1 YEAR WARRANTY

OMEGA™

User's Guide

DR-I4L

Isolated signal converter with universal power supply

for Load cells and Millivolts, DIN Rail Mount

omega.com info@omega.com

Omega Engineering, Inc:

800 Connecticut Ave. Suite 5N01, Norwalk, CT 06854, USA
Toll-Free: 1-800-826-6342 (USA & Canada only)
Customer Service: 1-800-622-2378 (USA & Canada only)
Engineering Service: 1-800-872-9436 (USA & Canada only)

Tel: (203) 359-1660
e-mail: info@omega.com

Fax: (203) 359-7700

SIGNAL CONVERTER **DR-I4L**

Signal converter for load cells and millivolts, isolated, industrial applications

Isolated signal converter for load cell signals and millivolts. Provides +5 Vdc excitation voltage to power the load cell, and '*sense*' function to compensate for excitation voltage variations. Accepts direct connection of 1, 2 3 or up to 4 load cells (typical 350 Ohm load cells). Accepts 4 and 6 wire load cells. Accepts unipolar and bipolar ranges up ±80 mV.

USER'S MANUAL

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Configurable output in 4/20 mA (active or passive) or 0/10 Vdc. Universal power supply from 18 to 265 Vac/dc. 3 way isolation between input, output and power circuits. Circuit isolation prevents ground loops and transient propagation, protecting remote equipment and signal integrity.

Predefined configuration codes available for fast and easy configuration. Advanced configuration menu available to customize input and output signal ranges to specific values required. '*Tare*' function accessible from front keypad. Configuration through front push-button keypad. Front display available for configuration and system information (tare value, input signal value, output signal value, configured label, signal percentage, process value, excitation voltage and excitation current values).

Built-in '*force*' functions to manually generate low and high output signals, to validate remote instrumentation during installation. '*SOS*' mode to help on critical maintenance and repairs. Configurable power frequency rejection filter. '*Password*' function to block non-authorized access to '*configuration menu*'.

Designed for industrial use, with potential integration into a wide range of applications, reduced cost, excellent quality and available customization.

When the marks '*Attention*' or '*Risk of electrical shock*' appear, read the documentation for information about the nature of the risk.

1. How to order

Reference	Description
DR-I4L	Signal converter for load cells

2. Material included

The instrument is provided with the following elements:

- 1 x instrument **DR-I4L**
- 4 x plug-in screw terminals
- 1 x quick installation guide

3. Additional information

To view the DR-I4L spec sheet and manuals visit us at http://www.omega.com/...

4. Installation and start-up

⚠ If this is the first time you are configuring the instrument, below are the steps to follow during a first installation. 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 17.

1. Install the instrument at the DIN rail
2. Read how to operate the instrument (see section 12)
3. Read the '*practical load cell information*' (see section 7)
4. Connect the input, the output and the power terminals (see section 9).
   • error messages may appear in the process of connection (see section 16), for example, if '*sense*' is not yet connected, or there is no current flowing to the cell, because the cell is still not connected.
5. Configure the input and output signals
   • choose a predefined configuration code (see section 8)
   • introduce the code at the instrument (see section 13.1)
6. If needed, customize the input and output signal ranges (see section 13.4)
   • if needed, correct the slope of the load cell using the '*field correction*' functions (see section 13.5) or manually operating the '*input signal low*' and '*input signal high*' parameters (see section 13.4)
   • if needed, apply a '*tare*' to the system (see section 13.4)
7. If needed, configure the display reading (see section 13.6), the key '**UP**' (▲) '*force*' menu (see section 13.7), and the key '**LE**' (◀) '*messages*' function (see section 13.8)
8. If needed, block access to the '*configuration menu*' (see section 13.9)

5. SOS mode

The instrument includes a configurable '*SOS mode*' function that provides a way to manually configure a fixed output signal. This output signal remains fixed, independent of the input signal value or sensor state.

This function allows to perform urgent maintenance or repair tasks at the input section of the system, for example replacing damaged sensors, while the instrument still provides a controlled signal that allows the process to continue its activity, under human surveillance. When the maintenance or repair task has been performed, the instrument can be taken back to the standard working mode, where the output signal is proportional to the input.

When manually activated, the '*SOS mode*' generates the output signal configured, and the front display remains flashing with the message '**SoS**'. All other systems are disabled, which means that :

- no error messages will be shown on display
- no key '**UP**' (▲) '*fast access*' menu is accessible
- no key '**LE**' (◀) '*messages*' function is accessible
- no '*Eco*' mode activates

Only key '**SQ**' (■) is accessible, to access the '*configuration menu*' (eventually this access can be password locked) in order to deactivate the '*SOS mode*'. Deactivation of '*SOS mode*' must be performed manually by configuring the function to '**oFF**'.

To configure the '*SOS mode*' function, see section 13.9.

6. Messages

The instrument includes a configurable '*messages*' function that provides advanced information about the system, available to the operator with a single click at the front key '**LE**' (◀).

This information is helpful during start-up, installation, system verification, routine maintenance and troubleshooting, as messages and values provide information on the actual input and output signal value, actual percentage of the input signal compared to the full scale, scaled process values and excitation voltage and excitation current provided to the load cell.

This information is available at any time, and is displayed sequentially when requested (except while on '*SOS mode*'). Access to this information reduces maintenance time, improves time invested in failure location, and helps for an easy resolution of the problem.

Additionally, each instrument can be assigned a custom label code of up to 8 characters (see 4), that can be displayed at the front display or at the messages sequence, making system identification of each instrument an easy task.

To configure the '*messages*' function, see section 13.8.

Table 1 | **Available label codes**

Letters		Numbers	Special
A	n	0	-
b	o	1	_
c	P	2	.
d	q	3	º
E	r	4	(blank)
F	S	5	
G	t	6	
h	u	7	
I	V	8	
J	W	9	
K	X		
L	Y		
M	Z		

Labeling examples: an application measures weight from five different load cells, at the four corners of a platform and the center. All signals are converted to 4/20 mA for retransmission to PLC or SCADA. Each DR-I4L can be configured the following label for easy identification :

- *Label for instrument 1: cornEr1*
- *Label for instrument 2: cornEr2*
- *Label for instrument 3: cornEr3*
- *Label for instrument 4: cornEr4*
- *Label for instrument 5: cEntEr*

7. Practical load cell information

7.1 Number and type of cells accepted

The instrument accepts up to 4 standard 350 Ohms load cells. The instrument provides 5 Vdc excitation voltage. For load cells with different impedance, calculate the current consumption for each cell, and the total must not exceed the maximum current the instrument can provide (see section 11).

In case of problems with the signal provided by the load cell, the instrument provides information for troubleshooting purposes. Configure the '*messages*' function (see section 13.8) to access the actual values for the input signal (expressed in mV), the excitation voltage measured at the '*sense*' terminals (expressed in Vdc) and the current provided to the cell (expressed in mA). The operator can use these values to identify the cause of the problem. See section 6 for more information on how to access these values in real time.

7.2 Load cell and '*sense*' wires

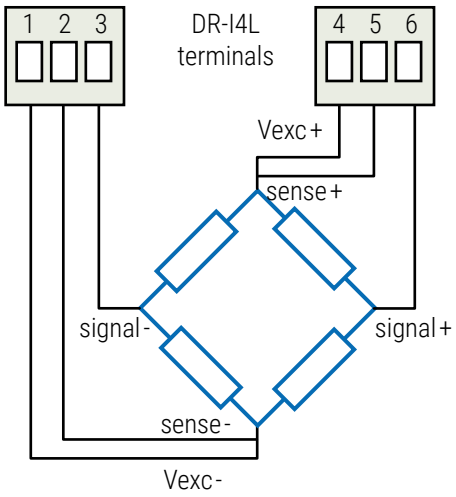
The instrument is designed to measure load cell signals. The instrument provides 5 Vdc excitation voltage to power the load cell, and reads the millivolt signal generated by the load cell. The instrument also reads the actual excitation voltage connected to the load cell, and compensates the read signal for changes at the excitation voltage.

The actual value of the excitation voltage is detected by using the '*sense*' wires. Connect the '*sense+*' and '*sense-*' (terminals 5 and 2) to the load cell, to provide the instrument with an accurate value of the excitation voltage received by the cell. Deviations and errors from the standard excitation value (5 Vdc) are automatically compensated by the instrument, increasing the accuracy and reliability of the measure.

If you can not connect the '*sense*' wires to the load cell, place a shortcircuit between terminals '*sense+*' and '*Vexc+*' (terminals 5 and 4), and between terminals '*sense-*' and '*Vexc-*' (terminals 2 and 1).

For applications with multiple load cells (2, 3 or 4 cells) connect the '*sense*' wires to the '*electrical middle point*' of the power wires of all the cells (see section 7.8).

Table 2 | **Typical load cell connection**

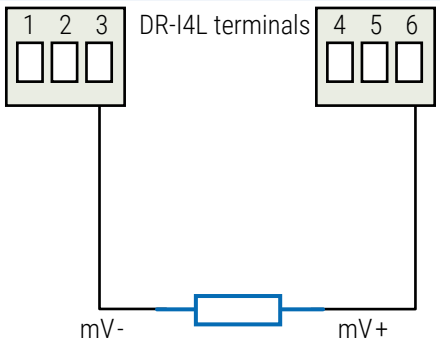


The '*sense*' terminals must be always connected. If you do not use the '*sense*' wires, shortcircuit with '*Vexc*' terminals

7.3 Millivolt mode

The instrument can be configured to measure millivolts in differential mode. Activating any millivolt measurement mode, disables de excitation voltage and disables the '*sense*' compensation for changes at the excitation voltage. The instrument works as a pure differential millivolt signal converter.

Table 3 | **Millivolt mode connection**



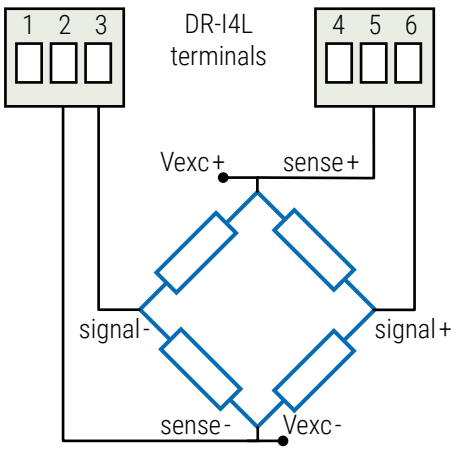
7.4 Load cell with external power

The instrument can be configured to read signals from load cells which are externally powered up to 10 Vdc, and not use the power provided by the instrument.

Configure the instrument to read in '*load cell*' mode and set the excitation voltage parameter to '*off*'. Connect the '*sense*' wires to the excitation voltage terminals of the load cell. With the '*sense*' wires, the instrument will compensate for variations of the power supply.

With this configuration, values indicated in mV' units (see section 10.1), are scaled to a theoretical power value of 5 Vdc, therefor values may not be directly interpretable.

Table 4 | **Load cell connection with external power**



7.5 Connecting the cell to the ground

Measuring with load cells requires an electrically clean installation. When connecting the ground to the cell system, assure that the load cell connection to ground is performed in such a way that the current to ground does not flow through the cell.

7. Practical information (cont.)

7.6 Connections with a junction box

A '*junction box*' is a connections box where several load cells can be connected. The '*junction box*' then offers a single set of output terminals, that will be connected to the instrument.

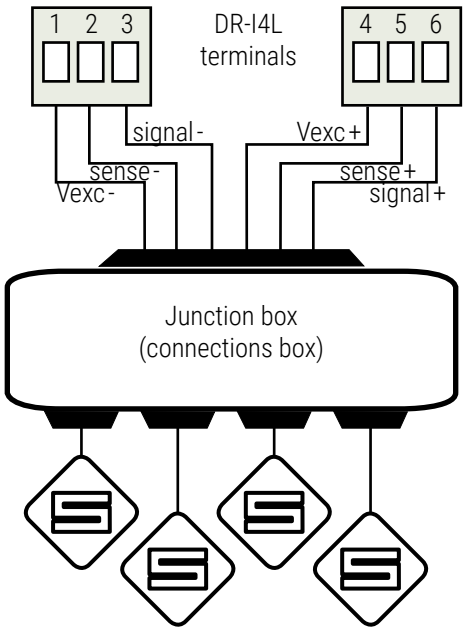
The '*junction box*' provides 4 or 6 terminals, like a normal load cell: two terminals for millivolt signal, two terminals for excitation voltage, and eventually two additional terminals for '*sense*' wires. If '*sense*' terminals are not present, you can connect the '*sense*' wires to the excitation voltage terminals of the '*junction box*' or directly to the '*electrical middle point*' of the power wires of the load cells. Last option is to short circuit the '*sense*' terminals to the excitation voltage terminals as indicated at section 7.2.

If the '*junction box*' provides an output signal that is the addition of each of the millivolt load cell signals, configure the instrument for the appropriate input signal range.

Example : four load cell signals of 2 mV/V, powered at 5 Vdc, each load cell provides a maximum of 10 mV signal. The output of the 'junction box' will be 40 mV maximum, so select the 0/40 mV input signal range.

If the '*junction box*' provides the mean value of the four load cell signals, then the input signal range must be selected to 0/10 mV.

Table 5 | **Connections with a junction box**



7.7 How to calculate the input signal range

The input signal range selected at the instrument must be able to accept the whole range of signal that the load cell can provide. This value is obtained by multiplying the sensitivity of the load cell (expressed in mV/V) with the excitation voltage value, which is 5 Vdc for this instrument.

- Load cell sensitivity = 2 mV/V
- Excitation voltage = 5 Vdc
- Maximum signal = 2 mV/V x 5 Vdc = 10 mV
- Select '*Input signal range*' = 0/10 mV
- Code 011 for 4/20 mA output or code 110 for 0/10 Vdc output

7.8 Connections with 3 or 4 load cells

Using 3 load cells is the optimal way to distribute the weight on a plane, although it is common to work with 4 load cells in applications with tanks, hoppers and similar.

When working with multiple load cells, the optimal connection is the one that makes the wires of the load cell converge in the same central area, so that all the cells are at the same '*electrical distance*' from the instrument.

Use the same type load cell and connect the wires to the central area as indicated below. Configure the instrument as indicated in this manual, assuming that :

- the nominal weight of the system is the addition of the nominal weight of each cell (3 x 100 Kg = 300 Kg for 3 cells, or 4 x 100 Kg = 400 Kg for 4 cells)
- the '*sense*' wires are carried to the central area together with the Vexc wires, but are not propagated to each individual cell. If you do not want to use the '*sense*' wires, see section 7.2.

Table 6 | **Direct connection to 3 load cells**

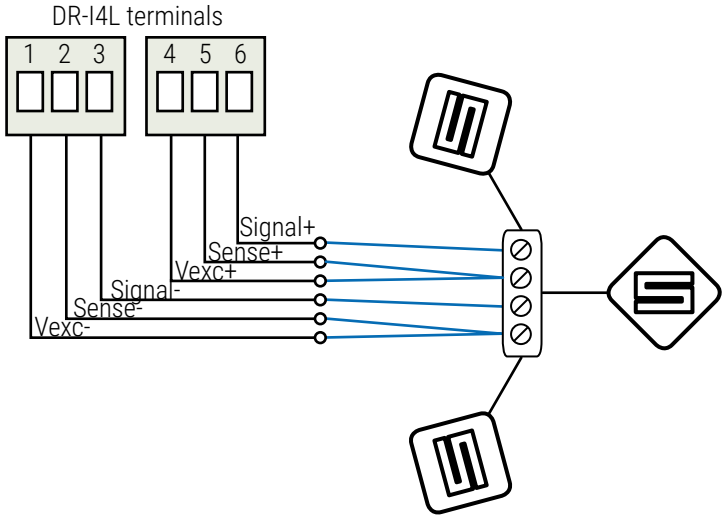
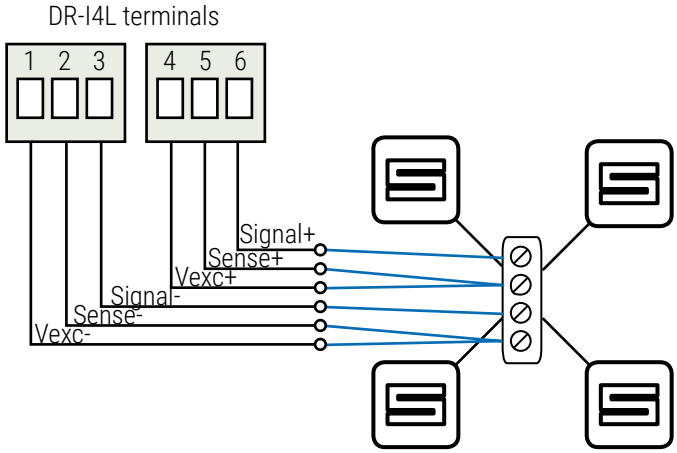


Table 7 | **Direct connection to 4 load cells**



8. Predefined configuration codes

Select the desired code for your application, and check the following sections for more information:

- for information on how to activate a code, see section 13.1
- to customize the input and output signals, see section 13.4

The instrument accepts up to 4 standard 350 Ohms load cells. The instrument provides 5 Vdc excitation voltage. Calculate the maximum output signal generated by your load cell, and select the '*Predefined configuration code*' accordingly (see Table 8).

To calculate the optimal input signal range for your load cell, see section 7.7.

The instrument can be configured to measure millivolt in differential mode. Activating the millivolt mode disables de excitation voltage and disables the '*sense*' compensation for changes at the excitation voltage. The instrument works as a pure differential millivolt signal converter. Select the '*Predefined configuration code*' according to your maximum millivolt signal (see Table 9).

Table 8 | **Predefined configuration codes for load cells - Input / Output**

Input signal range	Type of signal	Output 4/20 mA Code	Output 0/10 Vdc Code	See section ...
0/5 mVdc	load cell signal	010	110	10.1
0/10 mVdc		011	111	
0/15 mVdc		012	112	
0/20 mVdc		013	113	
0/25 mVdc		014	114	
0/30 mVdc		015	115	
0/40 mVdc		016	116	
0/50 mVdc		017	117	
0/60 mVdc		018	118	
0/70 mVdc		019	119	
0/80 mVdc		020	120	
±5 mVdc		021	121	
±10 mVdc		022	122	
±20 mVdc		023	123	
±30 mVdc		024	124	
±40 mVdc		025	125	
±50 mVdc		026	126	
±60 mVdc		027	127	
±70 mVdc		028	128	
±80 mVdc		029	129	
Reserved		030 to 049	130 to 149	

Table 9 | **Predefined configuration codes for millivolt signals - Input / Output**

Input signal range	Type of signal	Output 4/20 mA Code	Output 0/10 Vdc Code	See section ...
0/5 mVdc	millivolt signal	050	150	10.2
0/10 mVdc		051	151	
0/15 mVdc		052	152	
0/20 mVdc		053	153	
0/25 mVdc		054	154	
0/30 mVdc		055	155	
0/40 mVdc		056	156	
0/50 mVdc		057	157	
0/60 mVdc		058	158	
0/70 mVdc		059	159	
0/80 mVdc		060	160	
±5 mVdc		061	161	
±10 mVdc		062	162	
±20 mVdc		063	163	
±30 mVdc		064	164	
±40 mVdc		065	165	
±50 mVdc		066	166	
±60 mVdc		067	167	
±70 mVdc		068	168	
±80 mVdc		069	169	
Reserved		070 to 099	170 to 199	
(End of list)		**'----'**	(see notes below)	
(Custom selection)		'**uSEr**'	(see notes below)	

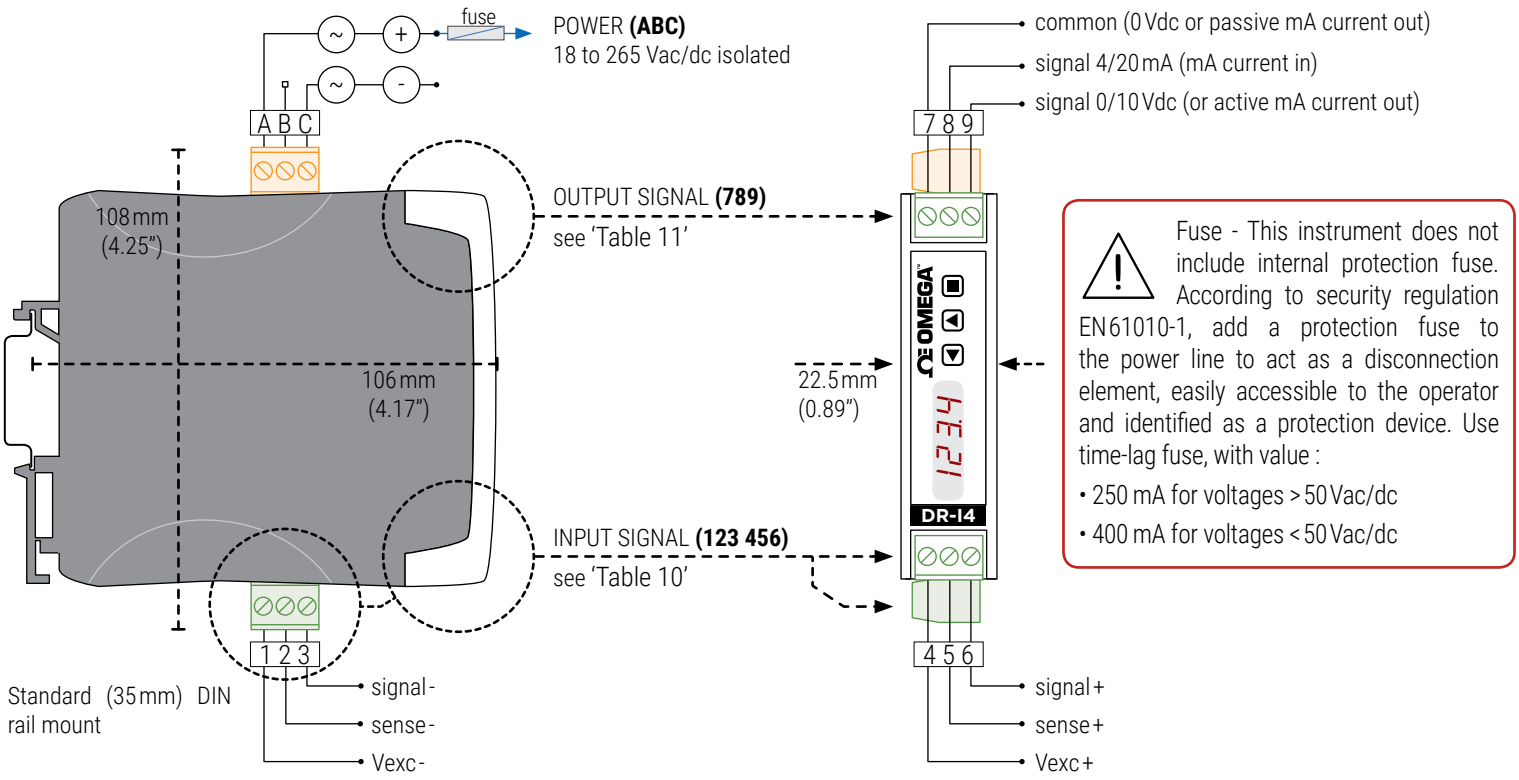
Notes

• Code '**uSEr**' indicates that a user custom configuration is active, and it does not match any of the listed codes This code is non-selectable, for information only.

Example: select code '**013**' for 0/20 mVdc=4/20 mA, the instrument reads code '**013**'. Later, configure the input to 0/17 mVdc=4/20 mA, this does not match a listed code, and the instrument reads '**uSEr**'. Or change the output to 0/20 mVdc=1/5 Vdc, this does not match a listed code, and the instrument reads '**uSEr**'.

• Code '**----**' identifies the end of the list, it follows code '**199**' and the list continues with code '**010**'. Select '**----**' to exit the list without applying changes.

9. Connections and dimensions (mm (*inch*))



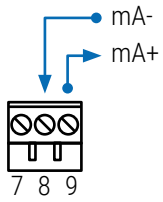
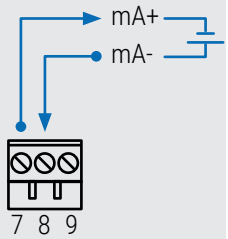
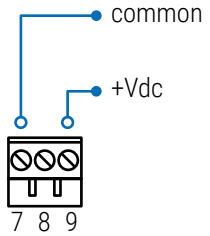
Fuse - This instrument does not include internal protection fuse. According to security regulation EN 61010-1, add a protection fuse to the power line to act as a disconnection element, easily accessible to the operator and identified as a protection device. Use time-lag fuse, with value :

- 250 mA for voltages > 50 Vac/dc
- 400 mA for voltages < 50 Vac/dc

Table 10 | **INPUT signal connections**

INPUT signal	Input terminals						Section ...
	1	2	3	4	5	6	
load cell	Vexc -	sense -	signal -	Vexc +	sense +	signal +	10.1
millivolts			mV -			mV +	10.2

Table 11 | **OUTPUT signal connections**

OUTPUT signal	Output terminals			Connections
	7	8	9	
4/20 mA active output		mA- (in)	mA+ (out)	
4/20 mA passive output* *(*external loop power needed)*	mA+ (out)	mA- (in)		
0/10 Vdc	common		+Vdc	

10. Input signals

10.1 Load cell signals

Load cell

MEASURING LOAD CELL SIGNALS

The instrument can be configured to measure load cell signals, with pre-configured ranges from 0/5 mV up to 0/80 mV. The instrument provides excitation voltage of +5 Vdc to power the load cell, with a maximum of 70 mA (this is 4 standard load cells of 350 Ohms). Bipolar ranges from ±5 mV up to ±80 mV can also be configured.

'SENSE' FUNCTION

The instrument reads the actual excitation voltage received by the load cell, and compensates the signal read for any variations of the excitation voltage. The applied voltage is read through the '*sense*' wires and the '*sense*' wires must be connected to the load cell. If it is not possible to connect the '*sense*' wires to the load cell, apply a shortcircuit between terminals '*sense+*' and '*Vexc+*' (terminals 5 and 4), and between terminals '*sense-*' and '*Vexc-*' (terminals 2 and 1). (see section 7.2).

PREDEFINED CONFIGURATION CODES

See 'Table 13' for a list of predefined input-output configuration codes. To activate a code see section 13.1.

CUSTOMIZED SIGNAL RANGES

To customize the input and/or output signal ranges, access the '*Advanced scaling*' menu (see section 13.4).

MAXIMUM OVERSIGNAL AND PROTECTIONS

'*Maximum oversignal*' is the maximum signal accepted by the instrument. Higher signal values may damage the instrument. Lower signal values are non destructive but may be out of accuracy specifications. Do not connect active signals to the excitation voltage terminals.

OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc.

Table 12 | **Connection example for load cell signals**

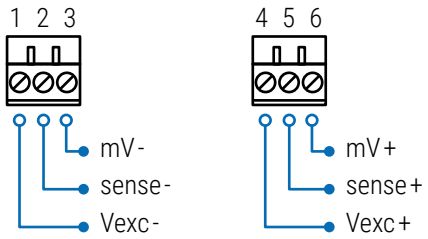


Table 13 | **Input signal ranges for load cell signals**

Input range	Code for 4/20 mA output	Code for 0/10 Vdc output	Accuracy (% FS)	Max. oversignal	Zin
0/5 mV	010	110	<0.18 %	±12 Vdc	20 MOhm
0/10 mV	011	111	<0.13 %	±12 Vdc	20 MOhm
0/15 mV	012	112	<0.13 %	±12 Vdc	20 MOhm
0/20 mV	013	113	<0.10 %	±12 Vdc	20 MOhm
0/25 mV	014	114	<0.10 %	±12 Vdc	20 MOhm
0/30 mV	015	115	<0.10 %	±12 Vdc	20 MOhm
0/40 mV	016	116	<0.10 %	±12 Vdc	20 MOhm
0/50 mV	017	117	<0.08 %	±12 Vdc	20 MOhm
0/60 mV	018	118	<0.08 %	±12 Vdc	20 MOhm
0/70 mV	019	119	<0.08 %	±12 Vdc	20 MOhm
0/80 mV	020	120	<0.08 %	±12 Vdc	20 MOhm
±5 mV	021	121	<0.15 %	±12 Vdc	20 MOhm
±10 mV	022	122	<0.10 %	±12 Vdc	20 MOhm
±20 mV	023	123	<0.10 %	±12 Vdc	20 MOhm
±30 mV	024	124	<0.10 %	±12 Vdc	20 MOhm
±40 mV	025	125	<0.08 %	±12 Vdc	20 MOhm
±50 mV	026	126	<0.08 %	±12 Vdc	20 MOhm
±60 mV	027	127	<0.08 %	±12 Vdc	20 MOhm
±70 mV	028	128	<0.08 %	±12 Vdc	20 MOhm
±80 mV	029	129	<0.08 %	±12 Vdc	20 MOhm

CORRECTED MILLIVOLT SIGNAL

Throughout this document, the '**Input signal low**' (**In.Lo**), '**Input signal high**' (**In.hI**) and '**Tare**' (**tArE**) parameters and the '**Input signal value**' (**InP.S**), are expressed in '*corrected millivolt*' units, and are indicated with a (') symbol. The millivolt values of these parameters may not be the same as the millivolt values directly measured at the input signal terminals. The parameter values are corrected to a theoretical excitation voltage scale of '*5 Vdc*'. The instrument reads the real value of the excitation voltage at the load cell, and compensates for any variations away from the '*5 Vdc*' theoretical value.

For troubleshooting purposes, the '*Measure*' function displays the real millivolt signal at terminals (see section 13.5). This value can be compared with the value provided by a handheld millivolt meter connected at the input terminals.

10. Input signals (cont.)

10.2 Millivolts signals

MEASURING MILLIVOLT SIGNALS

The instrument can be configured to measure millivolt signals from any source, with pre-configured ranges from 0/5 mV up to 80 mV. See connections at 'Table 14'. Bipolar ranges from ±5 mV up to ±80 mV can also be configured.

PREDEFINED CONFIGURATION CODES

See 'Table 15' for a list of predefined input-output configuration codes. To activate a code see section 13.1.

CUSTOMIZED SIGNAL RANGES

To customize the input and/or output signal ranges, access the '*Advanced scaling*' menu (see section 13.4).

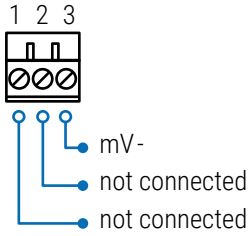
MAXIMUM OVERSIGNAL AND PROTECTIONS

'*Maximum oversignal*' is the maximum signal accepted by the instrument. Higher signal values may damage the instrument. Lower signal values are non destructive but may be out of accuracy specifications.

OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc.

Table 14 | **Connection examples for millivolt signals**



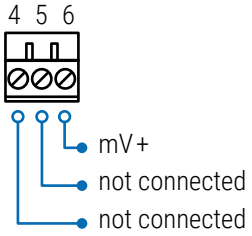


Table 15 | **Input signal ranges for millivolt signals**

Input range	Code for 4/20 mA output	Code for 0/10 Vdc output	Accuracy (% FS)	Max. oversignal	Zin
0/5 mV	050	150	<0.15 %	±12 Vdc	10 MOhm
0/10 mV	051	151	<0.10 %	±12 Vdc	10 MOhm
0/15 mV	052	152	<0.10 %	±12 Vdc	10 MOhm
0/20 mV	053	153	<0.07 %	±12 Vdc	10 MOhm
0/25 mV	054	154	<0.07 %	±12 Vdc	10 MOhm
0/30 mV	055	155	<0.07 %	±12 Vdc	10 MOhm
0/40 mV	056	156	<0.05 %	±12 Vdc	10 MOhm
0/50 mV	057	157	<0.05 %	±12 Vdc	10 MOhm
0/60 mV	058	158	<0.05 %	±12 Vdc	10 MOhm
0/70 mV	059	159	<0.05 %	±12 Vdc	10 MOhm
0/80 mV	060	160	<0.05 %	±12 Vdc	10 MOhm
±5 mV	061	161	<0.12 %	±12 Vdc	10 MOhm
±10 mV	062	162	<0.07 %	±12 Vdc	10 MOhm
±20 mV	063	163	<0.07 %	±12 Vdc	10 MOhm
±30 mV	064	164	<0.07 %	±12 Vdc	10 MOhm
±40 mV	065	165	<0.05 %	±12 Vdc	10 MOhm
±50 mV	066	166	<0.05 %	±12 Vdc	10 MOhm
±60 mV	067	167	<0.05 %	±12 Vdc	10 MOhm
±70 mV	068	168	<0.05 %	±12 Vdc	10 MOhm
±80 mV	069	169	<0.05 %	±12 Vdc	10 MOhm

11. Technical specifications

INPUT SIGNAL RANGES FOR LOAD CELLS	
signal ranges	from 0/5 mV up to 0/80 mV (see section 10.1)
bipolar signal ranges	from ±5 mV up to ±80 mV (see section 13.4)
excitation voltage	+5 Vdc
excitation voltage variations	automatic compensation (see section 7.2)
excitation current	max. 70 mA
INPUT SIGNAL RANGES FOR MILLIVOLTS	
signal ranges	from 0/5 mV up to 0/80 mV (see section 10.2)
bipolar signal ranges	from ±5 mV up to ±80 mV (see section 13.4)
excitation voltage	no
input impedance	10 MOhm typical (with 1 MOhms during 150 milliseconds, every 10 seconds approx.)
ACCURACY AT 25 ºC	see for each type of signal at section 10* **accuracy values are indicated for 4/20 mA output. For 0/10 Vdc output, add +0.05 % to indicated accuracy values*
THERMAL DRIFT	±150 ppm/ºC (F.S.) for ranges up to 5 mV ±100 ppm/ºC (F.S.) for ranges up to 20 mV ±75 ppm/ºC (F.S.) for ranges up to 80 mV
STEP RESPONSE	
Response time according to the configured parameter 'power filter' (see section 13.9). Typical response times to reach 99% of the output signal, in response to a 100% step at the input.	
with '*no filter*'	<115 mSec. typ. (0 to 99%)
with '*50Hz filter*' or '*60Hz filter*'	<150 mSec. typ. (0 to 99%)
with '*50 and 60Hz filter*'	<300 mSec. typ. (0 to 99%)
OUTPUT SIGNAL RANGES	
active current output	4/20 mA active max. <22 mA, min. 0 mA maximum load <400 Ohm
passive current output	4/20 mA passive max. 30 Vdc on terminals
voltage output	0/10 Vdc, max. <11 Vdc, min. -0.05 Vdc (typ.) minimum load > 10 KOhm
CONFIGURATION SYSTEM	
key pad + display	accessible at the front of the instrument
configuration	'*configuration menu*' and '*predefined codes*'
scalable units	scalable input ranges scalable output ranges scalable process display
POWER SUPPLY	
voltage range	18 to 265 Vac/dc isolated (20 to 240 Vac/dc ±10%)
AC frequency	45 to 65 Hz
consumption	<3.0 W
power wires	1 mm^2 to 2.5 mm^2 (AWG17 to AWG14)
overvoltage category	2
ISOLATION	
input - output	3000 Veff (60 seconds)
power - input	3000 Veff (60 seconds)
power - output	3000 Veff (60 seconds)

ENVIRONMENTAL	
IP protection	IP30
impact protection	IK06
operation temperature	from 0 to +50 ºC
storage temperature	from -20 to +70 ºC
'*warm-up*' time	15 minutes
humidity	0 to 95% non condensing
altitude	up to 2000 meters
MECHANICAL	
size	106 x 108 x 22.5 mm
mounting	standard DIN rail (35 x 7.5 mm)
connections	plug-in screw terminal (pitch 5.08 mm)
housing material	polyamide V0
weight	<150 grams
packaging	120 x 115 x 30 mm, cardboard

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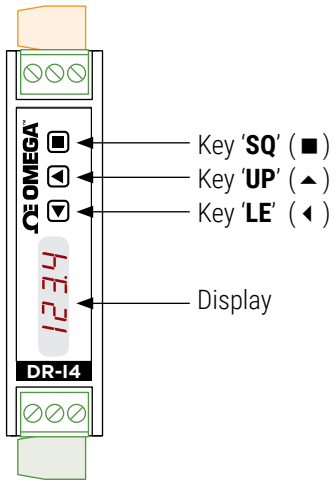
12. How to operate the instrument

12.1 Configuration system

The instrument is fully configurable from the 3 push button keypad and the 4 red digit led display at the front of the instrument (see Table 16).

Table 16 | **CONFIGURATION SYSTEM**



12.2 'Normal mode' of operation

AT POWER-UP

When the power supply is connected, the instrument applies the following sequence :

- the '*display*' shows the firmware code '**b3.xx**'.
- the '*display*' shows the configured '*units*' and '*input range*' (for example: '**Lc'** and **'15**' for 0/15 mV in load cell mode, or '**MV**' and '**b15**' for ±15 mV in millivolt mode).
- the instrument is now in '*normal mode*' of operation and the '*display*' shows the '*information*' configured at section 13.6.

FROM 'NORMAL MODE' OF OPERATION

From '*normal mode*' of operation, the operator can access the following functions:

- key '**SQ**' (■) gives access to the '*configuration menu*' (see section 12.3).
- key '**UP**' (▲) gives access to the '*force*' menu (see section 12.4).
- key '**LE**' (▲) activates the '*messages*' function (see section 12.5).

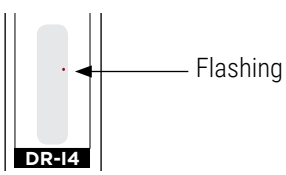
'ECO' FUNCTION ('DISPLAY' POWERED OFF)

The 'Eco' function powers off the display under the following conditions:

- the instrument is in '*normal mode*' of operation.
- and there is no interaction from the operator for 60 seconds.

The decimal point remains active (flashing), indicating that the instrument is working correctly. This is a configurable function, enabled by default. To configure the '*Eco*' function, see section 13.9.

Table 17 | **'ECO' DECIMAL POINT**



12.3 How to operate the 'Configuration menu'

HOW TO ENTER THE 'CONFIGURATION MENU'

With the instrument in '*normal mode*' of operation (see section 12.2), press the '**SQ**' (■) key and maintain for 1 second. The horizontal leds light from bottom to top. When the upper led lights, the instrument enters into the '*configuration menu*'.

When entering the '*configuration menu*', the first menu entry '**Function code**' (**codE**) is displayed. See section 14 for a full view of the '*configuration menu*'.

If the '**SQ**' (■) key is released before entering into the '*configuration menu*', the horizontal leds light downwards from top to bottom, and the instrument returns to '*normal mode*' of operation.

HOW TO OPERATE INSIDE THE 'CONFIGURATION MENU'

Inside the '*configuration menu*', use the front keypad to move through menu entries, parameters, and select configuration values:

- **Key 'SQ'** (■) functions as the '*ENTER*' key. It selects the menu entry currently displayed. At numerical value entries, it validates the number displayed.
- **Key 'UP'** (▲) moves vertically through the different menu entries. At numerical value entries, it modifies the selected digit by increasing its value to 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.
- **Key 'LE'** (◀) functions as the '*ESCAPE*' key. It leaves the selected menu entry, and eventually, will leave the '*configuration menu*'. When leaving the '*configuration menu*', the changed parameters are activated. At numerical value entries, the **'LE'** (◀) key allows to select the active digit. To modify a numeric value press the '**UP**' (▲) key to increase the value '+1'. Press the **'SQ'** (■) key to validate the value.

WHEN EXITING THE 'CONFIGURATION MENU'

When exiting the '*configuration menu*' without changes (either by '*rollback*' activation or because there are no changes in the configuration), the horizontal leds light down from top to bottom, and the instrument returns to '*normal mode*' of operation.

When exiting the '*configuration menu*' with changes, the display leds light a round shape while the new configuration is stored. When the round shape is finished, a start-up is applied (see section 12.2). After start-up, the new configuration is active and the instrument is in '*normal mode*' of operation.

'ROLLBACK' FUNCTION

If there is no interaction from the operator for 60 seconds, the instrument exits the '*configuration menu*' discarding changes, and returns to '*normal mode*' of operation.

When the operator is inside the '*configuration menu*', the output signal will remain overranged at maximum signal. Additional configurations are available at the '**On SQ**' parameter (see section 13.9).

When the operator exits the '*configuration menu*', the output signal is temporarily set to minimum value for a time <5 seconds, while the instrument restarts.

12. How to operate the instrument (cont.)

12.4 How to operate the 'Force' menu

HOW TO ENTER THE 'FORCE' MENU

With the instrument in '*normal mode*' of operation (see section 12.2), press and hold the '**UP**' (▲) key for 1 second. The horizontal leds light from bottom to top. When the upper led lights, the instrument enters into the '*force*' menu.

If the '**UP**' (▲) key is released before entering into the '*force*' menu, the horizontal leds light downwards from top to bottom, and the instrument returns to '*normal mode*' of operation.

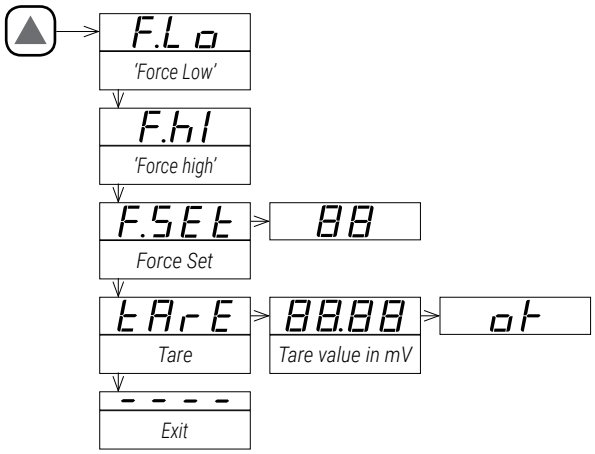
HOW TO OPERATE INSIDE THE 'FORCE' MENU

The available functions inside the '*force*' menu can be configured (see section 13.7). By default, '*Force High*', '*Force Low*', '*Force Set*' and '*Tare*' are available. Inside the '*force*' menu:

- press the '**UP**' (▲) key to move to the next function.
- press the '**SQ**' (■) key to activate the selected function.

When the function is active, the display will remain flashing. Press the '**SQ**' (■) key to deactivate the function (display stops flashing), or wait for the rollback to activate.

Table 18 | **Example of 'Force' menu with all functions set to 'on'**



See section 13.7 for a list and a description of available functions.

DESCRIPTION OF 'FORCE' FUNCTIONS

The '*force*' functions allow to manually force the output signal to the low and high levels of the output signal selected. These functions allow to easily validate the correct function of remote elements connected to the instrument output, such as PLC, HMI's, SCADAs, etc.

The '*force low*' function sets the output signal to the minimum value of the selected range (4 mA or 0 Vdc or the value configured at the '*output_low*' parameter).

The '*force high*' function sets the output signal to the maximum value of the selected range (20 mA or 10 Vdc or the value configured at the '*output_high*' parameter).

The '*force set*' function sets the output signal to a value between 0 and 100% of the maximum selected range (4 to 20 mA or 0 to 10 Vdc or the range configured at the '*output_low*' and '*output_high*' parameters). When entering the '*force set*' function, the display reads '50' (the output is forced to 50% of the configured range). Use keys '**UP**' (▲) and '**LE**' (◄) to move up to 100% or down to 0% of the configured range.

DESCRIPTION OF 'TARE' FUNCTION

The '*tare*' function allows to view the actual value of the tare and manually apply a tare. Press the '**SQ**' (■) key to enter the '*tare*' function, and access the actual tare value expressed in millivolts' (see section 10.1) with 2 decimal points. Press again the '**SQ**' (■) key to apply a new tare. The instrument will show '*ok*' while the new tare is applied, and will return back to indicate the new tare value applied. Tare value can also be accessed and manually modified at the '*configuration menu*' (see section 13.4).

HOW TO EXIT 'FORCE' MENU

To exit the '*force*' menu, press the '**LE**' (◄) key, or press the key '**UP**' (▲) key until the parameter '**----**' appears, and select by pressing the '**SQ**' (■) key, or wait without pressing any key until the automatic '*rollback*' activates.

When exiting the '*force*' menu, the horizontal leds light down from top to bottom, and the instrument returns to '*normal mode*' of operation.

'ROLLBACK' FUNCTION

If there is no interaction from the operator for 60 seconds, the instrument exits the '*force*' menu and returns to '*normal mode*' of operation.

12.5 How to activate the 'Messages' function

HOW TO ACTIVATE 'MESSAGES' FUNCTION

With the instrument in '*normal mode*' of operation (see section 12.2), press the '**LE**' (◄) key to activate the '*messages*' function. The '*messages*' function displays information about the instrument status. The information available is configurable (see section 13.8).

The '*messages*' function ends when all the information has been displayed or front keys '**UP**' (▲) or '**SQ**' (■) are pressed. The '*display*' returns to '*normal mode*' of operation.

12.6 Fast and advanced configurations

FAST CONFIGURATION

The fastest way to configure the instrument is to activate one of the predefined configuration codes (see section 8).

Access the '*configuration menu*' and enter the '**Function code**' (**codE**) menu entry. The code displayed is the current active input-output range. Select the new code and validate. Selecting a code automatically exits the '*configuration menu*' and activates the new configuration.

**There are different codes for 4/20 mA and 0/10 Vdc output signals.*

To customize the input and output signals, see the '*Advanced scaling*' section of the '*configuration menu*' (see section 13.4).

ADVANCED CONFIGURATION

Additional configuration parameters are available at the '*configuration menu*'. The operator can customize the input and output signal ranges, the messages seen on display, the functions available at the '*force*' menu, the messages associated to the '**LE**' (◄) key, activate filters, password function, etc.

See section 13 for a detailed explanation on the '*configuration menu*'.

13. Configuration menu

13.1 Function codes

The fastest way to configure the instrument, is to select a predefined configuration code (see section 8). At the '**Configuration code**' (**codE**) parameter use keys '**UP**' (▲) and '**LE**' (◀) to move up and down through the list of codes. Locate the desired code, and press '**SQ**' (■). The instrument shows the '**codE**' parameter. Press '**LE**' (◀) to exit the '*configuration menu*'. The instrument stores the new configuration, applies a '*power-up*' routine and returns to the '*normal mode*' of operation (see section 12.2).

Selecting a '*reserved*' code or '**----**' returns to the previous menu without changes.

When entering the '**Function code**' (**codE**) parameter, the active '*configuration code*' is displayed. If the actual configuration does not match any of the configuration codes, code '**uSEr**' is displayed.

There are different codes for 4/20 mA output (codes from 010 to 099) and 0/10 Vdc output (codes from 110 to 199) (see section 8).

Custom input and output signal ranges can be configured at the '*Advanced scaling*' section of the '*configuration menu*' (see section 13.4).

13.2 Initial configuration

At the '**Input configuration**' (**InP**) menu entry, configure the reading mode and the input signal range.

If you have already selected a configuration code (see section 13.1), the input signal has been already selected and there is no need to manually select the '**Mode**' (**ModE**) or '**Signal range**' (**rAnG**) parameters again.

At the '**Mode**' (**ModE**) parameter select '**cELL**' for load cell measurement, or select '**MV**' for millivolt measurement. See section 7.2 and 7.3 for an explanation of the differences between both modes.

At the '**Signal range**' (**rAnG**) parameter select the input signal range. Input signal ranges can also be configured by selecting a pre-defined configuration code (see section 13.1).

For an example on how to calculate the appropriate input signal range for a given load cell, see section 7.7.

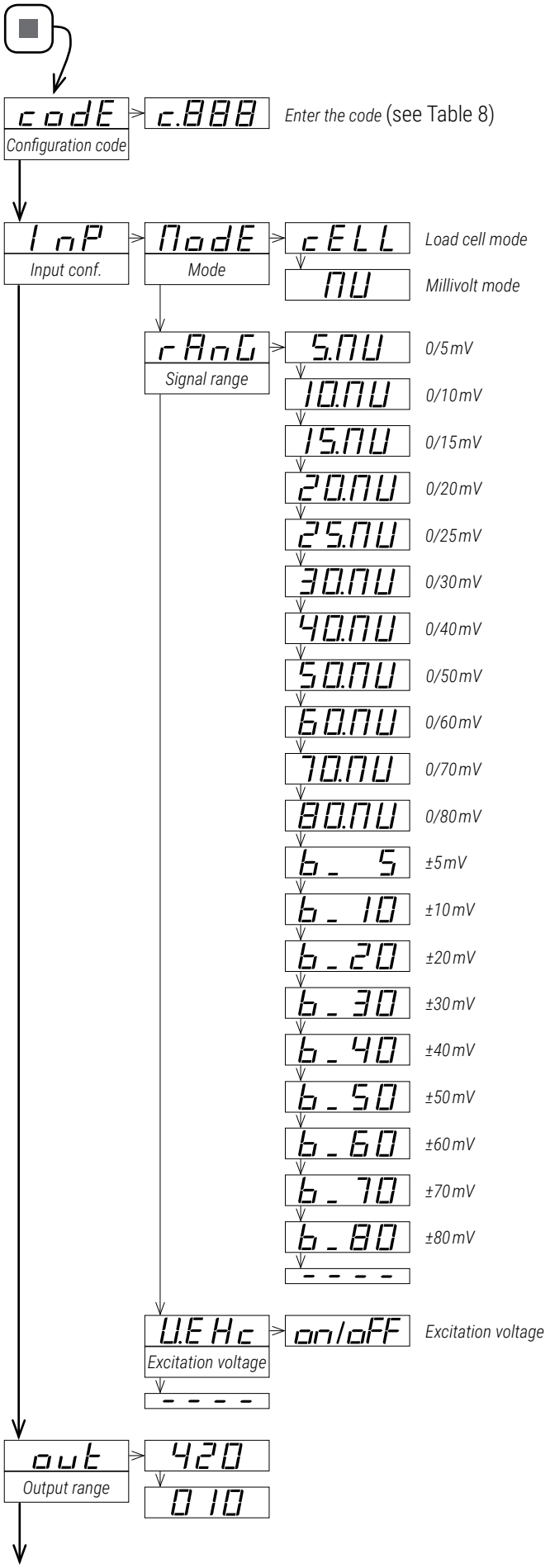
To customize to an intermediate range (for example 0/7.5 mV) see section 13.4. To manually select the output signal see section 13.3.

At the '**Excitation voltage**' (**V.EXc**) parameter select '**oFF**' to disable the excitation voltage. Excitation voltage is set to '**on**' when selecting the '**cELL**' mode, and set to '**oFF**' when selecting the '**MV**' mode at the '**Mode**' (**ModE**) parameter.

13.3 Output range

At the '**Output range**' (**out**) menu entry, select the output signal range to 4/20 mA (value '**420**') or to 0/10 Vdc (value '**010**').

The output signal range selected can be later customized to operate in a reduced range of signal (see section 13.4).



13. Configuration menu (cont.)

13.4 Advanced scaling

At the '**Advanced scaling**' (**Ad.Sc**) menu, customize the actual value for the tare, the input and output signal ranges and, if used, the process value. When selecting a predefined configuration code, the parameters are configured according to the code selected. The parameters are accessible for manual configuration:

- at '**Tare**' (**tArE**) view the actual value of the tare parameter, expressed in '*x.xx*' mV' (see section 10.1). To reset the tare value manually set this parameter to '*0.00*'. Selecting a new '*configuration code*' (see section 13.1) or a new '*signal range*' (see section 13.2) also restes the '*tare*' value to zero.
- at the '**Input low signal**' (**In.Lo**) parameter configure the low input signal value. This value is expressed in '*x.xx*' mV' (see section 10.1). The parameter value is not affected by changes at the tare value.
- at the '**Input high signal**' (**In.hI**) parameter configure the high input signal value. This value is expressed in '*x.xx*' mV' (see section 10.1). The parameter value is not affected by changes at the tare value.
- at the '**Output low signal**' (**ou.Lo**) parameter configure the low output signal value. This value is expressed in '*x.xx*' mA or in '*x.xx*' Vdc.
- at the '**Output high signal**' (**ou.hI**) parameter configure the high output signal value. This value is expressed in '*x.xx*' mA or in '*x.xx*' Vdc.

These four parameters define the relation between the input and the output signal (see Table 19) and can be modified independently, to match the specific input-output relation for your application (see Table 20).

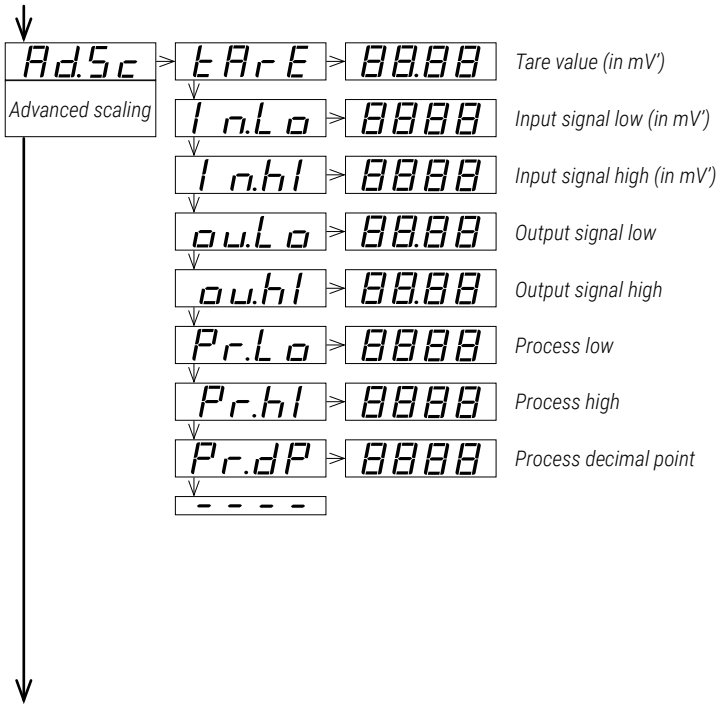
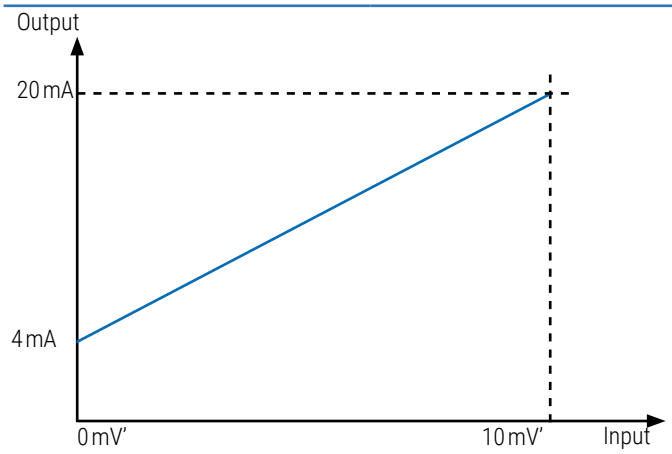
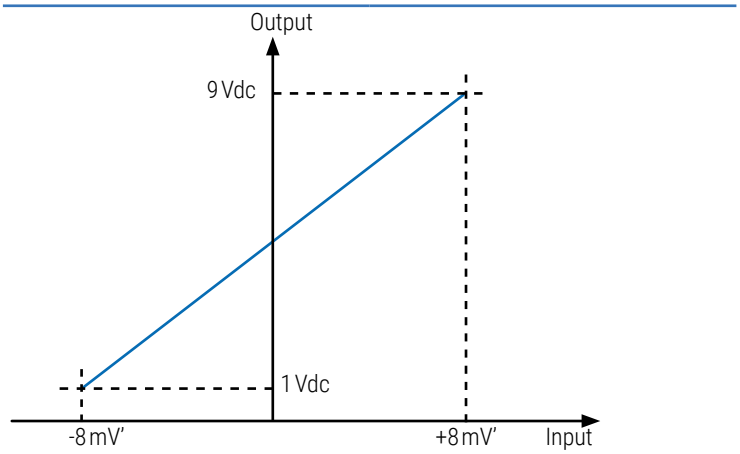


Table 19 | **EXAMPLE FOR CODE '011' (0/10 mV=4/20 mA)**



Selecting the predefined code '011' configures a range of 0/10 mV'=4/20 mA, and the values configured are as indicated below:	
input_low = 0.00 mV'	output_low = 4.00 mA
input_high = 10.00 mV'	output_high = 20.00 mA

Table 20 | **EXAMPLE FOR CUSTOM RANGE (-8/+8 mV=1/9 Vdc)**



To configure -8/+8 mV'=1/9 Vdc, select code 122 (-10/+10 mV'=0/10 Vdc) and then configure the parameters below:	
input_low = -8.00 mV'	output_low = 1.00 Vdc
input_high = 8.00 mV'	output_high = 9.00 Vdc

Additionally, a process value can be scaled using the last three parameters of the '**Advanced Scaling**' (**Ad.Sc**) menu. The actual process value can be accessed through the '*display information*' function (see section 13.6) or the '*messages*' function (see section 13.8).

- at the '**Process low**' (**Pr.Lo**) parameter, configure the process value associated to the low input signal value.
- at the '**Process high**' (**Pr.hI**) parameter, configure the process value associated to the high input signal value.
- at the '**Process decimal point**' (**Pr.dP**) parameter, configure the decimal point position for the process value.

13. Configuration menu (cont.)

13.5 Field correction

At the '**Field correction**' (**F.cor**) menu, there is access to the '*field correction*' functions. The '*field correction*' functions allow to modify the '*input signal low*' and '*input signal high*' parameters of the '*Advanced scaling*' menu (see section 13.4), based on the actual input signal measured at the input. Functions used to correct and fine tune the slope of the load cell, by loading low and high weights and applying the correction low and high. Tares can are applied after the correction.

- select the '**Field correction low**' (**Fc.Lo**) function to set the actual input signal value at the '*input signal low*' parameter of the '*Advanced scaling*' menu. While measuring the value, the message '**ok**' remains flashing for 5 seconds. When the measure is completed, the instrument returns to the '**Field correction low**' (**Fc.Lo**) parameter.

- select the '**Field correction high**' (**Fc.hI**) function to set the actual input signal value at the '*input signal high*' parameter of the '*Advanced scaling*' menu. While measuring the value, the message '**ok**' remains flashing for 5 seconds. When the measure is completed, the instrument returns to the '**Field correction high**' (**Fc.hI**) parameter.

The '*tare*' value is reset to '0' when a '**Field correction low**' (**Fc.Lo**) or '**Field correction high**' (**Fc.hI**) is applied.

13.6 Display information

At the '**Display information**' (**dISP**) menu select one parameter to read on display when the instrument is in '*normal mode*' of operation. If you need access to more than one information, see the '*messages*' function (see section 13.8) associated to front key '**LE**' (◂).

- select '**Measure**' (**MEAS**) to read the value of the actual millivolts at signal terminals (for example: '**MEAS mV 7.82**'). Value is expressed in millivolts (see section 10.1).

- select '**Tare**' (**tArE**) to read the actual value of the '*tare*' parameter. (for example : '**tArE mV 1.27**') This value is expressed in corrected millivolts (mV') (see section 10.1).

- select '**Input signal value**' (**InP.S**) to read the input signal value and the measurement units (for example: '**Inp mV 8.52**'). This value is expressed in millivolts (mV') (see section 10.1).

- select '**Output signal value**' (**out.S**) to read the output signal value and the measurement units (for example : '**Out mA 12.40**').

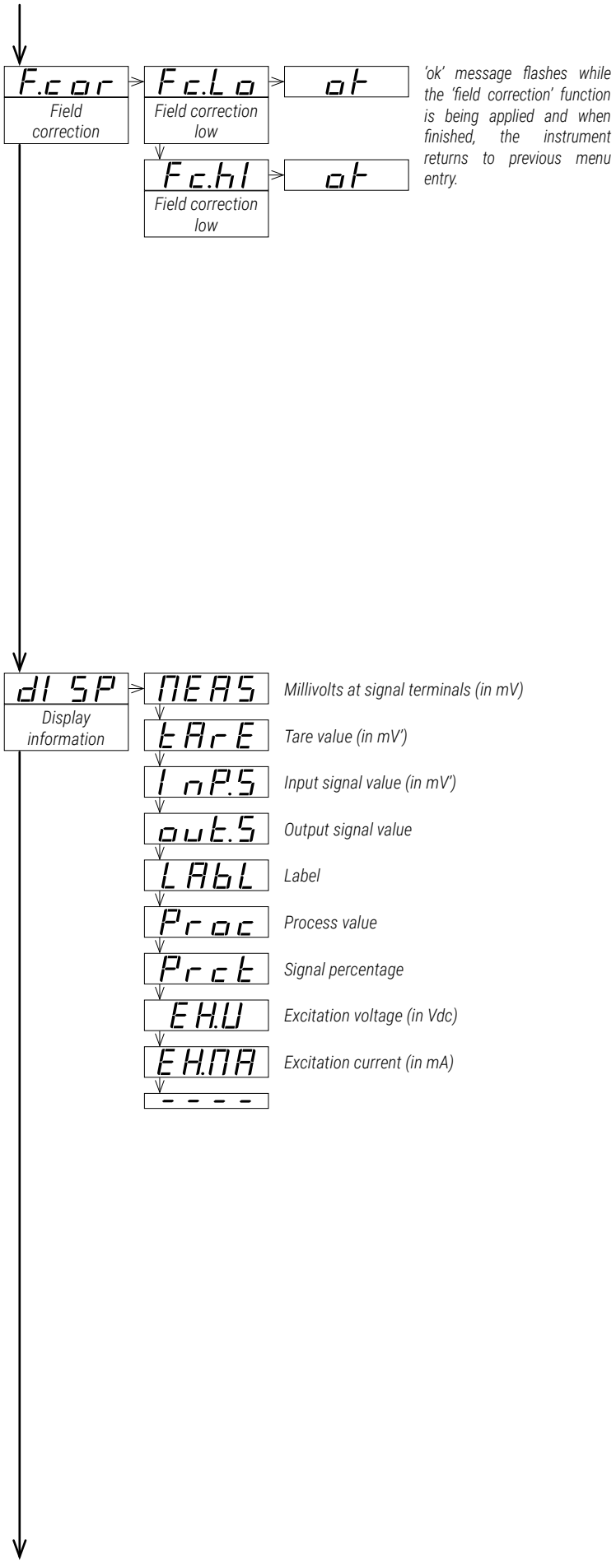
- select '**Label**' (**LAbL**) to read the value configured at the '*label*' and '*label2*' parameters (see section 13.9).

- select '**Process value**' (**Proc**) to read the process value as scaled at the process parameters (see section 13.4) (for example: '**Proc 150.0**').

- select '**Percentage**' (**Prct**) to read the percentage of input signal, where '0' is the value assigned to the '*input signal low*' parameter, and '100' is the value assigned to the '*input signal high*' parameter (see section 13.4) (for example: '**Prct 23.5**').

- select '**Excitation voltage**' (**EX.V**) to read the value of the excitation voltage received by the load cell. This value is read from the '*sense*' terminals (see section 7.2) (for example : '**ExV 4.97**').

- select '**Excitation current**' (**EX.MA**) to read the value of the current provided through the excitation voltage terminals (for example: '**ExMA 14.3**').



13. Configuration menu (cont.)

13.7 Key 'UP' ('force' menu)

The key '**UP**' (▲) at the front of the instrument gives access to a configurable list of functions (see section 12.4).

At the '**Key UP ('force' menu)**' (**K.uP**) menu select which functions will be available when pressing the front key '**UP**' (▲). Select '**on**' to activate the desired functions.

- configure '**Force Low**' (**F.Lo**) to '**on**' to activate the '*Force low*' function menu entry.
- configure '**Force High**' (**F.hI**) to '**on**' to activate the '*Force high*' function menu entry.
- configure '**Force Set**' (**F.SEt**) to '**on**' to activate the '*Force set*' function menu entry.
- configure '**Tare**' (**tArE**) to '**on**' to activate the '*Tare*' function menu entry.

The functions configured to '**on**' are available at the '*force*' menu. See section 12.4 for a description on each function and how to operate them.

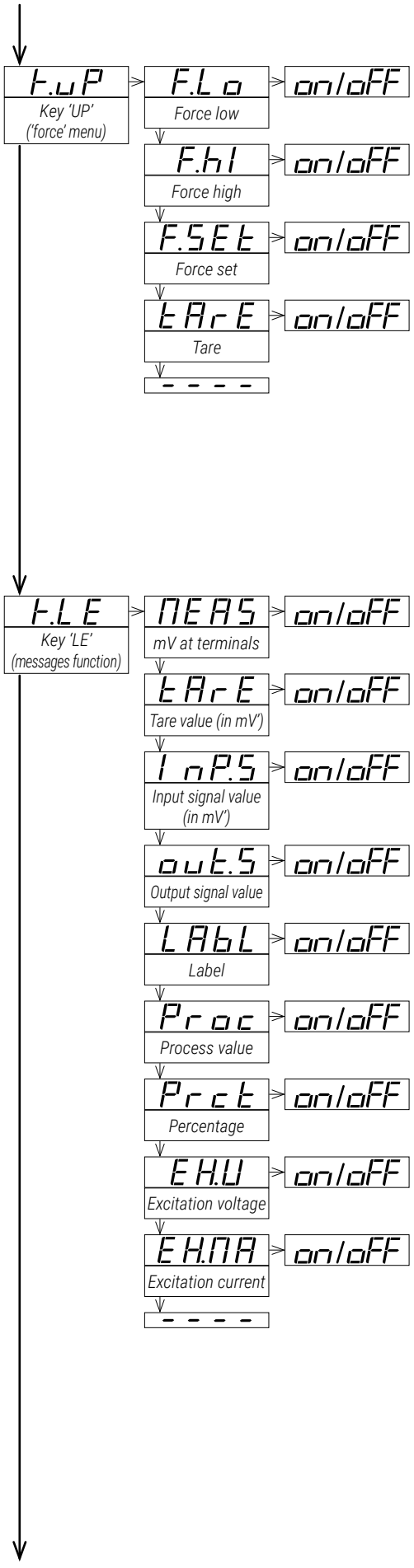
13.8 Key 'LE' ('*messages*' function)

The key '**LE**' (◀) at the front of the instrument gives access to a configurable set of information messages.

At the '**Key LE (messages function)**' (**K.LE**) menu, select the informations to be displayed when the front key '**LE**' (◀) is pressed (see section 12.5). Select '**on**' to activate each information.

- configure '**mV at terminals**' (**MEAS**) to '**on**' to see the value in millivolts at terminals (for example : '**MEAS mV 13.82**').
- configure '**Tare value**' (**tArE**) to '**on**' to see the actual value of the '*tare*' parameter. (for example : '**tArE mV 1.27**') This value is expressed in corrected millivolts (mV') (see section 10.1).
- configure '**Input signal value**' (**InP.S**) to '**on**' to see the input signal value and the measurement units (for example: '**Inp mV 8.52**'). This value is expressed in millivolts (mV') (see section 10.1).
- configure '**Output signal value**' (**out.S**) to '**on**' to see the output signal value and the measurement units (for example : '**Out mA 12.40**').
- configure '**Label**' (**LAbL**) to '**on**' to see the value configured at the '*label*' and '*label2*' parameters (see section 13.9).
- configure '**Process value**' (**Proc**) to '**on**' to see the process value as scaled at the process parameters (see section 13.4) (for example: '**Proc 150.0**').
- configure '**Percentage**' (**Prct**) to '**on**' to see the percentage of input signal, where '0' is the value assigned to the '*input signal low*' parameter, and '100' is the value assigned to the '*input signal high*' parameter (see section 13.4) (for example: '**Prct 23.5**').
- configure '**Excitation voltage**' (**EX.V**) to '**on**' to see the value of the excitation voltage received by the load cell. This value is read from the '*sense*' terminals (see section 7.2) (for example : '**ExV 4.97**').
- configure '**Excitation current**' (**EX.MA**) to '**on**' the value of the current provided through the excitation voltage terminals (for example: '**ExMA 14.3**').

When more than one parameter is set to '**on**', values will be displayed sequentially, in the same order as they are listed in the menu, with a middle dash '**-**' between them. When all information has been displayed, the instrument returns to '*normal mode*' of operation.

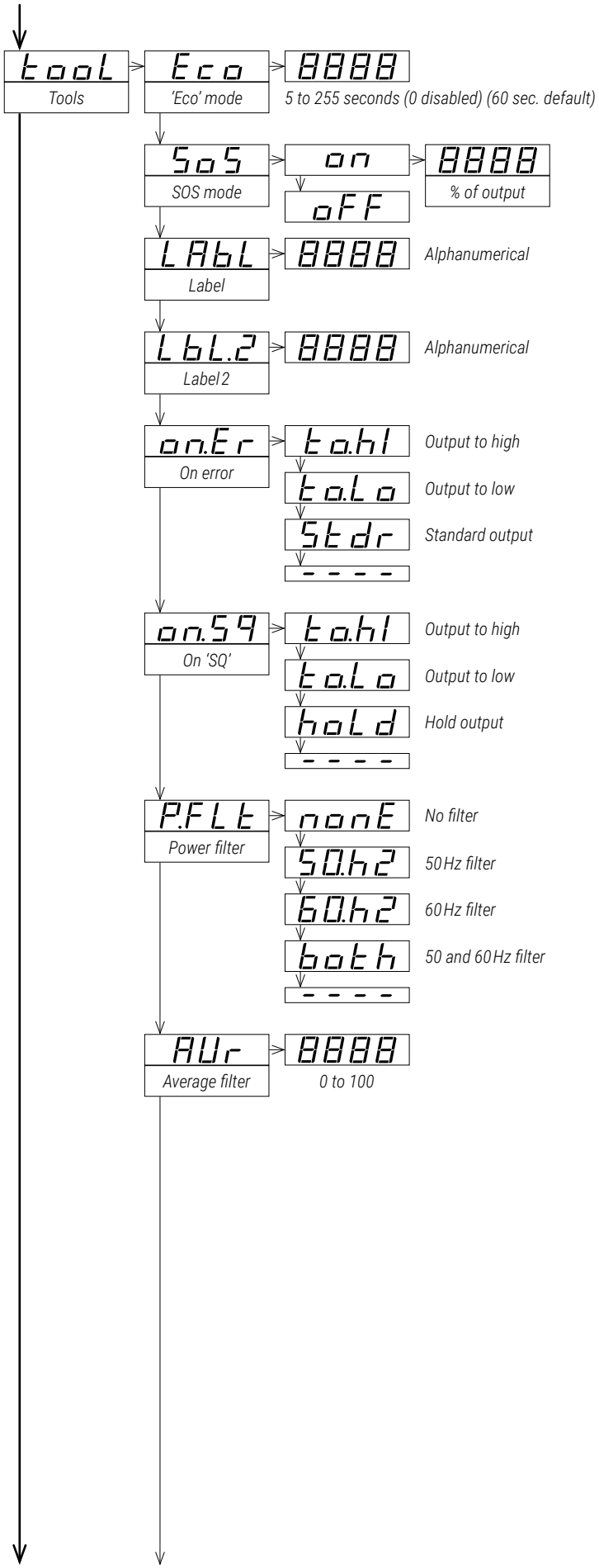


13. Configuration menu (cont.)

13.9 'Tools' menu

The '**Tools'** (**tool**) menu groups several functions.

- at the '**Eco mode**' (**Eco**) parameter, define the time to wait before the display is powered off (while in '*normal mode*' of operation). Default value is 60 seconds. Configure '0' to disable the function and maintain the display always on.
- at the '**SOS mode**' (**SoS**) parameter select '**on**' to activate the output signal to a predefined value. Select the value from 0 to 100 % of the active output range (4/20 mA or 0/10 Vdc). To deactivate the '*SOS mode*' select '**oFF**'. See section 5 for more information on the '*SOS mode*'.
- at the '**Label**' (**LAbL**) parameter, define an alphanumerical value to be displayed on the display, when the instrument is in '*normal mode*' of operation, or at the '*messages*' function when the key '**LE**' (◂) is pressed. The label can be used to identify the instrument with its own internal factory code. If more than four characters are needed, configure the '**Label 2**' (**LbL.2**) parameter. The total label value is the characters at '*label*' followed by the characters at '*label2*'. For additional information and a list of available characters, see section 6.
- at the '**On error**' (**on.Er**) parameter, configure the behavior of the output signal, in case of error at the input signal (see section 16).
  - select '**Output to high**' (**to.hI**) to force the output signal to overrange to maximum value
  - select '**Output to low**' (**to.Lo**) to force the output signal to underrange to minimum value
  - select '**Standard output**' (**Stdr**) to overrange output signal to maximum value in case of input signal overrange, and to underrange output signal to minimum value in case of input signal underrange.
- at the '**On 'SQ''** (**on.Sq**) parameter, configure the behavior of the output signal when the operator is inside '*configuration menu*' (see section 12.3).
  - select '**Output to high**' (**to.hI**) to force the output signal to overrange to maximum value (21.5 mA, 10.5 Vdc)
  - select '**Output to low**' (**to.Lo**) to force the output signal to underrange to minimum value (0 mA, 0 Vdc)
  - select '**Hold output**' (**hoLd**) to hold the output signal while the operator remains inside '*configuration menu*'.
- at the '**Power filter**' (**P.FLt**) parameter, select a filter for specific power frequency rejection. The filter selection has an effect on the response times (see section 11).
  - select '**No filter**' (**nonE**) to disable frequency rejection filters. This enables the fastest response time.
  - select '**50 Hz filter**' (**50.hZ**) to enable rejection to 50 Hz frequency.
  - select '**60 Hz filter**' (**60.hZ**) to enable rejection to 60 Hz frequency.
  - select '**50 and 60 Hz filter**' (**both**) to enable rejection to both 50 Hz and 60 Hz frequencies. This is the slowest response time.
- at the '**Average filter**' (**AVr**) parameter, configure the recursive filter to be applied to measured input signal. The filter can be used to reduce oscillations on noisy signals. Configure the filter strength between '0' and '100'. The filter is stronger with higher values. Increasing the strength of the filter slows the response speed of the instrument. Value '0' disables the filter.



13. Configuration menu (cont.)

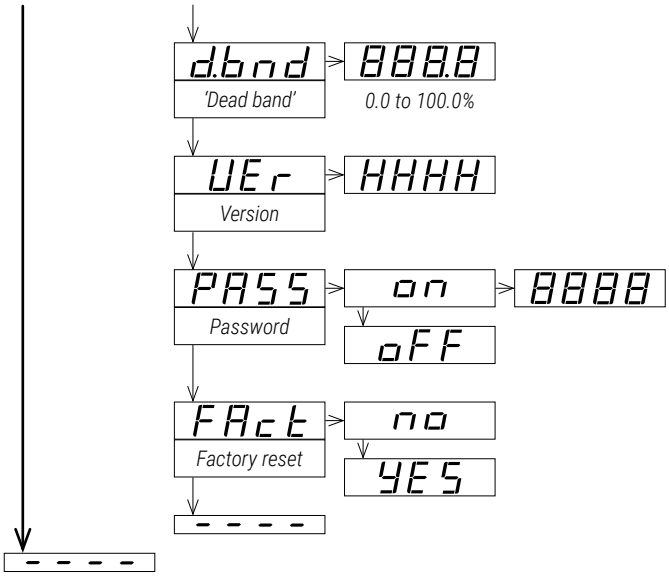
• at the '**Dead band**' (**d.bnd**) parameter set a value between '0.0'% and '100.0'%. This is a percentage of the '*input signal high*' parameter configured at the '*Advanced scaling*' section. Input signals below this value, are treated as a '0'.

example : instrument configured with code '011' (0/10 mVdc = 4/20 mA) and 'input signal high' parameter modified to 8 mVdc for an effective input - output relation of '0/8 mVdc = 4/20 mA'. Configure the 'Dead band' parameter to '1.0' to set a dead band value of 0.08 mVdc. All signals below 0.08 mVdc will be treated as 0 mVdc, and the output will be 4 mA.

• the '**Version**' (**VEr**) parameter informs about the firmware version running in the instrument.

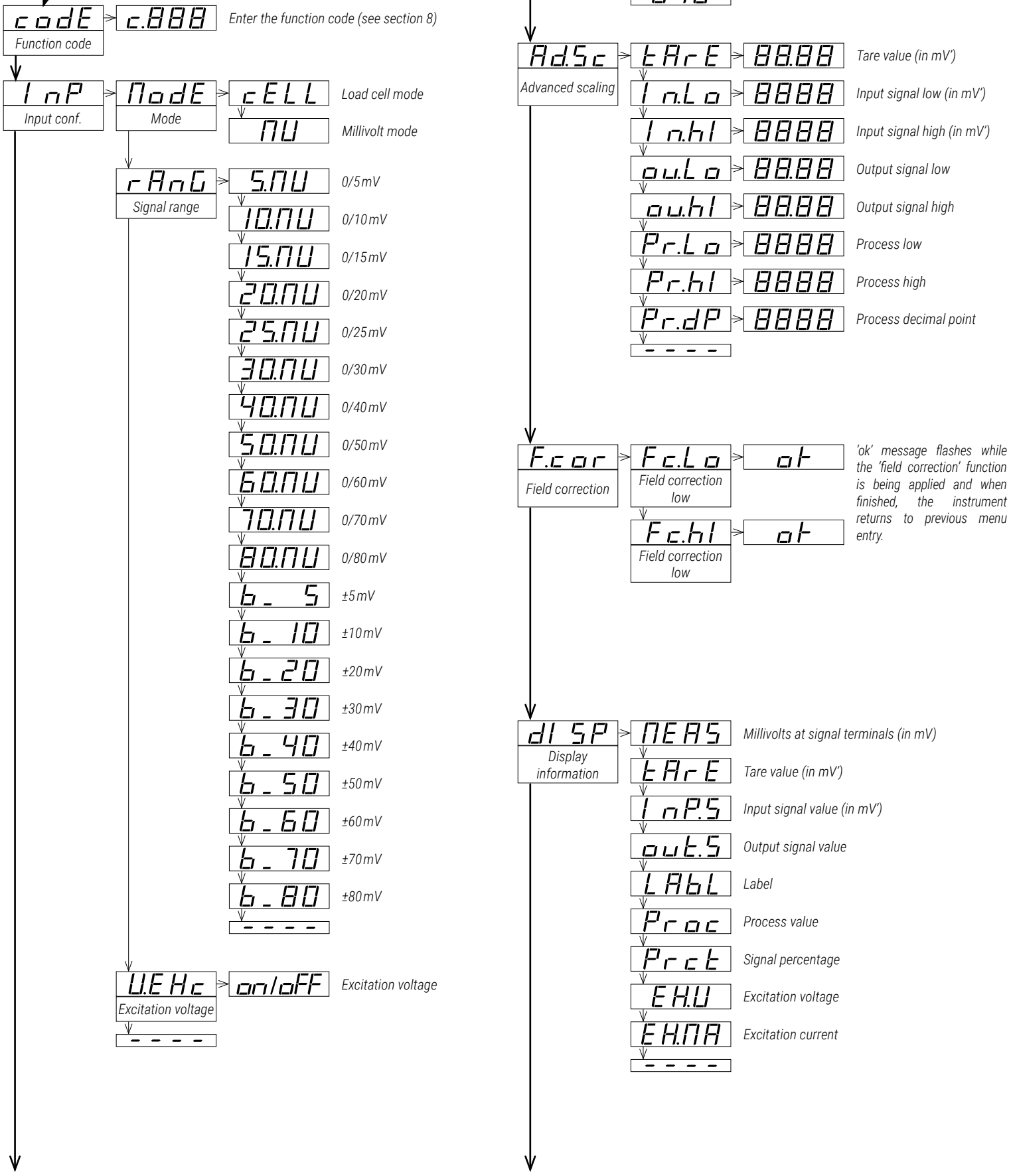
• at the '**Password**' (**PASS**) parameter define a 4 digit code to block access to the '*configuration menu*'. Activate the password to prevent access to the instrument configuration by non authorized personnel. To activate the '*Password*' function select '**on**', enter the code and validate. The password will be requested when accessing the '*configuration menu*'. The password does not block access to the '*force*' menu. To deactivate the password, set the parameter to '**oFF**'.

• at the '**Factory reset**' (**FAct**) parameter select '**yes**' to activate the default factory configuration (see section 15 for a list of factory default parameters).

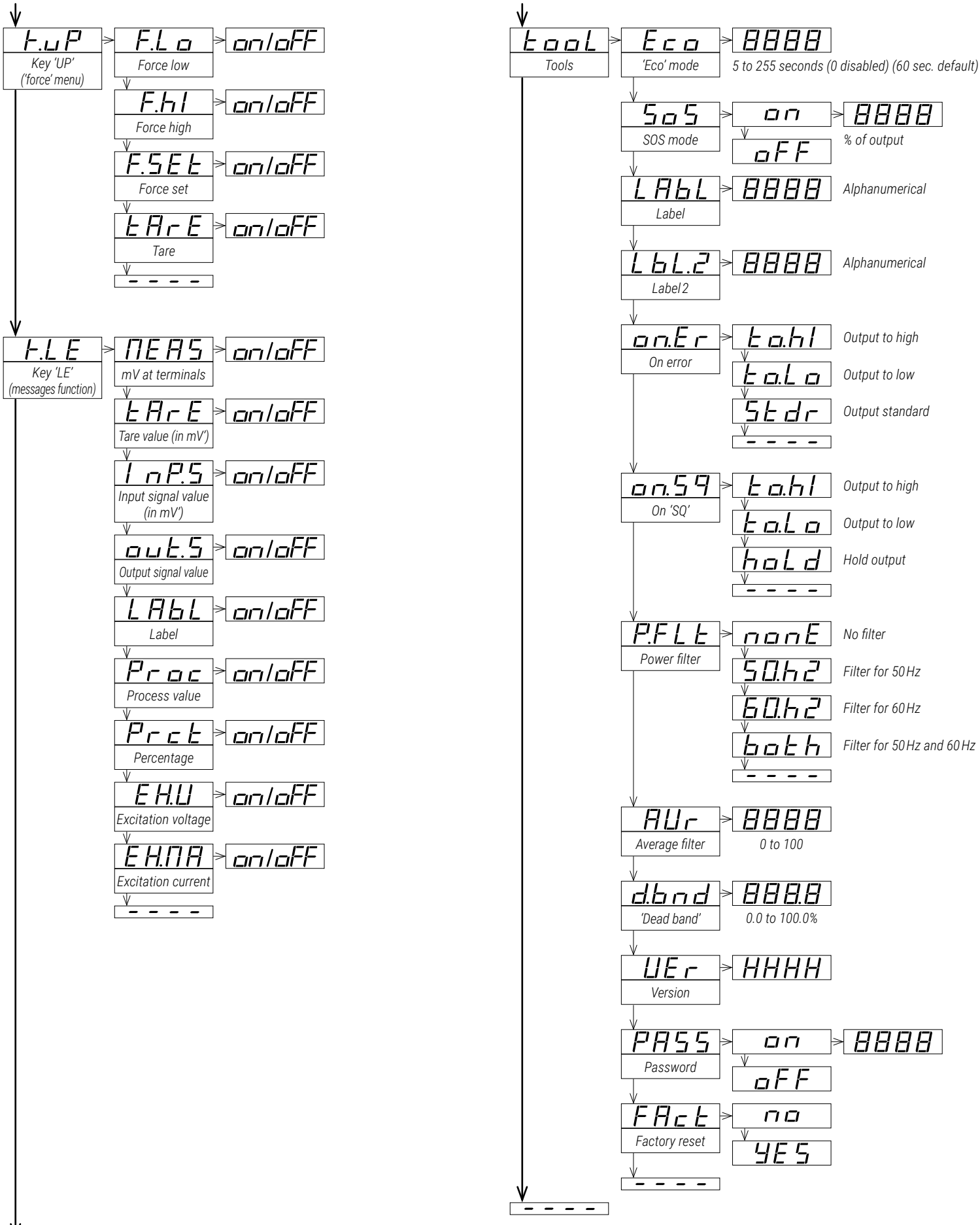


14. Full configuration menu

Press '**SQ**' (■) for 1 second to access the '*configuration menu*'. For a description on how to operate inside the menus see section 12. For a full vision of the '*configuration menu*' structure see section 13.



14. Full configuration menu (cont.)



15. Factory default parameters

Function code (**codE**)	11	[**c.011**]
Input configuration (**InP**)		
Mode (**ModE**)	load cell (**cELL**)	
Signal range (**rAnG**)	10.00 mV	
Excitation voltage (**V.EXc**)	on	
Output range (**out**)	4/20 mA	
Advanced scaling (**Ad.Sc**)		
Tare (**tArE**)	0.00	[mV']
Input signal low (**In.Lo**)	0.00	[mV']
Input signal high (**In.hI**)	10.00	[mV']
Output signal low (**ou.Lo**)	4.00	[mA]
Output signal high (**ou.hI**)	20.00	[mA]
Process low (**Pr.Lo**)	0	
Process high (**Pr.hI**)	1000	
Process decimal point (**Pr.dP**)	8888 (no decimal point)	
Display information (**dISP**)	mV at signal terminals (**MEAS**)	
Key '**UP**' ('*force*' menu) (**K.uP**)		
Force low (**F.Lo**)	on	
Force high (**F.hI**)	on	
Force set (**FSEt**)	on	
Tare (**tArE**)	on	
Key '**LE**' ('*messages*' function) (**K.LE**)		
Measure (**MEAS**)	off	
Tare value (**tArE**)	off	
Input signal value (**InP.S**)	off	
Output signal value (**out.S**)	on	
Label (**LAbL**)	off	
Process value (**Proc**)	off	
Percentage (**Prct**)	off	
Excitation voltage (**EX.V**)	off	
Excitation current (**EX.MA**)	off	
Tools (**tooL**)		
'*Eco*' mode (**Eco**)	60	[seconds]
SOS mode (**SoS**)	off	
Label (**LAbL**)	LAbL	
Label 2 (**LbL.2**)	----	(disabled)
On error (**on.Er**)	to.hI	(output to maximum value)
On '*SQ*' (**on.Sq**)	to.hI	(output to maximum value)
Power filter (**P.FLt**)	both	(50 and 60 Hz filter)
Average filter (**AVr**)	0	(disabled)
Dead band (**d.bnd**)	0.0	(disabled)
Password (**PASS**)	off	(disabled)

RESET TO DEFAULT FACTORY PARAMETERS

To recover the instrument to default factory parameters, enter into '*configuration menu*' and go to '*Tools*' / '*Factory reset*' and select '*yes*'

- access the '*configuration menu*' (press key '**SQ**' (■) for 1 second)
- press key '**UP**' (▲) to locate '*tools*' and press '**SQ**' (■)
- parameter '*Eco mode*' appears on display
- press key '**UP**' (▲) to locate '*Factory reset*' and press '**SQ**' (■)
- value '*no*' appears on display
- press key '**UP**' (▲) and '*Yes*' appears on display
- press key '**SQ**' (■) to apply the factory reset
  - the leds light a round shape while the new configuration is applied
  - the start up message appears ('**Lc 10**')
  - the actual signal input value is displayed
- the instrument is in '*normal mode*' of operation

16. Error codes

In case of error, the error code is shown flashing on the digits. The error code is not visible inside '*configuration mode*' or inside the '*force*' menu.

The error code remains active on display until the problem that caused the error is solved. In case of multiple error codes, solve the first problem to see the next active error code.

In case of error, the output can be configured to overrange or underrange. See the '**On error**' (**on.Er**) parameter at section 13.9.

Table 21 | **Error codes**

Error	Description
'**Er.01**'	Password error. The password code entered is not correct.
'**Er.02**'	Input hardware overrange. The input signal is higher than the maximum signal that can be measured.
'**Er.03**'	Input hardware underrange. The input signal is lower than the minimum signal that can be measured.
'**Er.04**'	Output hardware overrange. The output signal should be higher than the maximum output signal that can be generated.
'**Er.05**'	Output hardware underrange. The output signal should be lower than the minimum output signal that can be generated.
'**Er.08**'	Scaled input slope not valid. The values for '*Input signal low*' (**In.Lo**) and '*Input signal high*' (**In.hI**) can not be the same. Enter a different value to validate the parameter (see section 13.4).
'**Er.09**'	Scaled output slope not valid. The values for '*Output signal low*' (**ou.Lo**) and '*Output signal high*' (**ou.hI**) can not be the same. Enter a different value to validate the parameter (see section 13.4).
'**Er.10**'	Scaled process display slope not valid. The values for '*Process low*' (**Pr.Lo**) and '*Process high*' (**Pr.hI**) can not be the same. Enter a different value to validate the parameter (see section 13.4).
'**Er.15**'	Error at '*sense*' wires. Signal detected at '*sense*' wires is below 3.5 Vdc. Correct value should be around 5 Vdc. Short circuit, broken cell, ...
'**Er.17**'	Overload at the excitation current. The current provided by the excitation terminals is higher than 70 mA. Short circuit, broken cell, too many cells, ...

Messages do not affect the output signal, and do not trigger the '**On error**' (**on.Er**) function.

Table 22 | **Messages**

Message	Description
'**d.oVr**'	Display overrange. The display value should be higher than the maximum value that can be displayed.
'**d.udr**'	Display underrange. The display value should be lower than the minimum value that can be displayed.
'**-nA-**'	Function not available. For the actual configuration, the function is not available.

17. Precautions on installation

Check the documentation when you find this symbol, to know the nature of a potential danger and actions to prevent it.

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

Instrument protected with double isolation. No earth connection required.

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 all external circuits 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.

The instrument is designed to be DIN rail mounted, inside a closed cabinet, protected from direct impacts. 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. The use of shielded cables is recommended to prevent the coupling of environmental electromagnetic noise, connected to earth only one cable end side. 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.

Conformity with security regulations EN-61010-1 requires a closed front cover. There is no need to open the front cover under normal usage or configuration. The output terminal prevents the front cover from opening. An open front cover may expose areas with dangerous voltages. Remove connections with dangerous voltages before opening. Only to be performed by qualified operators.

18. Warranty

This instrument is warranted against all manufacturing defects for a period of 36 months, as requested by the European legislation. This warranty does not apply in case of misuse or accident, and the scope of the warranty is limited to repair of the instrument, not being the manufacturer responsible for additional damages or additional costs. Within the warranty period and after examination by the manufacturer, the unit will be repaired or substituted when found to be defective.

19. CE declaration of conformity

Products **DR-I4L**

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

Electromagnetic compatibility directive 2014/30/EU
Low voltage directive 2014/35/EU
ROHS directive 2015/863/EU
WEEE directive 2012/19/EU

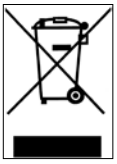
Security rules EN-61010-1

Instrument	Fixed, Permanently connected
Pollution degree	1 and 2 (without condensation)
Isolation	Double

Overvoltage category 2

Electromagnetic compatibility rules EN-61326-1

EM environment	Industrial
CISPR 11	Instrument Class A & Class B Group 1



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

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) 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 it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS 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.

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