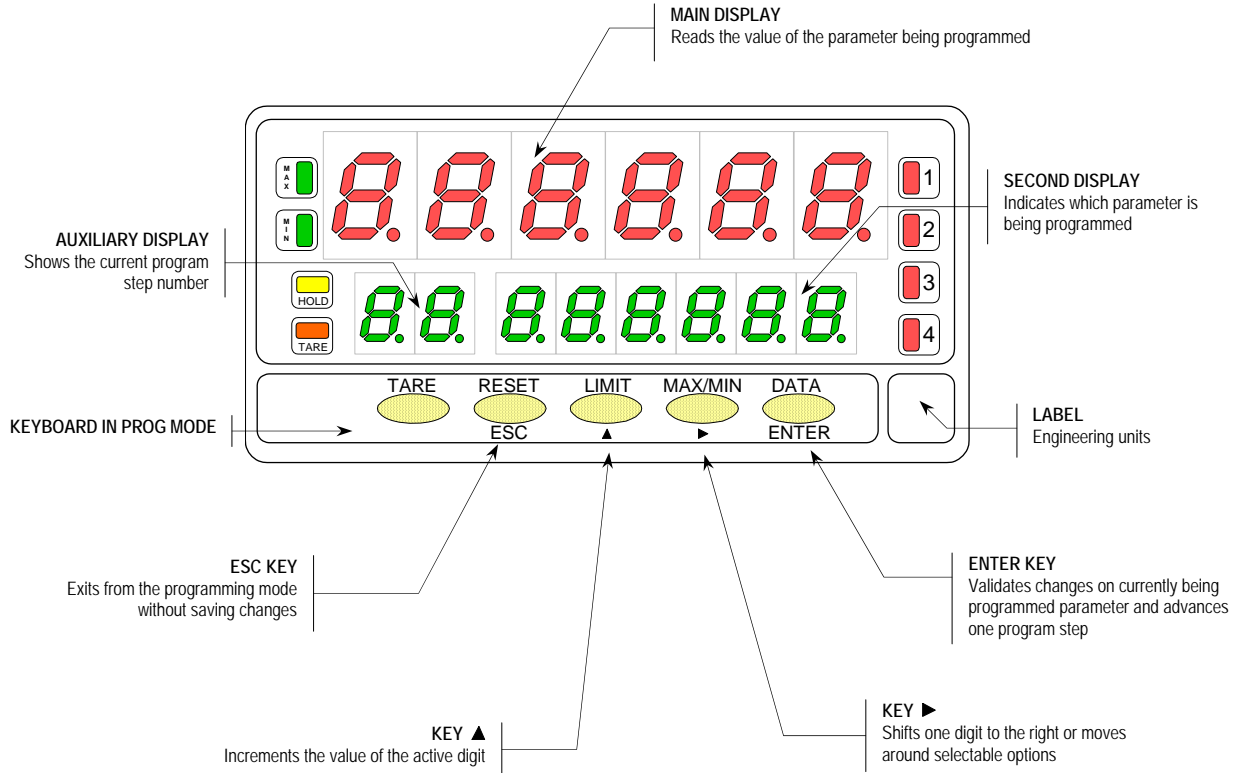


This instrument conforms to the following directives: EMC 2004/108/CEE and LVD 2006/95/CEE
Caution: Read complete instructions to ensure safety protections.

1.1 - RUN MODE: FRONT-PANEL FUNCTIONS



1.2 - PROG MODE: FRONT-PANEL FUNCTIONS



2. GETTING STARTED

Packing contents

- ❑ Instructions manual in English, including Declaration of Conformity.
- ❑ Digital panel meter model Beta-M.
- ❑ Accessories for panel mounting (sealing gasket and fixing clips).
- ❑ Accessories for wiring connections (plug-in terminal block connectors with a fingertip key).
- ❑ Wiring label stuck to the plastic case
- ❑ Set of labels with engineering units
- ✓ *Check the packing is complete.*

Configuration

Power supply (pages 11 & 12)

- ❑ The instruments with 115/230V AC power supply are set by default for a supply voltage of 230V (USA market 115 V AC).
- ❑ The instruments with 24/48V AC power supply are set by default for a supply voltage of 24V.
- ✓ *Check wiring label before applying power to the instrument.*

Programming instructions (pages 13, 14 & 15)

- ❑ The software is divided into several independently accessible modules for configuration of the input, the display, the setpoint outputs, the analog output, the communication output and the logic inputs.
- ✓ *Read carefully this section.*

Input types (pages 16 & 17)

- ✓ *Verify input configuration before connecting the input signal.*

Programming parameters lockout (page 54)

- ❑ The instrument is shipped from the factory with all programming levels accessible to the operator. Software allows selective lockouts of the programming parameters.
- ✓ Lockout is recommended after programming the instrument.

2.1 - Power supply and connector

To access hardware configuration, remove the meter from the case as shown in figure 11.1.

115/230 V AC: The instruments with 115/230 V AC power are shipped from the factory for 230V AC (USA market 115V AC), see figure 11.2. To change supply voltage to 115V AC, set jumpers as indicated in table 11.1. The wiring label should be modified to match new setup.

24/48 V AC: The instruments with 24/48V AC power supply are shipped from the factory for 24V AC, see figure 11.2. To change supply voltage to 48V AC, set jumpers as indicated in table 11.1. The wiring label should be modified to match new setup.

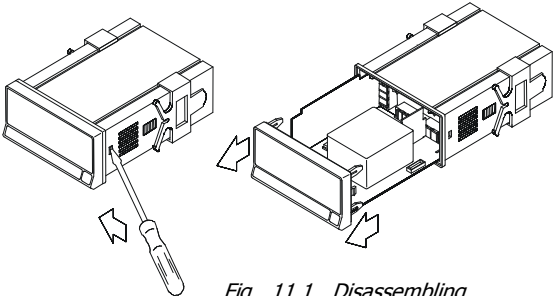


Fig. 11.1. Disassembling

Table 1. Jumper settings.

Pin	1	2	3	4	5
230V AC	-	[Jumper]		[Jumper]	
115V AC	[Jumper]		[Jumper]		-
48V AC	-	[Jumper]		[Jumper]	
24V AC	[Jumper]		[Jumper]		-

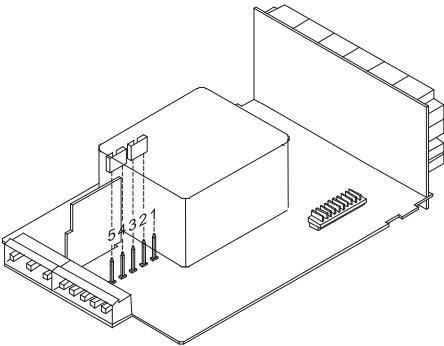


Fig. 11.2. Jumper location for 230 V or 48 V AC

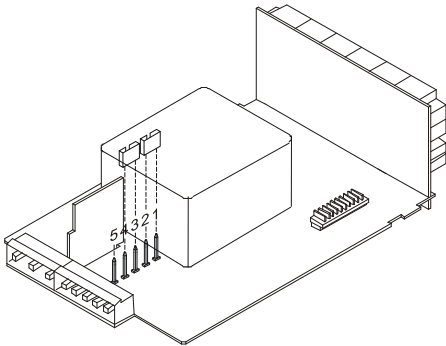
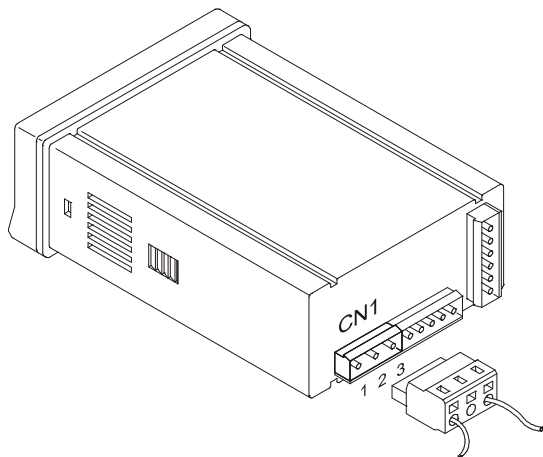


Fig. 11.3. Jumper location for 115 V or 24 V AC

POWER CONNECTION - CN1



PIN 1 - AC PHASE
PIN 2 - GND (GROUND)
PIN 3 - AC NEUTRAL



INSTALLATION

To meet the requirements of the directive EN61010-1, where the unit is permanently connected to the mains supply it is obligatory to install a circuit breaking device easy reachable to the operator and clearly marked as the disconnect device.

WARNING

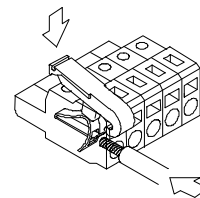
In order to guarantee electromagnetic compatibility, the following guidelines for cable wiring must be followed:

- Power supply wires must be routed separated from signal wires.
Never run power and signal wires in the same conduit.
- Use shielded cable for signal wiring and connect the shield to ground of the indicator (pin2 CN1).
- The cable section must be $\geq 0.25 \text{ mm}^2$

If not installed and used according to these instructions, protection against hazards may be impaired.

CONNECTORS

To perform wiring connections, remove the terminal block from the meter's connector, strip the wire leaving from 7 to 10 mm exposed and insert it into the proper terminal while pushing the fingertip down to open the clip inside the connector as indicated in the figure.



Proceed in the same manner with all pins and plug the terminal block into the corresponding meter's connector.

Each terminal accepts cables of section between 0.08 mm^2 and 2.5 mm^2 (AWG 26 ÷ 14).

The blocks provide removable adaptors into each terminal to allow proper fastening for cable sections of $< 0.5 \text{ mm}^2$.

2.2 - Programming Instructions

Access to the programming mode

When power is applied to the instrument, the display briefly illuminates all segments and LED's then shows the software version and finally enters in the normal mode. Press **ENTER** to enter in the programming mode. The second display shows the indication "-Pro-" (fig. 13.1).

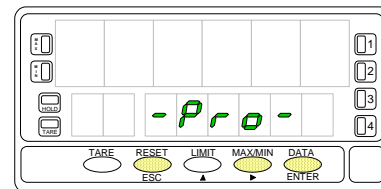


Fig. 13.1. PROG mode first step (-Pro- stage)

Exit from the programming mode without saving data

From any step of the program routines, a push of **ESC** returns the meter to the -Pro- stage. From this point, a new push of **ESC** shows momentarily the indication "qUIt" on the second display, the meter exits from the programming mode, restores the previous configuration and returns to the normal operation. Any parameter change made before exiting in this mode is discarded.

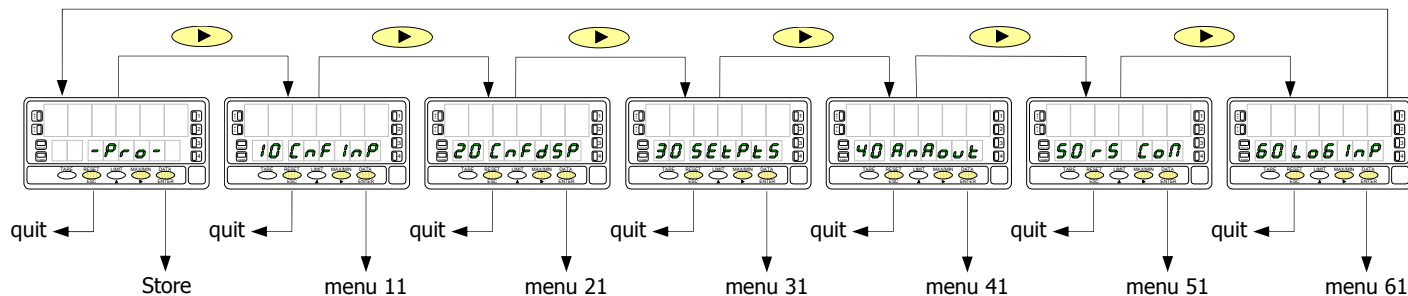
Save changes in the configuration

In the programming mode, the instrument returns to the -Pro- stage at the end of each program menu. The data changes are not saved at this point, to keep changes in the configuration parameters press **ENTER**, the second display shows momentarily the indication "StorE" while the new configuration is saved in the memory. After, the instrument returns to the run mode.

Guidelines on programming instructions

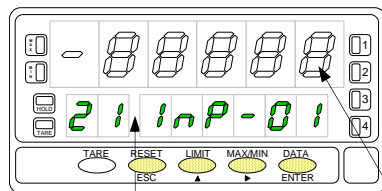
The programming software is divided into 6 modules. Each module is organized in several independently accessible menus and each menu contains a list of parameters necessary to configure a specific function of the meter.

From the -Pro- stage, press repeatedly **▶** to cycle around the existing modules: module 10 = Input configuration, module 20 = display configuration, module 30 (if option is installed) = setpoints, module 40 (if option is installed) = analog output, module 50 (if option is installed) = serial outputs and module 60 = logic functions. Press **ENTER** to get access to the selected module.



The programming instructions are composed by a general description and a series of step-by-step instructions to be followed sequentially. Each menu step is represented by an illustration of the display and keyboard module with indications (displays and LED's), reference [page number. figure number] and a text describing the action of each key at current step.

[page n°/figure n°] Mnemo



The auxiliary display shows the identification of the current menu.

The second display shows the parameter being programmed.

In the step-by-step instructions, you are given the action of the three buttons mainly used to program data. The normal procedure at each step is to push on a number of times to make changes and push on to validate changes and advance to the next programming step. At the end of a complete menu sequence the meter returns to the -Pro- stage, where:

- to save changes and exit
- to discard changes and exit
- to select among available options

With respect to the figures in the step-by-step instructions, the display indications may have the following meanings:

1. / The first display shows one of the available options with filled-out segments. That means that the display shows the choice made previously. The use of allows to select from available options.

2. / A series of black "8" also represents the display indication of a previous choice, with the difference that it cannot be changed in the current step. If it is already the desired parameter, you may exit from the menu by a push of without making changes or, if wanted to modify it, a push of advances the meter to the next step where changes are allowed.

3. / A series of white "8" represents any numerical value that is programmed by the and buttons.

2.3 - Programming guide

The steps listed here below should be followed to properly configure the indicator according to desired input. Steps are marked depending on whether they are mandatory (**M**), recommended (**R**) or optional (**op**).

Process indicator:

1. Input programming, pages. 16 - 20 (**M**).
2. Signal wiring, pages. 21 - 22 (**M**).
3. Scaling, pages. 34 - 45 (**M**).
4. Configure the integrator option, pages 46 - 48 (**op**)
5. Program remote inputs, pages. 66 - 69 (**R**).
6. Install and configure output options, refer to respective manual (**op**).
7. Lockout programming, pages. 71 - 72 (**R**).

Load cell indicator:

1. Input programming, pages. 16, 23 and 24 (**M**).
2. Signal wiring, page. 25 (**M**).
3. Configure the display, pages. 50 - 54 (**M**).
4. Program remote inputs, pages. 66 - 69 (**R**).
5. Install and configure output options, refer to respective manual (**op**).
6. Lockout programming, pages. 71 - 72 (**R**).

Pt100 thermometer:

1. Input programming, pages. 17, 26 and 27 (**M**).
2. Signal wiring, page. 28 (**M**).
3. Program display options, pp. 34 - 35 and 42 - 45 (**R**).
4. Program remote inputs, pages. 66 - 69 (**R**).
5. Install and configure output options, refer to respective manual (**op**).
6. Lockout programming, pages. 71 - 72 (**R**).

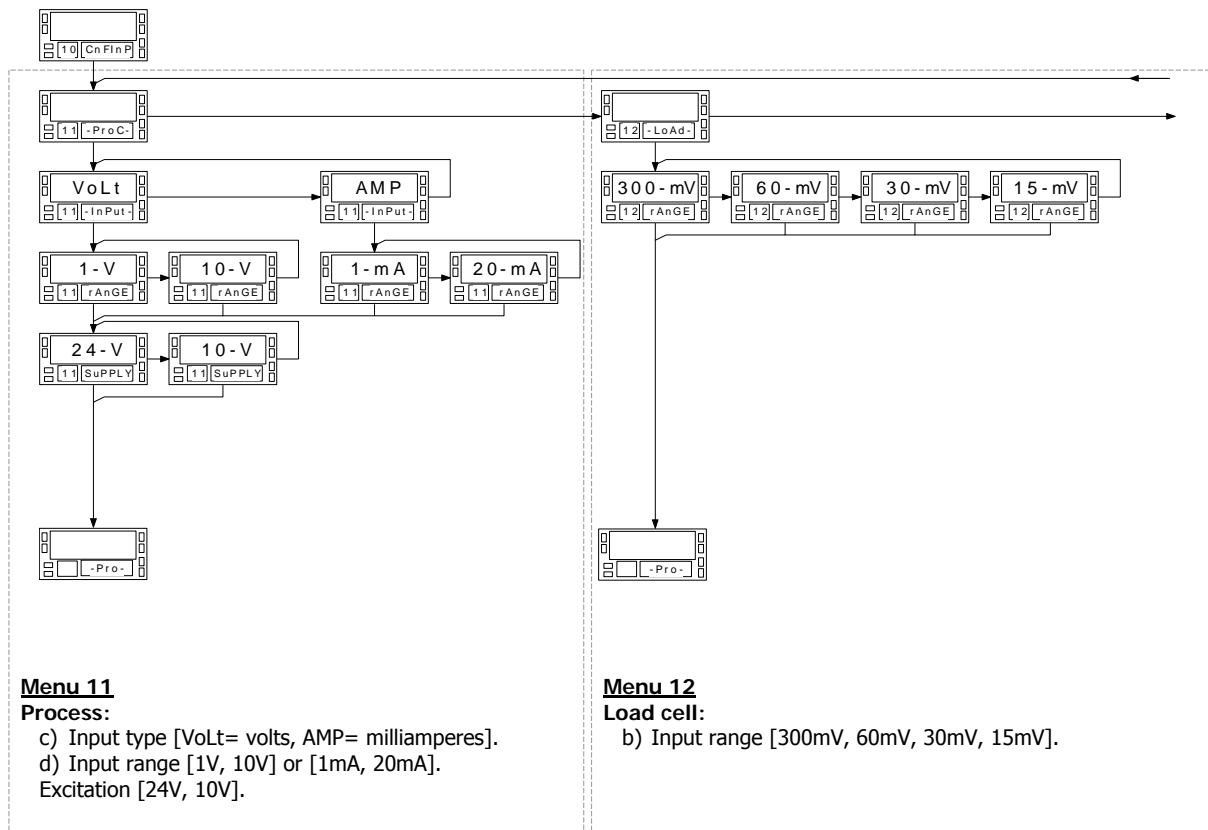
Thermocouple meter:

1. Input programming, pages. 17 and 29 - 31 (**M**).
2. Signal wiring, page. 32 (**M**).
3. Program display options, pp. 34 - 35 and 42 - 45 (**R**).
4. Program remote inputs, pages. 66 - 69 (**R**).
5. Install and configure output options, refer to respective manual (**op**).
6. Lockout programming, pages. 71 - 72 (**R**).

Potentiometer indicator:

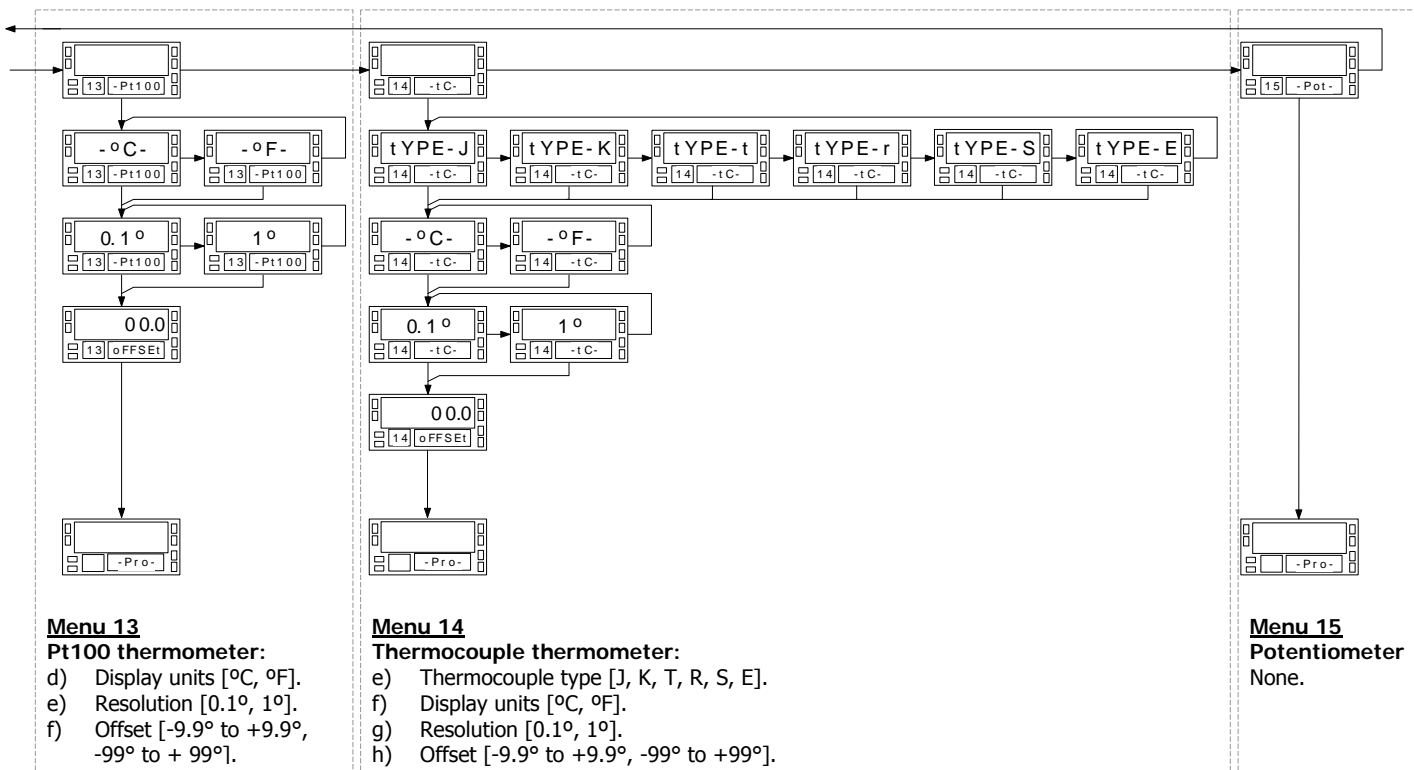
1. Input programming, pages. 17 and 33 (**M**).
2. Set excitation jumper, page. 18 (**M**).
3. Signal wiring, page. 33 (**M**).
4. Scaling, pages. 34 - 45 (**M**).
5. Configure the integrator option, pages 46 - 48 (**op**)
6. Program remote inputs, pages. 66 - 69 (**R**).
7. Install and configure output options, refer to respective manual (**op**).
8. Lockout programming, pages. 71 - 72 (**R**).

3. INPUT CONFIGURATION



MODULE 10 - INPUT CONFIGURATION ("CnFinP")

The figure shows the complete input configuration module which is divided into five menus. Each menu corresponds to a specific configuration of the meter. You may only need to program the parameters of the desired configuration (process, load cell, thermocouple, Pt100 or potentiometer).



To have access to the input configuration module, press **ENTER** to pass from the run mode to the programming mode and press **▶** to make the lower displays show the indication "10 CnFinP" (fig. 18.1).

3.1 - Program process input

The process indicator accepts inputs in volts or milliamperes and provides three selectable transducer excitation voltages.

Configurable parameters:

- a) Type of input : volts or milliamperes
- b) Input range in volts or milliamperes :
 - "1V", range -1V to +1V,
 - "10V", range -10V to +10V,
 - "1mA", range -1mA to +1mA,
 - "20mA", range -20mA to +20mA,
- c) Sensor excitation. Available excitation voltages are 24V, 10V or 5V. The 5V supply is set by selecting 10V in the software routines then placing a jumper in the position shown in figure 18.2.

Fig. 18.1: Input configuration module

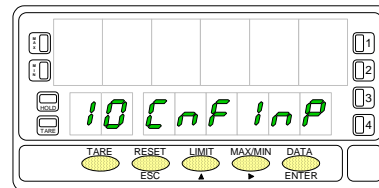
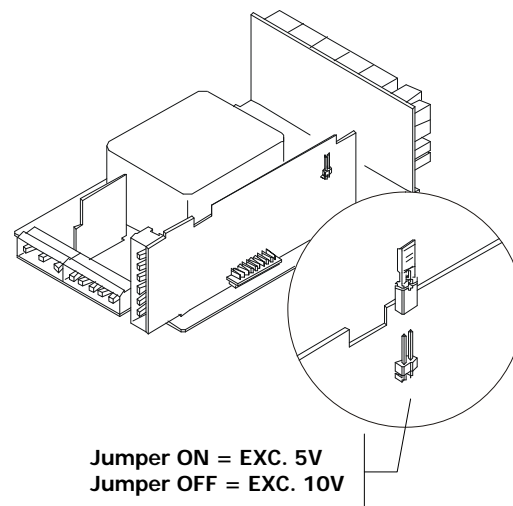


Fig. 18.2: 10V/5V excitation jumper



Menu 11 - PROCESS

This menu configures the meter as a process indicator. Programmable parameters are the input type (volts or milliamperes), input range and transducer's excitation.

[19.1] Access to menu 11

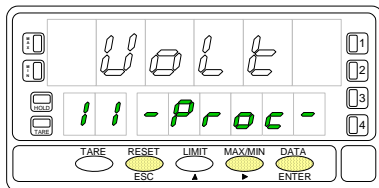
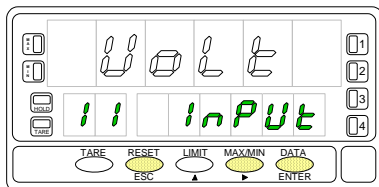


Figure 19.1 shows the indication corresponding to the access stage to process input configuration. The following actions are available at this stage :

- ENTER** Access to the process input parameters.
- ▶** Skip this menu and pass to the load cell configuration (p. 24).
- ESC** Exit from this routine and return to the -Pro- stage.

[19.2] Input type

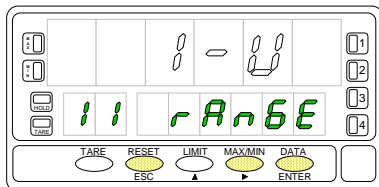


Menu 11 Input. Select input type.

The display shows the previous configuration [**VoLt** = voltage input, **AMP** = current input]. Press **▶** to change this parameter if desired.

- ENTER** Validate the choice and advance to the next programming step.
- ESC** Exit from this routine and return to the -Pro- stage.

[19.3] Input range

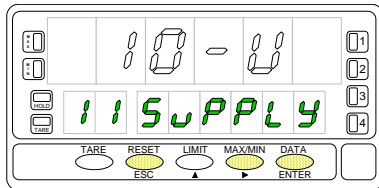


Menu 11 rAnGE. Select input range.


There are two ranges for each input type [**1-V** / **10-V** if input type is 'VoLt' and **1mA** / **20mA** if input type is 'AMP']. Press **▶** to change this parameter if desired.



- ENTER** Validate changes and advance to the next programming step.
- ESC** Exit from this routine and return to the -Pro- stage.

[20.1] Excitation Supply



Menu 11 SuPLY. Select excitation voltage.

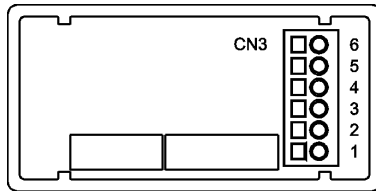
The meter provides two software selectable excitation voltages [10-V and 24-V] that alternate on the display by pressing the  key. To set the excitation supply to 5V DC, select the option '10-V' and place the jumper shown in figure 18.2.

-  ENTER Validate changes, exit from this menu and return to the -Pro- stage.
-  ESC Exit from this routine and return to the -Pro- stage.

3.1.1 - Signal wiring (V, mA)

Refer to wiring instructions in page 12.

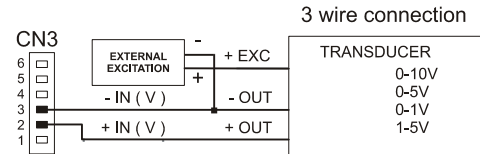
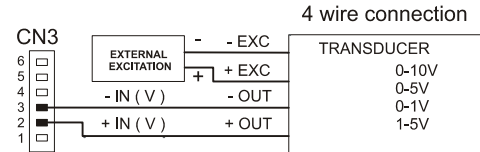
Instrument's rear view



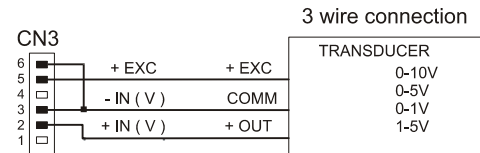
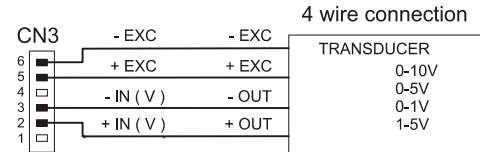
PIN 6 = -EXC [excitation supply (-)]
 PIN 5 = +EXC [excitation supply (+)]
 PIN 4 = +IN [input mA (+)]
 PIN 3 = -IN [input V (-) or mA (-)]
 PIN 2 = +IN [input V (+)]
 PIN 1 = N/C [not connected]

PROCESS input in volts

CONNECTION WITH EXTERNAL EXCITATION

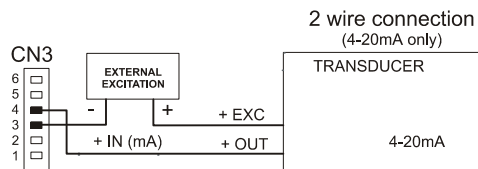
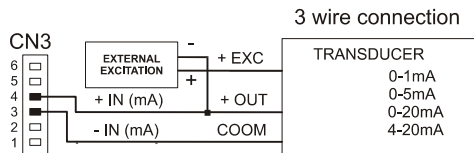
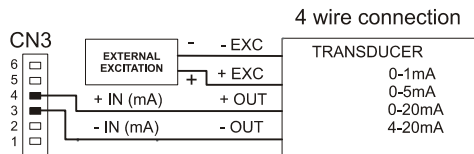


EXCITATION SUPPLIED BY BETA

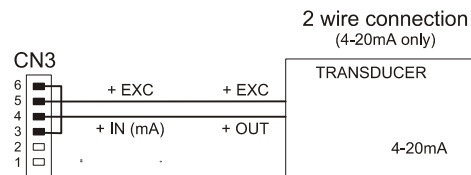
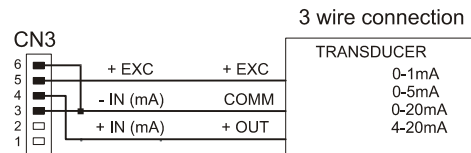
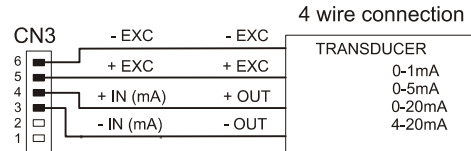


PROCESS indicator with mA input

CONNECTION WITH EXTERNAL EXCITATION



EXCITATION SUPPLIED BY BETA



3.2 - Program load cell input

Refer to the cell manufacturer's documentation, particularly with respect to the cell sensitivity and supply voltage specifications.

As load cell indicator the meter's function is to measure forces (weight, pressure, torque...) which are converted to a millivolts signal by a bridge type transducer such as load cell and applied to the input of the meter.

The instrument supplies 10V or 5V to feed the transducer as selected by jumper (fig. 25.1). These voltages can feed up to 4 cells connected in parallel with 10V or up to 8 cells connected in parallel with 5V without need for an external source (fig. 25.2).

Example:

4 cells with 2mV/V sensitivity are parallel connected to the meter input. With an excitation voltage of 10V, the max. voltage generated by the cells is 20mV. In the same case but with an excitation of 5V, the max. voltage generated by the cells is 10mV.

Software configuration requires selection of the input range which may be selected high enough for the maximum input signal to avoid overloads.

There are four ranges: $\pm 15\text{mV}$, $\pm 30\text{mV}$, $\pm 60\text{mV}$ and $\pm 300\text{mV}$

Example:

If a weighing process gives 20mV to the meter input with maximum load, the best range should be 30mV.

BATCH FUNCTION

Operation by logic input

Function n° 30 -BATCH- is designed to be used in batch weighing applications where it is required to read the accumulated total of a product quantity per cycle, or day and to keep count of the number of weighing operations.

A sensor connected to a logic input with function 30 detects the presence of a weight and pulls low the logic input which makes the instrument add the measured value to the totalizer and increment the batch counter in one unit.

The meter keeps in memory the totalizer and the batch count in a power failure or disconnection from the power source. These parameters can be displayed permanently on the second display as selected by the user.

Menu 12 - LOAD CELL

This menu configures the meter as a load cell indicator and allows selecting the input range. Available excitation voltages for this configuration are 10 and 5V DC which are selected by a plug-in jumper (see fig. 25.1).

[24.1] Access to menu 12

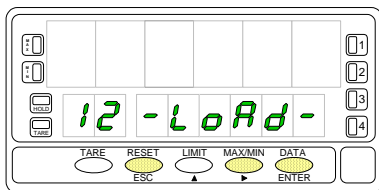



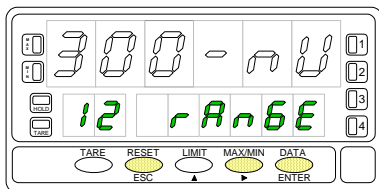



Figure 24.1 shows the indication corresponding to the input level to load cell input configuration. The following actions are available at this stage:



-  Access to the load cell input parameters.
-  Skip this menu and pass to the Pt100 configuration (p. 26).
-  Exit from this routine and return to the -Pro- stage.

[24.2] Input range



Menu 12 rAnGE. Select input range.

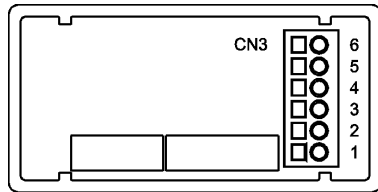
Press repeatedly the  key to cycle around available options [300mV, 60mV, 30mV and 15mV].

-  Validate changes, exit from this menu and return to the -Pro- stage.
-  Exit from this routine and return to the -Pro- stage.

3.2.1 - Load cell wiring connections (mV/ V)

Refer to wiring instructions page 12.

Instrument's rear view



PIN 6 = -EXC [excitation supply (-)]
PIN 5 = +EXC [excitation supply (+)]
PIN 4 = Not connected
PIN 3 = -mV [input signal mV (-)]
PIN 2 = Not connected
PIN 1 = +mV [input signal mV (+)]

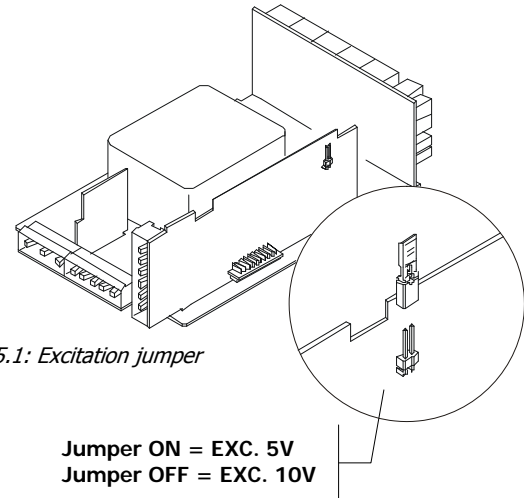
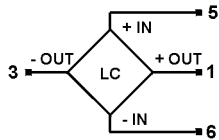
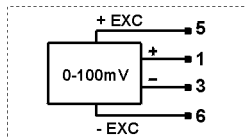


Fig. 25.1: Excitation jumper

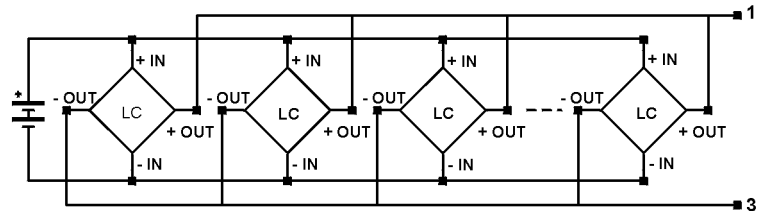
Fig. 25.2: Wiring schematics



Load cell



0-100mV Transducer



More than 4 cells connected in parallel

3.3 - Program Pt100 input

Please refer to your sensor documentation.

When configuring the meter for Pt100 input, the temperature ranges are set automatically depending on temperature units and resolution:

Input	Range (0.1 °)	Range (1°)
Pt100	-100.0 to +800.0 °C	-100 to +800 °C
	-148.0 to +1472.0 °F	-148 to +1472 °F

The Pt100 software menu allows selection of temperature units (Celsius or Fahrenheit), resolution (degrees or tenths of degree) and a display offset. The offset may be used to compensate for a difference that may exist between the temperature under measurement and the temperature read by the sensor.

The offset is programmable from -9.9 to +9.9 with 0.1° resolution and from -99 to +99 with 1° resolution.

Example:

The instrument is used to control the temperature of a baking oven, but the sensor is located at a distance from the oven where the temperature is 2 degrees below. To correct from this deviation, the offset should be programmed to +2 counts (with 1° resolution).

Configurable parameters for this input are:

- Reading units in Celsius "°C" or Fahrenheit "°F".
- Resolution to units "1°" or tenths "0.1°".
- Offset. Programmable $\pm 99^\circ$ counts.

After entering these parameters, the display range and linearization are adjusted automatically.

Menu 13 - THERMOMETER FOR Pt100 SENSOR

For this configuration, the meter requires the following information: readout units, resolution and optionally, an offset value.

[26.1] Access to menu 13

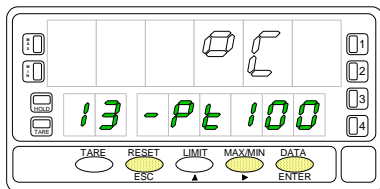



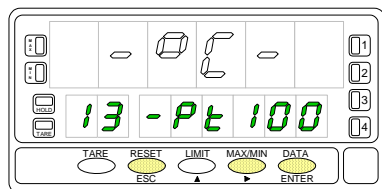



Figure 26.1 shows the indication corresponding to the access level to Pt100 input configuration. The following actions are available at this stage:


-  Access to the Pt100 input parameters.
-  Skip this menu and pass to the Pot input menu (p. 33).
-  Exit from this routine and return to the -Pro- stage.


[27.1] Units



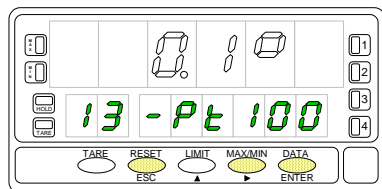
Menu 13 -Pt100. Select temperature units.

Use  to select desired units ["°C" = Celsius, "°F" = Fahrenheit].


 Validate changes and pass to the next program step.


 Exit from this routine and return to the "-Pro-" stage.


[27.2] Resolution



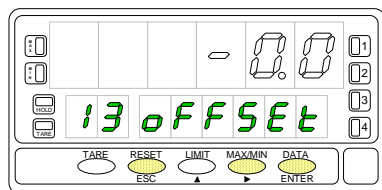
Menu 13 -Pt100. Select resolution.

Press  to switch between the indications "0.1°" (resolution to tenths of degree) and "1°" (resolution to degrees).



 Validate changes and pass to the next program step.

 Exit from this routine and return to the "-Pro-" stage.

[27.3] Offset




Menu 13 oFFSEt. Program the display offset.

The previously programmed offset appears on the display with the first digit in flash. To change the value, press  to increment the active digit value (the first digit can only be '0' or a minus sign). Press  to shift to the next digit to be modified and repeat these operations until desired offset is completed on the display (max values are ±99° with 1° resolution and ±9.9° with 0.1° resolution).

The TARE LED lights whenever the offset has been set to a value other than zero.

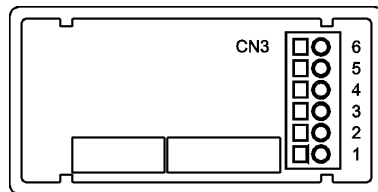
 Validate changes and return to the -Pro- stage.

 Exit from this routine and return to the "-Pro-" stage.

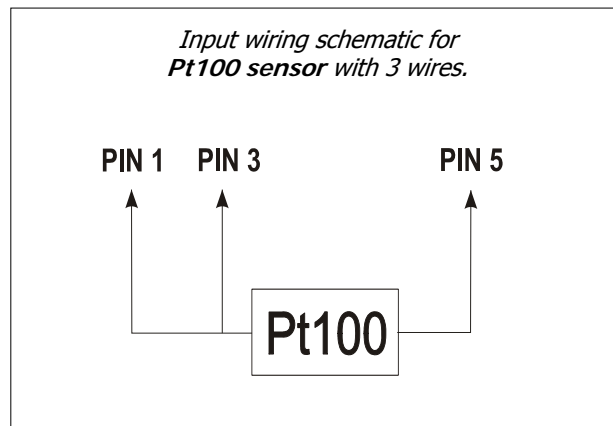
3.3.1 - Pt100 sensor connection

Refer to wiring instructions in page 12.

Instrument's rear view



PIN 6 = Not connected
PIN 5 = Pt100 COMM
PIN 4 = Not connected
PIN 3 = Pt100
PIN 2 = Not connected
PIN 1 = Pt100



3.4 - Program thermocouple input

Please refer to your thermocouple documentation.

When configuring the meter for thermocouple input, the temperature ranges are set automatically according to sensor type, temperature units and resolution:

Input	Range (0,1 °)	Range (1°)
TC J	-200,0 to +1100,0 °C	-200 to +1100 °C
	-328,0 to +2012,0 °F	-328 to +2012 °F
TC K	-200,0 to +1200,0 °C	-200 to +1200 °C
	-328,0 to +2192,0 °F	-328 to +2192 °F
TC T	-150,0 to +400,0 °C	-150 to +400 °C
	-238,0 to +752,0 °F	-238 to +752 °F
TC R	-50,0 to +1750,0 °C	-50 to +1750 °C
	-58,0 to +3182,0 °F	-58 to +3182 °F
TC S	-50,0 to +1750,0 °C	-50 to +1750 °C
	-58,0 to +3182,0 °F	-58 to +3182 °F
TC E	-200,0 to +1000,0 °C	-200 to +1000 °C
	-328,0 to +1832,0 °F	-328 to +1832 °F

The thermocouple software menu allows selection among several types of thermocouple, temperature units (Celsius or Fahrenheit), resolution (degrees or tenths of degree) and a display offset. The offset may be used to compensate for a difference that may exist between the temperature under measurement and the temperature read by the sensor. The offset is programmable from -9.9 to +9.9 with 0.1° resolution and from -99 to +99 with 1° resolution.

Example:

The instrument is used to control the temperature of a baking oven, but the sensor is located at a distance from the oven where the temperature is 2 degrees below. To correct from this deviation, the offset should be programmed to -2 counts (with resolution of 1°).

Configurable parameters for this input are:

- a) Thermocouple type [J, K, T, R, S, E].
- b) Reading units in Celsius "°C" or Fahrenheit "°F".
- c) Resolution to units "1°" or tenths "0.1°".
- d) Offset. Programmable $\pm 99^\circ$ counts.

After entering these parameters, the display range and linearization for the selected thermocouple input are adjusted automatically.

Menu 14 - THERMOCOUPLE METER

The thermocouple meter configuration provides a choice of six TC types: J, K, T, R, S and E. Other selectable parameters include temperature units, resolution and offset.

[30.1] Access to menu 14

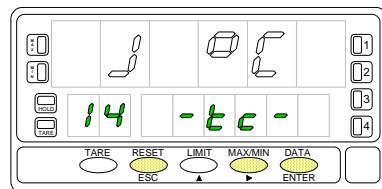
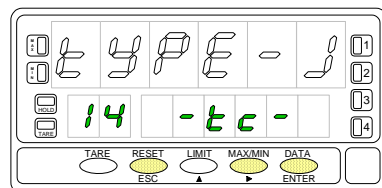


Figure 30.1 shows the indication corresponding to the thermocouple input selection. Press one of the following keys:

- ENTER** Access to the thermocouple input configuration menu.
- ▶** Pass to the menu 15 - Potentiometer (p.33).
- ESC** Exit from this menu and go to the "-Pro-" stage.

[30.2] Thermocouple type

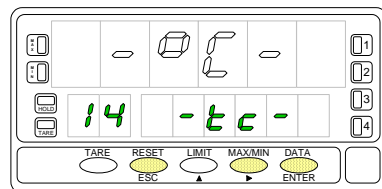


Menu 14 -tc-. Select thermocouple type.

Press **▶** to shift around available inputs ['tYPE-J', 'tYPE-K', 'tYPE-t', 'tYPE-r', 'tYPE-S' or 'tYPE-E'].

- ENTER** Validate changes and advance to the next program step.
- ESC** Exit this routine and return to the "-Pro-" stage.

[30.3] Units

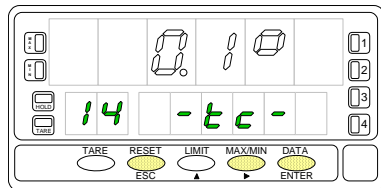


Menu 14 -tc-. Select temperature units.


Use **▶** to select desired units ["°C" = Celsius, "°F" = Fahrenheit].

- ENTER** Validate changes and pass to the next program step.
- ESC** Exit from this routine and return to the "-Pro-" stage.


[31.1] Resolution



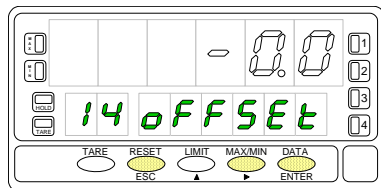
Menu 14 -tc-. Select resolution.

Press  to switch between the indications "0.1°" (resolution to tenths of degree) and "1°" (resolution to degrees).

 Validate changes and advance to the next program step.



 Exit from this routine and return to the "-Pro-" stage.

[31.2] Offset





Menu 14 OFFSEt. Program the display offset.

The previously programmed offset appears on the display with the first digit in flash.

To change the value, press  to increment the active digit value (the first digit can only be '0' or a minus sign). Press  to shift to the next digit to be modified and repeat these operations until desired offset is completed on the display (max values are $\pm 99^\circ$ with 1° resolution and $\pm 9.9^\circ$ with 0.1° resolutions).

The TARE LED lights whenever the offset has been set to a value other than zero.

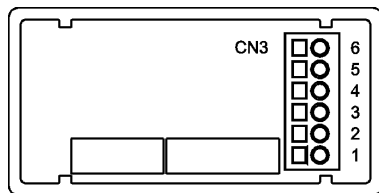
 Validate changes and return to the "-Pro-" stage.

 Exit from this routine and return to the "-Pro-" stage.

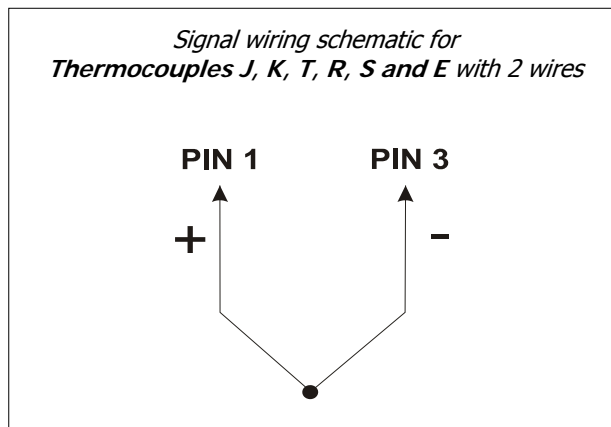
3.4.1 - Thermocouple wiring connections

Refer to the wiring instructions given in page 12.

Instrument's rear view



PIN 6 = Not connected
PIN 5 = Not connected
PIN 4 = Not connected
PIN 3 = - TC
PIN 2 = Not connected
PIN 1 = + TC



3.5 - Program potentiometer input

Please refer to the potentiometer manufacturer's documentation.

When setting the indicator for potentiometer input, no input configuration parameter is required by software. The excitation supply voltage is selected by a jumper (see fig.18.2). This output voltage is applied between the potentiometer HI and LO ends while the cursor position determines the signal level applied to the meter input.

Menu 15 - POTENTIOMETER

[33.1] Access to the menu 15

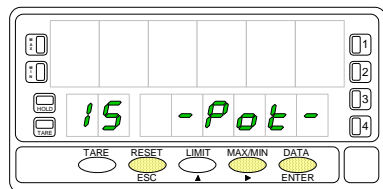





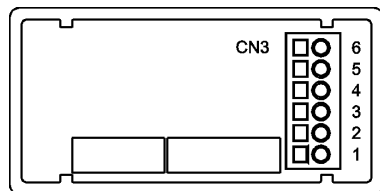
Figure 33.1 shows the indication corresponding to the potentiometer input selection. Press one of the following keys:

-  Validate the POT configuration and go to the -Pro- stage.
-  Pass to the menu 11 - Process (p. 19).
-  Exit from this menu and go to the "-Pro-" stage.

3.5.1 - POT input connection

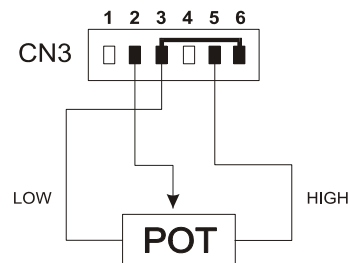
Refer to the wiring instructions given in page 12.

Instrument's rear view

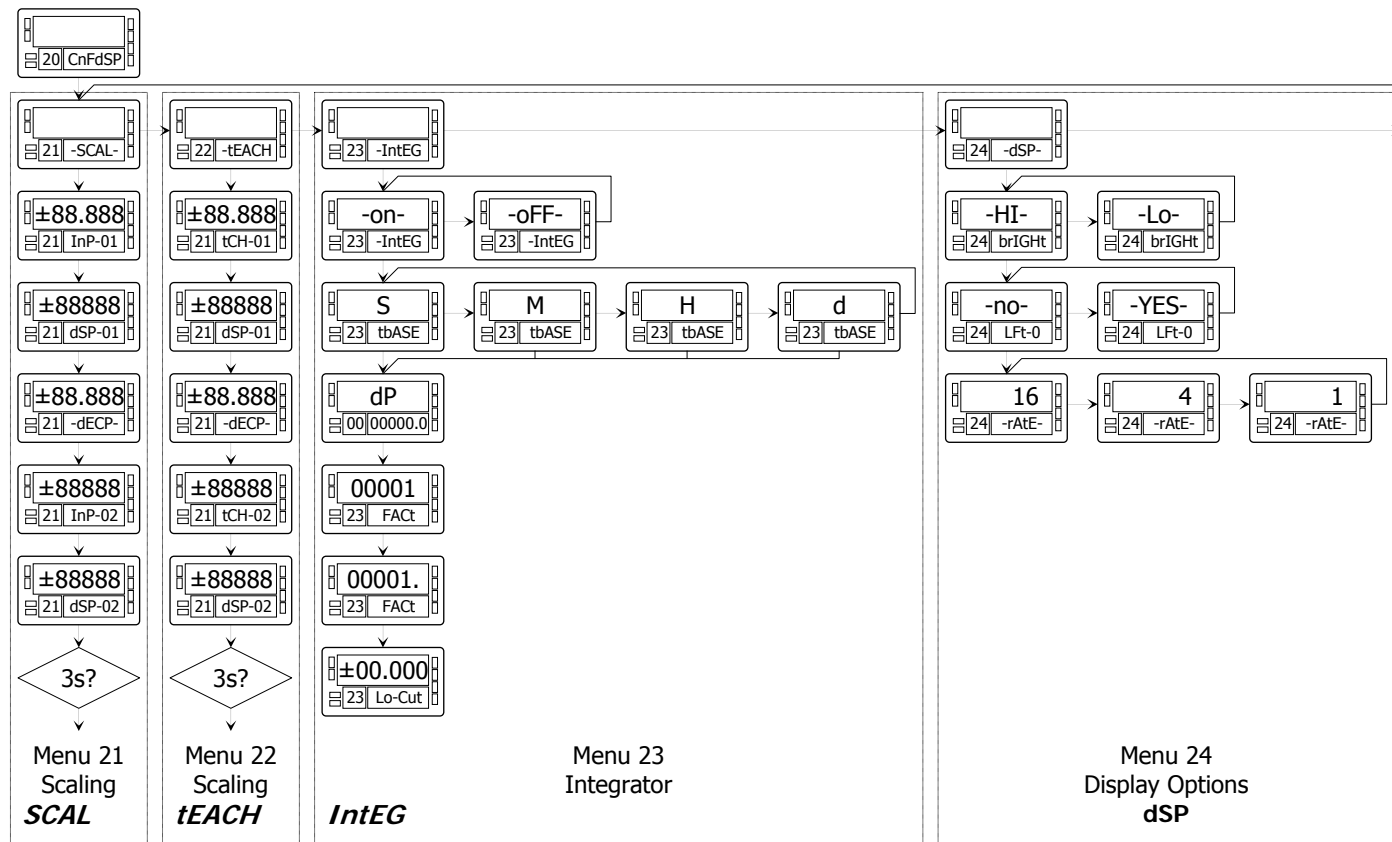


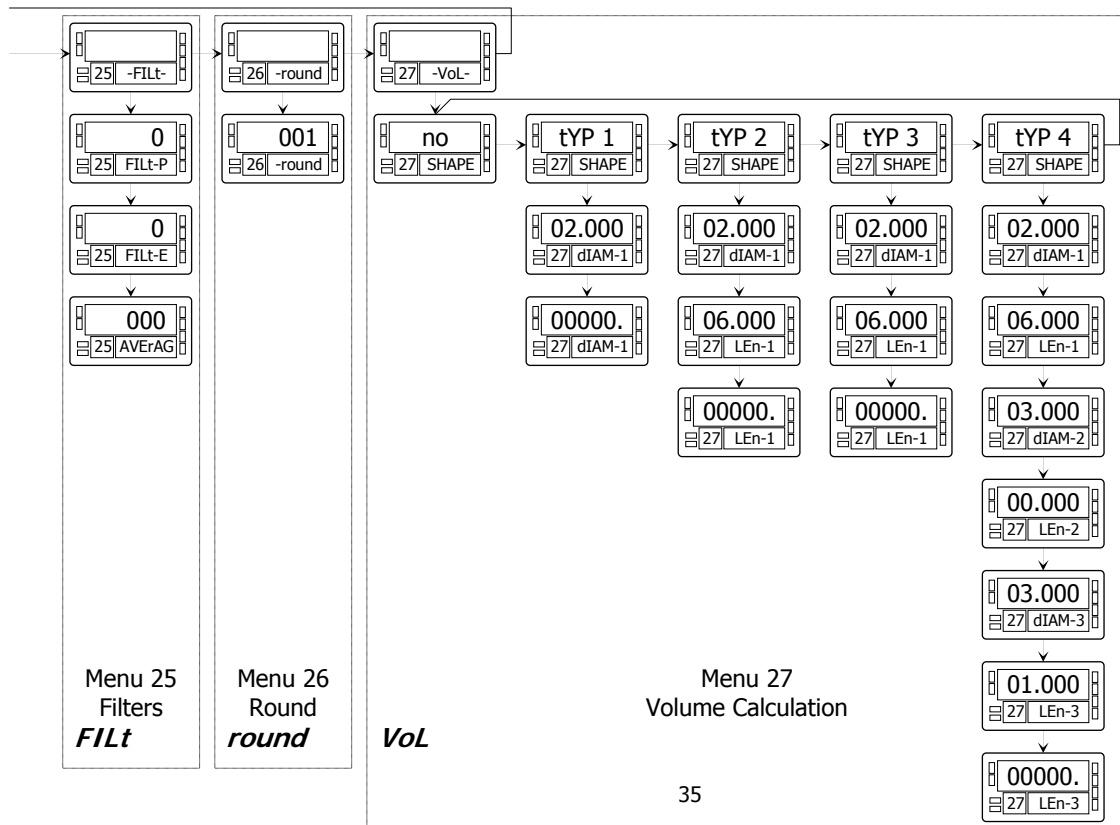
- PIN 6 = - EXC
- PIN 5 = POT HI
- PIN 4 = Not connected
- PIN 3 = POT LO (COMM)
- PIN 2 = POT CENTRAL
- PIN 1 = Not connected

Signal wiring schematic for potentiometer with 3 wires



4. DISPLAY CONFIGURATION



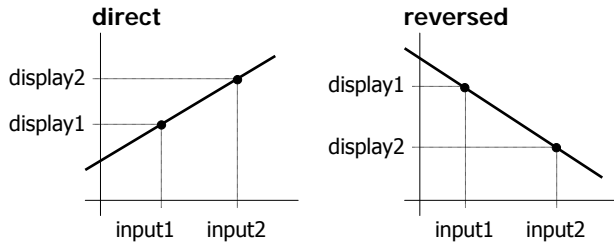


4.1. Scaling

When the instrument is configured as a process, load cell or potentiometer indicator, the display must be scaled to fit a particular application.

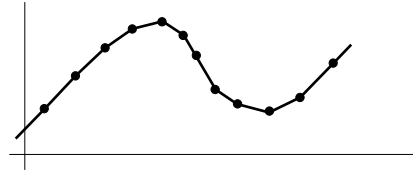
Scaling the display consists of assigning a display value to every input value.

For linear processes this is accomplished by programming two points -(input1,display1) and (input2,display2)-. The line plotted between these points establishes a linear relationship in which any input value produces a unique display value. Reverse operation is accomplished by reversing the display values or the input values (see figure).



The two points should be located near the process limits for the best possible accuracy.

For non-linear processes it is possible to set up to 30 pairs input-display. Each two consecutive points are linked by a straight segment forming all together a curve that represents a non-linear relationship between input and display.

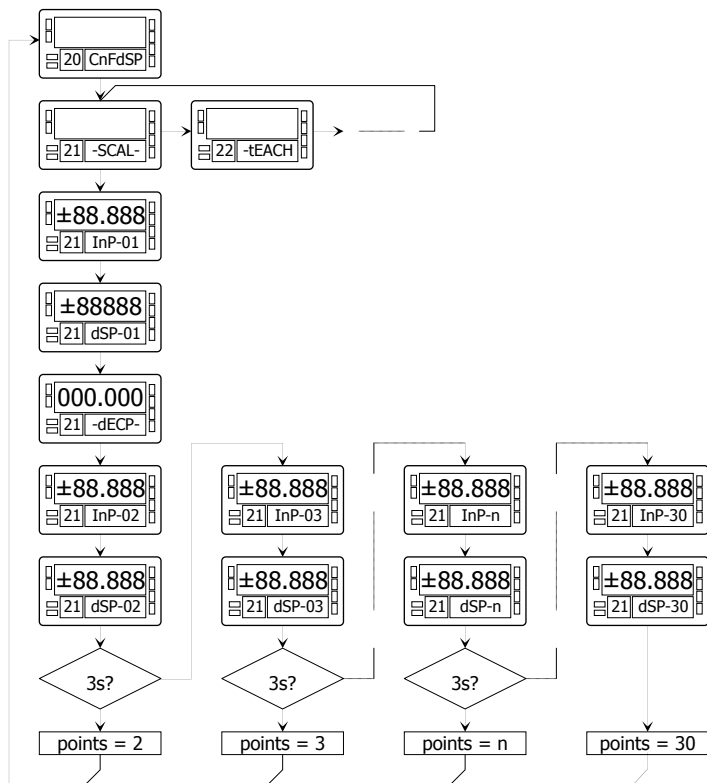


The greater the number of points used, the more accurate the measurement will be.

The input values must be programmed in always increasing or always decreasing order. Two different display values should not be assigned to the same input value.

The display values can be programmed in any order. The same display value can be assigned to different input values.

For input values below the first programmed point, the display follows the slope calculated between points 1 and 2 of the scale. For input values over the last programmed point, the display follows the slope calculated between the last two points of the scale.



The meter offers two methods to scale the display; **SCAL** (menu 21) and **tEACH** (menu 22). The diagram represents the program routine for the SCAL menu, but both routines are the same except that in the tEACH menu, the input values are denoted by tCH in the second display.

SCAL method

The input and display values are programmed manually by the front-panel keys. This method can be used when the transducer gives accurate calibrated known signals for each point of the process.

tEACH method

The input values are taken from the actual input signal present at the input connector at each point and the corresponding display values are programmed manually. This method is suitable when the transducer is connected to the process and the process can be brought to the desired conditions while programming.

Linearization points

The first two scaling points are accessible by entering in the proper scaling menu with the ENTER key. The accesses to program scaling points above 2 is achieved by a press of 3 seconds after programming the parameter 'dSP-02' in the SCAL or tEACH menus. The subsequent input-display pairs follow one another by successive pressings of ENTER. When sufficient numbers of points have been programmed, the user can exit from the routine and save the programmed data by a press of 3 seconds from the display value of the last point. In normal operation, the non-programmed pairs are missed out from the display calculation.

Menu 21 - SCAL (process, load cell and potentiometer)

This menu allows entering the input values and corresponding display values necessary to scale the meter. The decimal point location helps to read the indication in the desired units.

[38.1] Access to menu 21

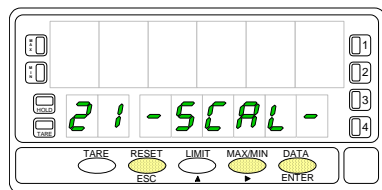
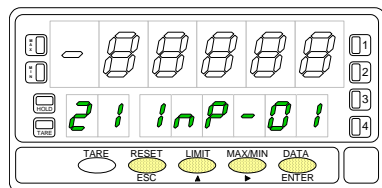


Figure 38.1 shows the indication corresponding to the access level to the SCAL menu. Press one of the following keys:

- ENTER** Access to the programming of the first menu parameter.
- ▶** Skip this menu and pass to menu 22 - Teach (page 42).
- ESC** Exit this menu and return to the -Pro- stage.

[38.2] Input 1

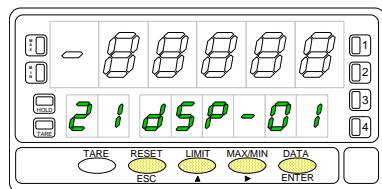


Menu 21 InP-01. Program input value for point 1.

The previously programmed value appears on the display with the first digit blinking. Press repeatedly the **▲** key to increment the active digit until it takes desired value (first digit can only be '0' or a minus sign). Press **▶** to move to the next digit to be modified and repeat these operations until desired value is completed on the display.

- ENTER** Validate changes and go to the next step.
- ESC** Cancel this routine and return to the -Pro- stage.

[38.3] Display 1

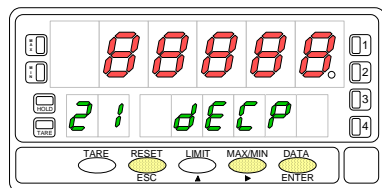


Menu 21 dSP-01. Program display value for point 1.


Use the procedure described on previous step (**▲** changes value, **▶** changes digit) to program the display value for point 1.



- ENTER** Validate changes and go to the next step.
- ESC** Cancel this routine and return to the -Pro- stage.

[39.1] Decimal point

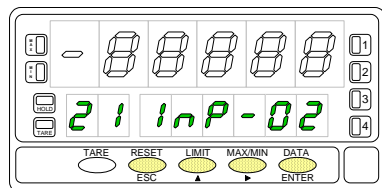


Menu 21 dECP. Decimal point position.



At this step, the decimal point goes in flash. Press the  key to rotate it to the right until it gets desired position. If no decimal point is required, it must be located to the rightmost digit as shown in figure 39.1.



-  Validate selection and go to the next step.
-  Cancel this routine and return to the -Pro- stage.

[39.2] Input 2

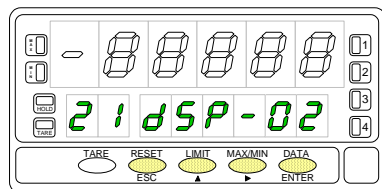


Menu 21 InP-02. Program input value for point 2.


Use the  (change value) and  (change digit) procedure to program the desired value of input 2 with sign.


-  Validate the entry and proceed to the next phase.
-  Cancel this routine and return to the -Pro- stage.

[39.3] Display 2




Menu 21 dSP-02. Program display value for point 2.

Use the  (change value) and  (change digit) procedure to program the desired value of display 2 with sign.

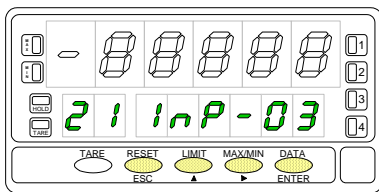
If you want to accept your changes and exit from the scaling routine with 2 points, press .

If you want to enter in the linearization routine press and hold  for 3 seconds.

-  Cancel this routine and return to the -Pro- stage.

From the programming phase of the display 2, press and hold **ENTER** for 3 seconds to get access to the linearization routine. From the point n°3, the progress through the routine is made by pressing the **ENTER** key after programming each value. At any program step, a press of **ESC** reverts to the previous point except for the programming phase of point 3, where the **ESC** key returns the meter to the -Pro- stage. To terminate the routine for a number of points less than 30, press and hold **ENTER** for 3 seconds from the last desired point display.

[40.1] Input 3

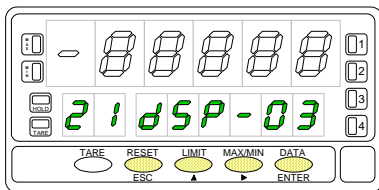


Menu 21 InP-03. Program input value for point 3.

Use the **▲** (change value) and **▶** (change digit) procedure to program the desired value of input 2 with sign.

- ENTER** Validate the entry and proceed to the next phase.
- ESC** Cancel this routine and return to the "-Pro-" stage.

[40.2] Display 3



Menu 21 dSP-03. Program display value for point 3.

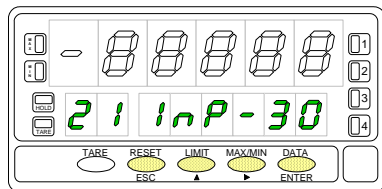
Press repeatedly the **▲** key to increment the active digit value and press the **▶** key to move to the next digit until the display reads the desired value with sign. The sign is programmed in the most significant digit ["0" = positive, "-" = negative].

1. If you want to validate the data and advance to the next program point, press **ENTER**.
2. If you want to validate the data and terminate the programming routine with three scaling points, press and hold **ENTER** for 3 seconds. The meter goes to the "-Pro-" stage.
Press **ESC** if you want to cancel the programming and return to the "-Pro-" stage.

The same procedure is used to program the rest of the input-display points except that the **ESC** key does not return to the "-Pro-" stage, but to the previous point.

A push of **ENTER** from the programming of the display n°29 gives access to the programming of the scaling point n°30 and last of the routine. The **ESC** key reverts to the previous point.
The programming routine is terminated by a press of **ENTER** after programming the display 30.

[41.1] Value of Input 30

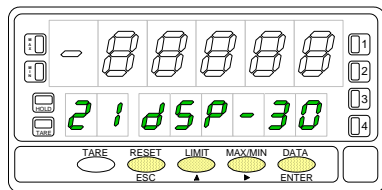


"InP-30". Programming the input of point 30.

Press repeatedly the **▲** key to increment the active digit value and press the **▶** key to move to the next digit until the display reads the desired value with sign. The sign is programmed in the most significant digit ["0" = positive, "-" = negative].

- ENTER** Validate the entry and advance to the next program step.
- ESC** Return to the programming of the previous point.

[41.2] Value of Display 30



"dSP-30". Programming the display of point 30.

Use the **▲** (increment digit) and **▶** (move to next digit) procedure to set the value of the display 30 with sign. The most significant digit is used to set the sign ["0" = positive, "-" = negative].

- ENTER** Validate the entry, exit from this routine and go to the "-Pro-" stage.
- ESC** Return to the previous point.

Menu 22 - TEACH (process, load cell and potentiometer)

This menu allows scaling the display by applying input signal values and keying-in corresponding display values. The decimal point location completes the scaling sequence in the desired units.

[42.1] Access to the Menu

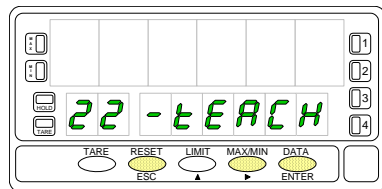
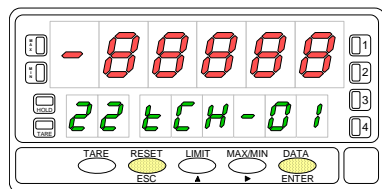


Figure 42.1 shows the indication corresponding to the access level to the tEACH menu. Press one of the following keys:

- ENTER** Access to the programming of the first menu parameter.
- ▶** Skip this menu and pass to menu 23 - Display options (page 49).
- ESC** Exit this menu and return to the -Pro- stage.

[42.2] Teach Input Signal 1

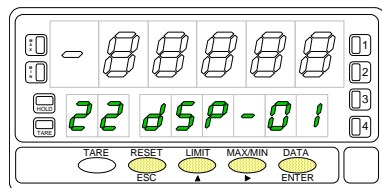


Menu 22 tCH-01. Apply input for point 1.

The main display reads the actual input signal present at the input connector. Bring the process to the conditions of the first point and press **ENTER** to take the displayed input value as the input 1 parameter and go to the programming of the corresponding display.

- ESC** Cancel this routine and return to the -Pro- stage.

[42.3] Value of Display 1

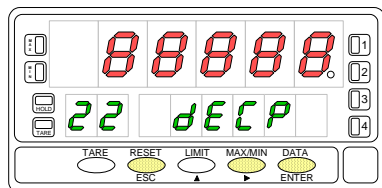


Menu 22 dSP-01. Program display value for point 1.


Use the key-in procedure to set the display corresponding to point 1 (**▲** changes the active digit value, **▶** moves to the next digit to be modified). The sign is programmed in the leftmost digit ["0" = positive, "-" = negative].


- ENTER** Validate changes and go to the next programming phase.
- ESC** Cancel this routine and return to the -Pro- stage.


[43.1] Decimal Point



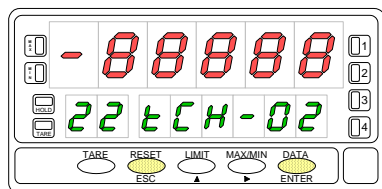
Menu 22 dECP. Decimal point position.

At this step, the decimal point goes in flash. Press the  key to move it to the right until it gets desired position. If no decimal point is required, it must be located to the rightmost digit as shown in figure 43.1.


 Validate the entry and go to the next step.


 Cancel this routine and return to the -Pro- stage.

[43.2] Teach Input Signal 2

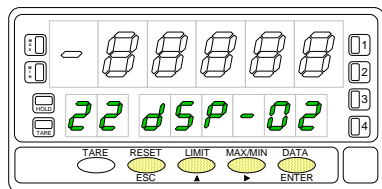


Menu 22 tCH-02. Set input value for point 2.



Bring the process to the conditions of the second scaling point. The main display reads the actual input signal present at the input connector. Press  to take the displayed input value as the input 2 parameter and go to the programming of the corresponding display.


 Cancel this routine and return to the -Pro- stage.


[43.3] Value of Display 2




Menu 22 dSP-02. Program display value for point 2.

Use the  (change value) and  (change digit) procedure to program the desired value of display 2 with sign.

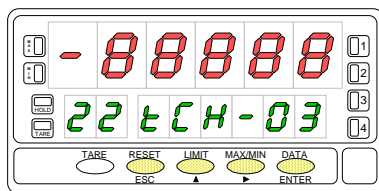
If you want to accept your changes and exit from the scaling routine with 2 points, press .

If you want to enter the linearization routine press and hold  for 3 seconds.

 Cancel this routine and return to the -Pro- stage.

From the programming phase of the display 2, press and hold **ENTER** for 3 seconds to get access to the linearization routine. From the point n°3, the progress through the routine is made by pressing the **ENTER** key after programming each value. At any program step, a press of **ESC** reverts to the previous point except for the programming phase of point 3, where the **ESC** key returns the meter to the -Pro- stage. To terminate the routine for a number of points less than 30, press and hold **ENTER** for 3 seconds from the last desired point display.

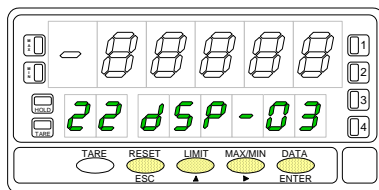
[44.1] Teach Input Signal 3



Bring the process to the conditions of the second scaling point. The main display reads the actual input signal present at the input connector. Press **ENTER** to take the displayed input value as the input 3 parameter and go to the programming of the corresponding display.

ESC Cancel this routine and return to the -Pro- stage.

[44.2] Value of Display 3



Menu 21 dSP-03. Program display value for point 3.

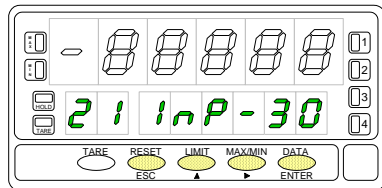
Press repeatedly the **▲** key to increment the active digit value and press the **▶** key to move to the next digit until the display reads the desired value with sign. The sign is programmed in the most significant digit ["0" = positive, "-" = negative].

1. If you want to validate the data and advance to the next program point, press **ENTER**.
2. If you want to validate the data and terminate the programming routine with three scaling points, press and hold **ENTER** for 3 seconds. The meter goes to the "-Pro-" stage. Press **ESC** if you want to cancel the programming and return to the "-Pro-" stage.

The same procedure is used to program the rest of the input-display points except that the **ESC** key does not return to the "-Pro-" stage, but to the previous point.

A push of **ENTER** from the programming of the display nº29 gives access to the programming of the scaling point nº30 and last of the routine. The **ESC** key reverts to the previous point.
The programming routine is terminated by a push of **ENTER** after programming the display 30.

[41.1] Teach Signal Input 30

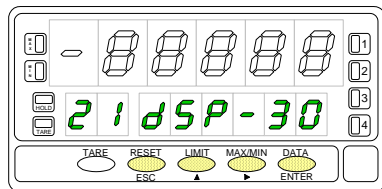


Menu 22 tCH-30. Set input value for point 30.

Bring the process to the conditions of the second scaling point. The main display reads the actual input signal present at the input connector. Press **ENTER** to take the displayed input value as the input 3 parameter and go to the programming of the corresponding display.

ESC Cancel this routine and return to the -Pro- stage.

[41.2] Value of Display 30



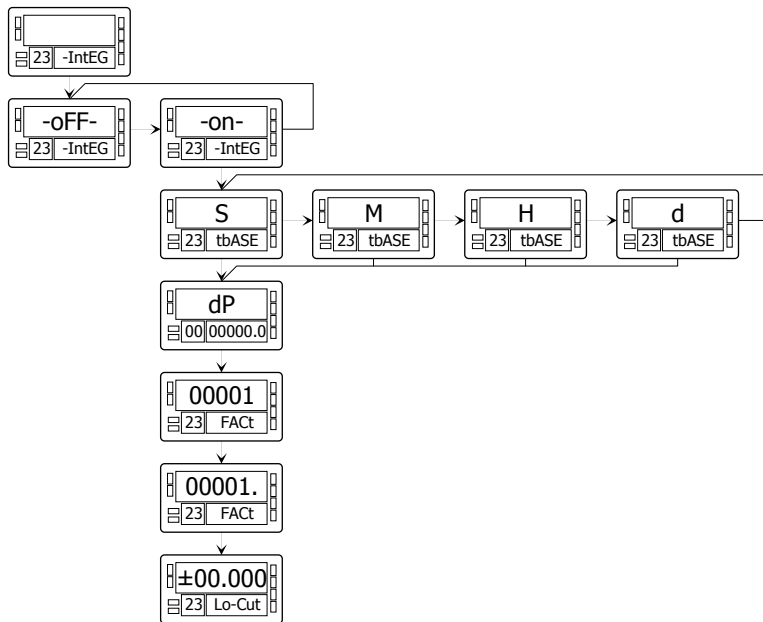
"dSP-30". Programming the display of point 30.

Use the **▲** (increment digit) and **▶** (move to next digit) procedure to set the value of the display 30 with sign. The most significant digit is used to set the sign ["0" = positive, "-" = negative].

ENTER Validate the entry, exit from this routine and go to the "-Pro-" stage.

ESC Return to the previous point.

4.2. Integrator



The instrument provides an 8 digit counter (or 7 digits with negative sign) that can be used to accumulate readings in totalizing+batch applications (logic function nº 30 at the rear connector) or to integrate the instantaneous reading using a timebase.

The counter is shown on the second display.

The integrator is enabled by setting the option **-on-** in the menu **23 IntEG**. When activated, the logic function nº 30 is inhibited.

(NOTE: It is not possible to activate the integrator when the automatic volume calculation option is programmed, see page 57, menu 27 -Vol-).

The value of the integrator appears on the auxiliary display permanently. This allows the instantaneous measurement and the accumulated total be read at the same time. The second display may show any other variable or be blanked if desired.

The integrator accumulates the reading of the display using a timebase in the following format:

$$\text{Total}(n) = \text{Total}(n-1) + \frac{\text{Display Reading} \times \text{Scale Factor}}{\text{Time Base}}$$

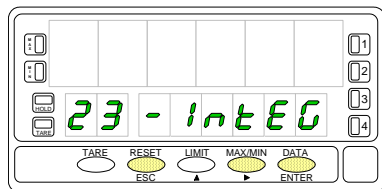
As an application example, it is required to show the total fluid quantity that pours out from a drain at a rate of 10 liters per minute. If the instantaneous value is 10.00 and is expressed in lit/min, we must select the timebase in minutes, so the totalizer may show 10.00 lit after one minute, 20.00 lit in two minutes, 600.00 lit in one hour, etc.

To read the daily consumption in m³, for instance, we should program a scale factor of 0,001 (1 lit=0,001 m³).

Menu 23 - INTEGRATOR (for process and potentiometer)

This menu allows enabling the integrator option and configuring the function parameters; time base, decimal point, scaling factor and low-cut display. This menu appears only in process and potentiometer configurations.

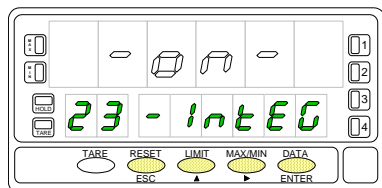
[47.1] Access to the menu



The figure 47.1 shows the indication "-IntEG" corresponding to the input stage of the integrator configuration menu.

- To access the integrator configuration.
- To skip this menu and pass to the next menu.
- To cancel this routine and return to the "-Pro-" stage.

[47.2] ON-OFF Selection

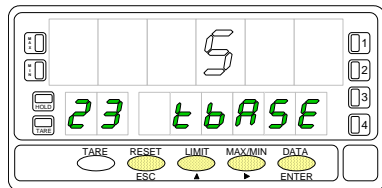


The first level of this menu offers two choices **-on-** and **-oFF-** to enable or disable the integrator respectively. Press the key to switch the display between the two options to set the desired one.

If the "automatic volume calculation" option is enabled (menu 27 - VoL-) it is not possible to activate the integrator.

- Validate the choice and go to the next program phase.
- Cancel this routine and return to the "-Pro-" stage.

[47.3] Time Base



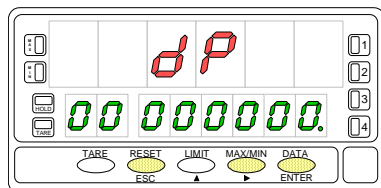
23 tbASE. Programming the time base.


There are four time bases: **-S-** seconds, **-M-** minutes, **-H-** hours and **-d-** days.



Use to shift around the available options until the display shows the indication corresponding to the desired time base.

- Validate the choice and go to the next program phase.
- Cancel this routine and return to the "-Pro-" stage.

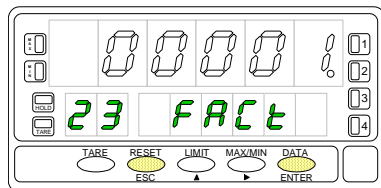
[48.1] Decimal Point






The totalizer decimal point is programmed in the second display and can be located in any of its 8 digits. In this step, the main display shows the indication "dP" and the second display shows the decimal point in flash. Press repeatedly the  key to move it to the desired location. If no decimal point is required, it must be placed to the right of the least significant digit, see figure 48.1.



-  Validate the choice and go to the next program phase.
-  Cancel this routine and return to the "-Pro-" stage.

[48.2] Scale Factor

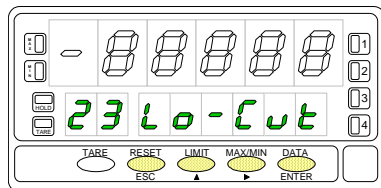


"23 FACT". Programming the scale factor.



Press repeatedly the  key to increment the active digit and press the  key to move to the next digit to the right until the desired scale factor value is completed on the display. A press of  to validate the entry makes the decimal point go in flash. The factor decimal point position is independent from the one of the display, so it is possible to program any value within the range 0.0001 to 09999. It is not possible to set the scale factor to 0.



-  Validate the entry and go to the next program phase.
-  Cancel this routine and return to the "-Pro-" stage.

[48.3] Low-Cut Display

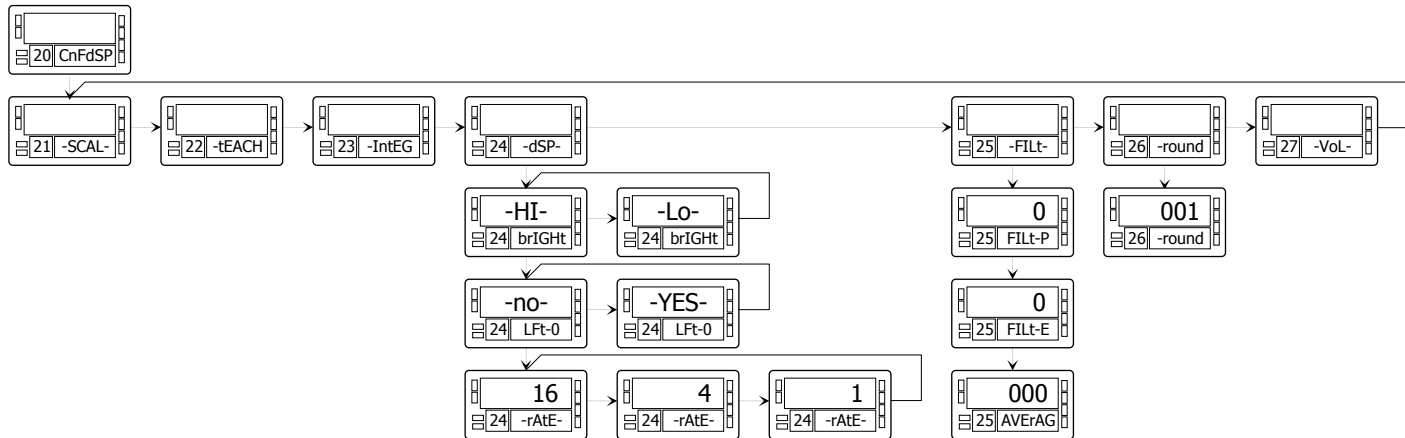


"Low-Cut" is the value below which the display is not added to the totalizer.

Press repeatedly the  key to increment the active digit and press the  key to move to the next digit to be modified until desired value is completed on the display. The leftmost digit is used to set the sign ["0" = positive, "-" = negative].

-  Validate the entry, exit from this routine and go to the "-Pro-" stage.
-  Cancel this routine and return to the "-Pro-" stage.

4.3. Display Options, Filters and Round



The instrument has several types of digital filtering to provide stable readings according to the nature of the input.

The P filter is a programmable low pass filter that smooths the response of the display to input variations.

The E filter cuts off the signal variations exceeding from the limits of a band. When the input stabilizes, the band moves to the new value.

The Average filter averages the reading over a programmable number of conversions to be displayed at the selected rate.

The round option allows eliminating display jitter by rounding off the meter display by increments of 1, 2, 5, 10, 20, 50 or 100 counts.

In addition, the instrument offers various options so that the user can adjust the reading of the display to meet the system environment conditions, such as selection of two display intensity levels, non-significant zeros (left zeros) and three display update rates.

Menu 24 - DISPLAY OPTIONS

This menu allows configuring various options related to the display visualization; the digit brightness, left zeros and display update rate.

[50.1] Access to the Menu

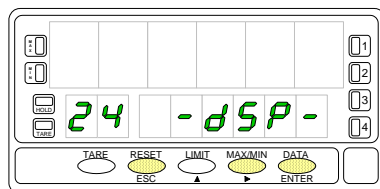
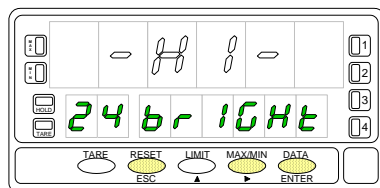


Figure 50.1 shows the indication corresponding to the entry level to display options menu. The following actions are available at this stage:

- ENTER** Access to the display options parameters.
- ▶** Skip this menu and pass to the filtering setup menu (p. 49).
- ESC** Exit from this routine and return to the -Pro- stage.

[50.2] Digit Brightness

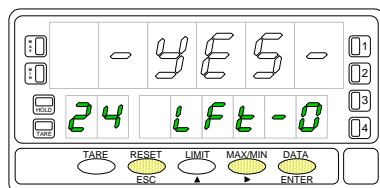


Menu 23 brIGHt. Select digit brightness.

Use the **▶** key to change the display brightness (current choice is noticed each time it is changed). Select "-HI-" or "-LO-" as desired and:

- ENTER** Validate the choice and go to the next step.
- ESC** Cancel this routine and return to the -Pro- stage.

[50.3] Left Zeros



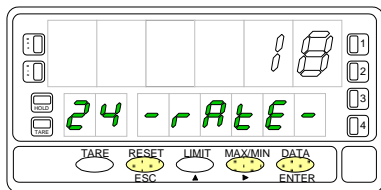
Menu 23 LfT-0. Select non-significant zeros.

There are two options. Select "-YES-" to read the measured value with all the digits of the display by adding left zeros or select "-NO-" to blank non-significant digits.


Use the **▶** key to set desired option and:

- ENTER** Validate the choice and go to the next step.
- ESC** Cancel this routine and return to the -Pro- stage.

[51.1] Reading Rate




Menu 23 -rAtE-. Select reading rate.

The reading rate determines the rate at which the display is updated. This parameter affects the display, the setpoints, the analog output and the BCD output. Available values are 18, 4 and 1 per second. Press  to select desired rate. Lower levels produce slower display responses to signal changes. The 16 readings/s option will update the display at the rhythm of the signal conversion.

For temperature configurations the effective rate is half the selected number of readings/s.

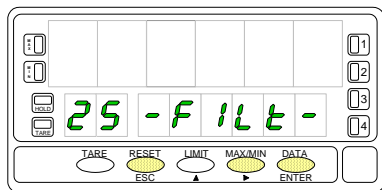
 Validate the choice and return to the "-Pro-" stage.

 Cancel the programming and go to the "-Pro-" stage.




Menu 25 - DIGITAL FILTERS

If the display reading is unstable due to small signal variations or noise, the use of digital filters may help to reduce these effects and eliminate display jittering. The filter-E parameter only appears for process, load cell or potentiometer inputs.

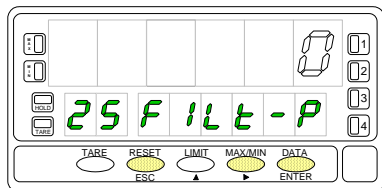
[52.1] Access to the Menu




The figure 52.1 represents the access level to menu 25 -FILt-. At this stage, you can use one of the following keys:



-  To enter the first step of the menu.
-  To skip this menu and pass to the menu 26 -round.
-  To cancel this routine and return to the "-Pro-" stage.

[52.2] Filter-P Level

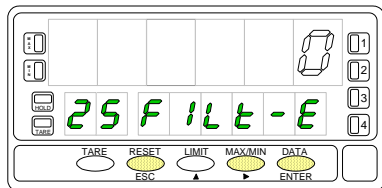


Menu 24 FILt-P. Set filter P level.


The P filter acts as a delay on the display response to signal variations produced at the input. The effect of incrementing this filter level results in a softer response of the display to the input variations. Select filter level from 0 (filter disabled) to 9 using the  key.



-  Validate changes and advance to the next step.
-  Cancel this routine and return to the "-Pro-" stage.

[52.3] Filter-E Level

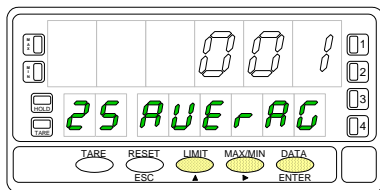


Menu 24 FILt-E. Set filter E level.

The E filter cuts off input variations exceeding from the limits of a moving band. This band becomes more selective as the filter level is increased. Select filter level from 0 (filter disabled) to 9 using the  key.



-  Validate changes and advance to the next step.
-  Cancel this routine and return to the "-Pro-" stage.


[53.1] Average Filter




Menu 24 AVErAG. Program nº of readings to average.

This value represents the number of readings that are summed up together and averaged before the display is updated.

Use the  (change value) and  (change digit) keys to program the desired value from 1 to 200.

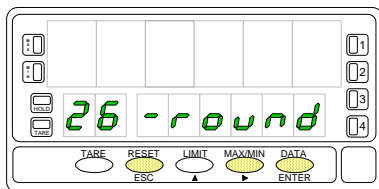
 **ENTER** Validate all changes in this menu and return to the -Pro- stage.

 **ESC** Exit this step and return to the -Pro- stage.




Menu 26 - ROUND (process, load cell and potentiometer)

This menu allows selection among six levels of display rounding. When resolution is not critical, a rounding increment other than 1 may help stabilize the display.

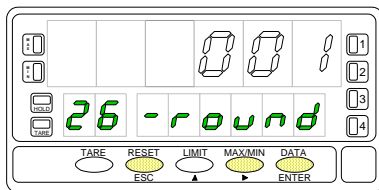
[54.1] Access




The figure 54.1 shows the indication corresponding to the access to the round menu. Press one of the following keys:



-  To get access to this menu.
-  To skip this menu and pass to the menu 27 -VoL.
-  To cancel this menu and return to the "-Pro-" stage.

[54.2] Round value



Menu 26 -round. Select rounding increment.

Press repeatedly the  key to scroll through available options for the round filter ["001" = no rounding, "005" = round to 5 counts, "010" = round to 10 counts, "020" = round to 20 counts, "050" = round to 50 counts or "100" = round to 100 counts].

-  Validate changes and return to the "-Pro-" stage.
-  Exit this step and return to the "-Pro-" stage.

4.4. Display Volume based on Pressure

There are several methods to calculate the volume of a fluid in a tank.

If a pressure sensor is placed in the bottom of the tank, the display may be scaled to convert the sensor's pressures into liquid height.

The Beta-M provides different approaches to calculate liquid volume.

1. For some special regular tank shapes, if you know the mathematical relationship between pressure and volume, it will only be necessary to scale the display by two points. For example, for a cylindric vertical tank, volume is the product of the cylinder base area and the liquid height.

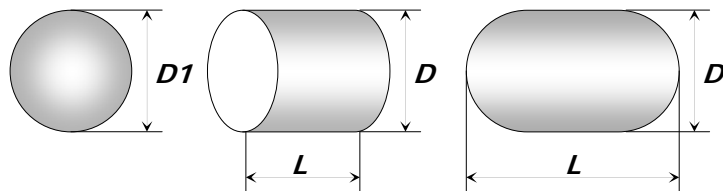
2. If the tank is irregularly shaped, you can use the linearization feature to readout volume utilizando el método teach y linealización por tramos.

The method consists of filling the tank with known amounts of liquid, teach the input and enter the volume at each of the selected points over the height of the tank. The more the number of points used, the more accurate the measurement will be.

3. A third method that offers the instrument to extract volume is to set the automatic volume calculation function. This function can be used when the tank's shape correspond to one of the figures represented at right.

Automatic Volume Calculation

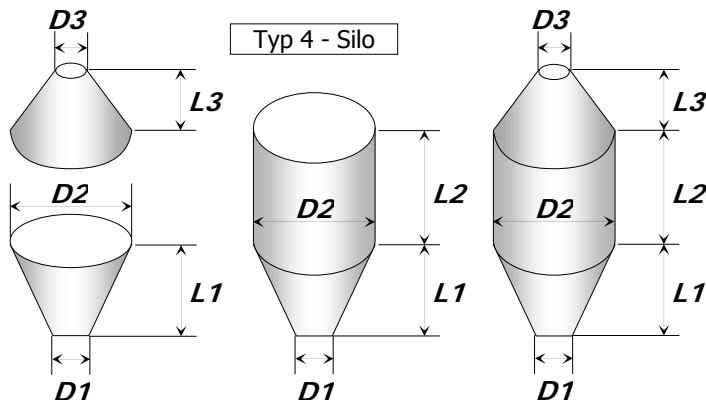
The instrument has most common tank geometry functions pre-programmed to calculate volume; spherical, horizontal cylinder, horizontal cylinder with spherical ends and conical bottom vertical cylinder. The user only has to enter the tank dimensions as requested in the program routine.



Typ 1 - Sphere

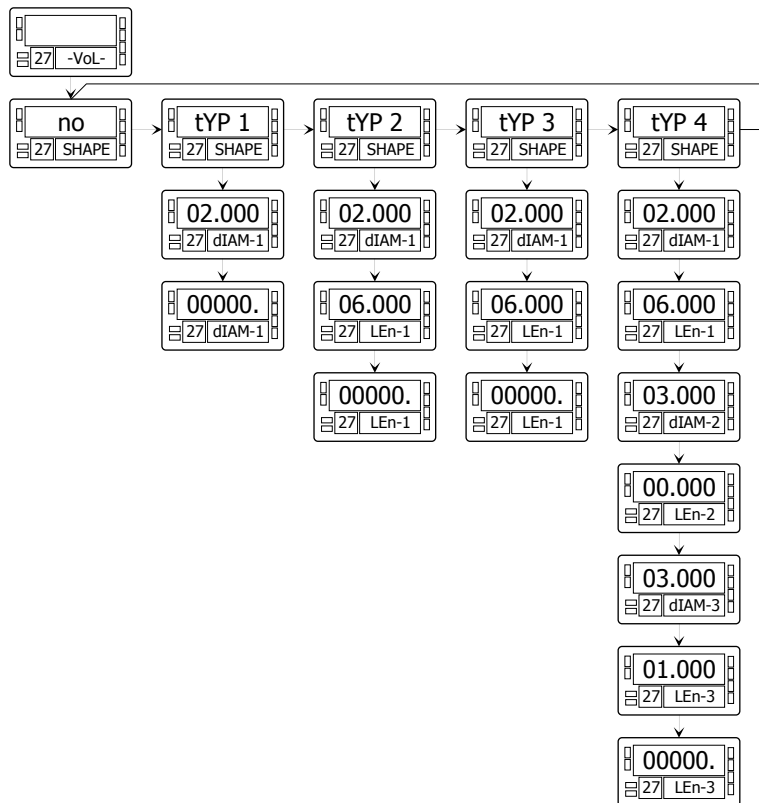
Typ 2 - Cylinder

Typ 3 - Sphere+Cylinder



Typ 4 - Silo

Programming Diagram



Programming Procedure to Readout Volume

When using this method to display volume, a pressure sensor must be placed at the bottom of the tank to drive a signal proportional to fluid level.

The first scaling phase is to convert the input signal to display height in meters. The height measurement is subsequently used to calculate volume.

The relation between pressure and height is linear, so two scaling points are enough to define the scale. The decimal point position must be chosen so that the display values are expressed in meters, for example, if the fluid level on top scale is 1.5m, suitable programmings would be 0001.5, 001.50, 01.500 or 1.5000 depending on desired resolution.

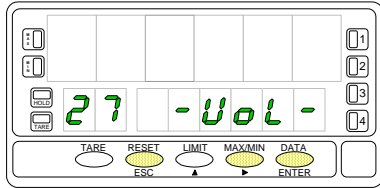
Once the signal is scaled to measure level in meters, the second phase is to activate the option 'VOL' to display volume. This option is enabled by selecting one of the available tanks shapes (see figure). After this, you must enter the diameter and length of the tank in meters, and finally set the decimal point of the display, which is independent from the decimal point programmed in the scaling procedure.

Volume is expressed in whole liters despite of the point position.

Menu 27 - AUTOMATIC VOLUME CALCULATION

This menu appears exclusively for process and potentiometer configurations. **It is not possible to enable this option if the integrator is active (menu 23).** The automatic volume calculation facility can be only used when the tank's shape is one of the pre-programmed shapes shown in page 55.

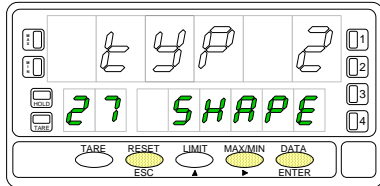
[57.1] Access to the Menu



The figure 57.1 shows the indication "27 -Vol-" corresponding to the input stage of the automatic volume calculation menu.
Use one of the following keys:

- To get access to this menu.
- To pass to the Pasar al Submenú 21 - SCAL.
- To cancel the programming and return to the "-Pro-" stage.

[57.2] Tank's Shape

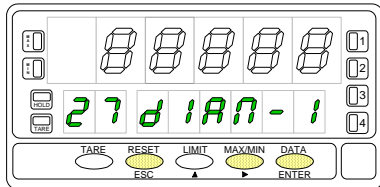


Selection of the tank's shape. There are five options: **-no-** to disable this facility, **-tYP 1-** for spherical shape, **-tYP 2-** for horizontal cylinder, **-tYP 3-** for horizontal cylinder with end caps and **-tYP 4-** for conical bottom vertical cylinder (silo). See figures in page 55.

Press to choose the most appropriate shape from the list (or set the option **-no-** to disable volume calculation).

- Validate the choice and advance to the next programming phase.
- Cancel this routine and return to the "-Pro-" stage.

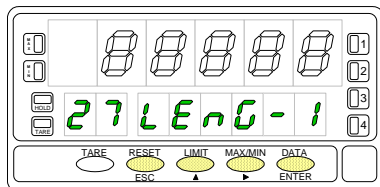
[57.3] Diameter 1





After selecting the tank's shape, it is necessary to enter the dimensions of the tank. Figure 57.3 shows the phase corresponding to the programming of the diameter D1. Press repeatedly the key to set the active digit to the desired value and to move one digit to the right until the value for the diameter D1, in meters is completed on the display (the digits to the right of the decimal point are fractions of meter).



- Validate the entry and advance to the next programming phase.
- Cancel this routine and return to the "-Pro-" stage.

[58.1] Length 1



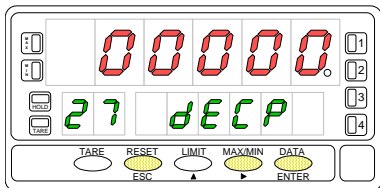
If you selected the spherical shape (tYP 1), this item does not appear. Please, go to the phase represented by figure 58.2.

For the other shapes program the length L1 (see figures in page 55) by using  to increment digit value and  to move to next digit until completing the desired value in meters (the decimal point notation marks the position of whole meters).


-  **ENTER** Validate the entry and advance to the next programming phase.
-  **ESC** Cancel the programming and return to the "-Pro-" stage.



SILO: The silo shape (tYP 4) is a combination of three parts and requires three diameters and three lengths to be programmed. You may have a tank that is composed of only one or two of the parts in which this shape is divided, according to figures on page 55. To overcome this situation, the length of the missing parts should be programmed to zero. The last phase of this routine is to set the decimal point of the display, go to figure 58.2.

[58.2] Decimal Point



After programming the tank dimensions, the display goes to all zeros with the decimal point in flash. This is the decimal point of the volume display, which is independent of that programmed in the scaling routine.

Shift the decimal point to the desired position using . If no decimal point is required, locate it to the rightmost digit.

-  **ENTER** Validate the entry and go to the "-Pro-" stage.
-  **ESC** Cancel the programming and return to the "-Pro-" stage.

5. FRONT-PANEL AND LOGIC INPUT FUNCTIONS

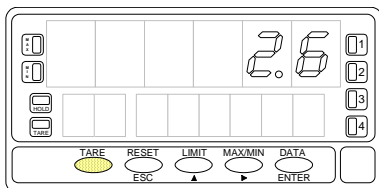
5.1 - Front-panel functions

The meter provides the following function keys: TARE, RESET, LIMIT and MAX/MIN. The functionality of each one in the "RUN" mode is described below.

TARE key

A push of the TARE key causes the current display to be stored in the tare memory.

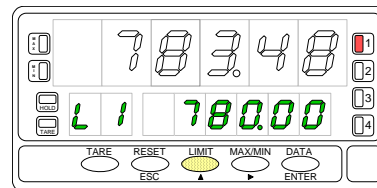
The TARE LED denotes that a tare value other than zero is contained in the memory. The tare value (or offset for a temperature meter) can be displayed on the second display by pressing the **MAX/MIN** key.



To clear the tare memory, press and hold the **RESET** key, then press **TARE**. Release first **TARE**, then **RESET**. If a tare or tare reset operation is impossible from the front-panel, check the tare key lock settings (see page 67).

LIMIT key

During the RUN mode, this key is only operative in case that one of the following output options is installed: 2 relays (ref. 2RE), 4 relays (ref. 4RE), 4 NPN transistors (ref. 4OP) or 4 PNP transistors (ref. 4OPP).



The setpoint programmed values appear on the second display at each push of the **LIMIT** key independently of whether they are enabled or inhibited. The auxiliary display shows L1, L2, L3 or L4 depending of which value is being read.

During the setpoints routine, the functionality of the rest of the keys remains active.



INSTRUCTIONS FOR THE RECYCLING

This electronic instrument is covered by the **2002/96/CE** European Directive so, it is properly marked with the crossed-out wheeled bin symbol that makes reference to the selective collection for electrical and electronic equipment which indicates that at the end of its lifetime, the final user cannot dispose of it as unsorted municipal waste.

In order to protect the environment and in agreement with the European legislation regarding waste of electrical and electronic equipments from products put on the market after 13 August 2005, the user can give it back, without any cost, to the place where it was acquired to proceed to its controlled treatment and recycling.

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