



Series EC . EC4-ZR3

OEM
APPLICATIONS

YOUR METER !

Multisignal panel meter

PANEL METERS. OEM APPLICATIONS

Multisignal digital panel meter with 4 relays and isolated analog output. Configurable to read AC and DC voltages (up to 600 Vac/dc), AC and DC currents (up to 5 Aac/dc), process signals (mA, Vdc), thermocouples, resistive temperature probes (Pt, Ni, PTC and NTC), resistances, potentiometers and frequency. Configurable. Standard 96x48 mm size (1/8 DIN). Scalable reading with 4 digits (9999/-1999). 'Fast access' to alarm setpoints, 'external control' to activate predefined functions, 'Eco' mode for low consumption, 5 levels of configurable brightness, fail-safe mode and segment linearization. Single universal power supply 18 to 265 Vac/dc.

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1. Panel meter EC4-ZR3

Multisignal 96x48 mm panel meter, with 4 relays and analog output

Multisignal digital panel meter in 96x48mm size (1/8 DIN), with 4 relays and isolated analog output. Accepts AC and DC voltage signals from mV up to 600 V and currents up to 5 A (AC measures in True RMS), process signals (mA and Vdc) with excitation voltage included, thermocouples K, J, E, N, L, R, S, B, T and C, resistive temperature probes (Pt100, Pt500, Pt1000, Ni100, Ni200, Ni1000, PTC and NTC), resistances, potentiometers and frequency. Scalable reading with 4 digits up to 9999 / -1999 with configurable decimal point.

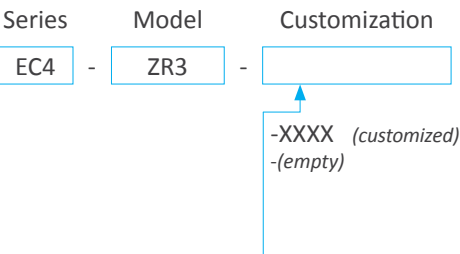
Four independent alarms, configurable as maximum or minimum, with hysteresis and setpoint. One 4/20mA analog output, isolated, with configurable active or passive output.

Front protection IP65. Connections with plug-in screw terminals.

Instrument designed for industrial use, highly flexible, allows for integration in multiple applications, reduced cost, excellent quality and optional customization available.

- ‘Fast access’ menu at front key UP (▲) configurable for fast access to alarm setpoints (see section 1.20).
- ‘Eco’ mode reduces power consumption (see section 1.23).
- 20 segment linearization (see section 1.21).
- Function ‘external control’ to activate with a contact a predefined function (reading ‘hold’, and memory of maximum or minimum) (see section 1.24).
- 5 configurable brightness levels (see section 1.29.8).

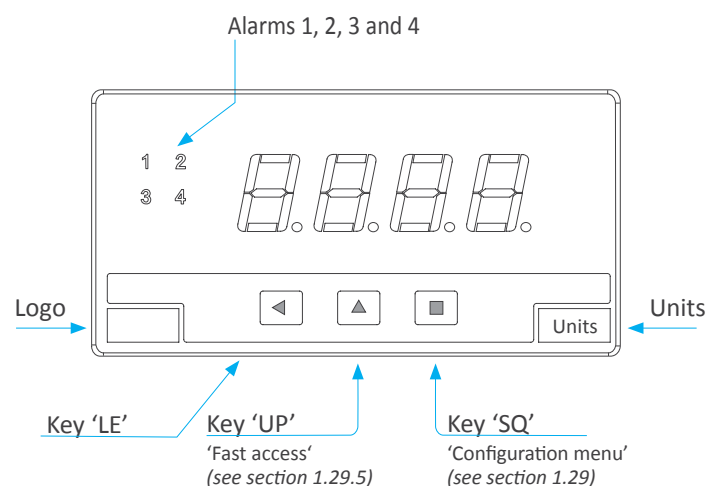
1.1 How to order



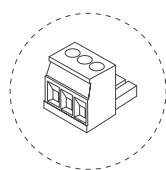
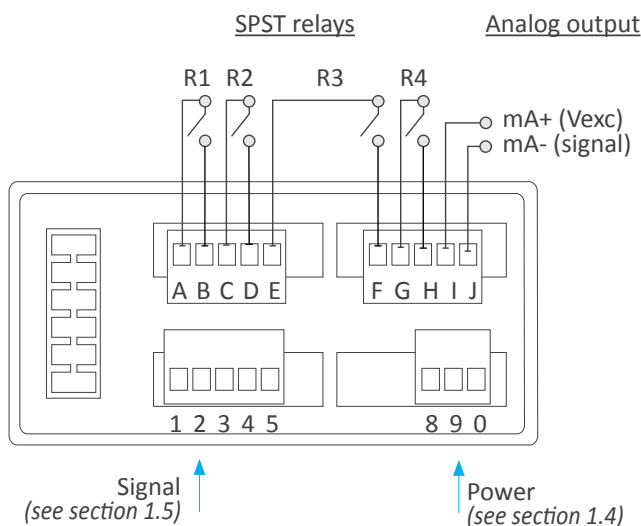
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1.2 Front view



1.3 Rear view



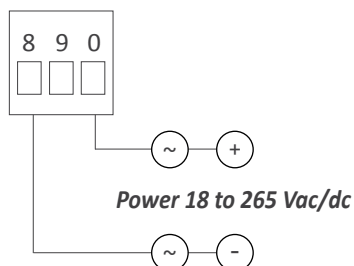
Detail of the plug-in screw terminals provided with the instrument. The instrument is provided with all terminals needed, both male and female.

1.4 Power connections

Earth connection - The instrument does not need earth connection for correct operation nor for compliance with security regulations.

Fuse - This instrument has not internal fuse. Conforming to security regulation 61010-1, add a protection fuse to the power line to act as disconnection element, easily accessible to the operator and identified as a protection device.

250 mA time-lag for power voltage > 50 Vac/dc
400 mA time-lag for power voltage < 50 Vac/dc

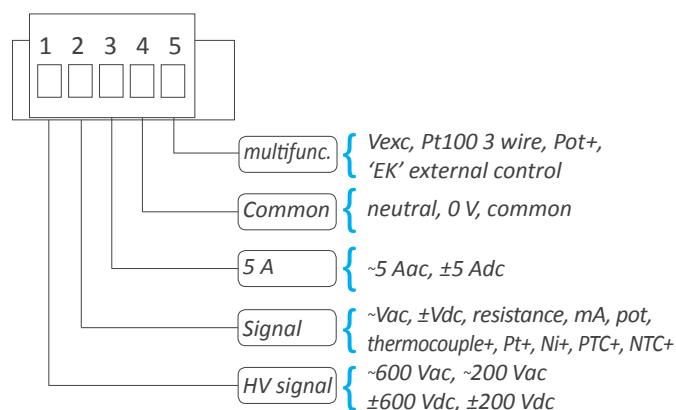


1.5 Signal connections

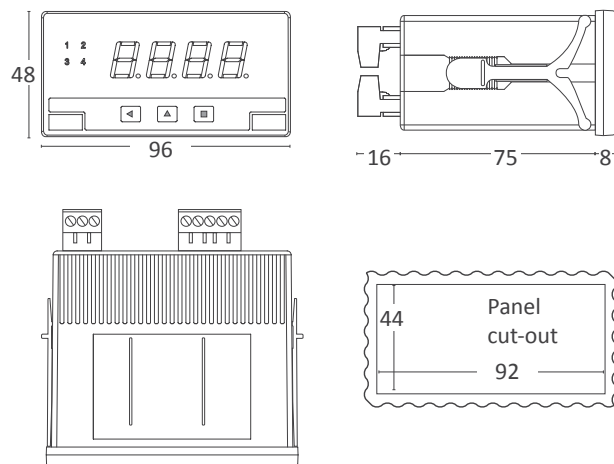
Signals up to 600 V and 200 V (AC and DC) must be connected at terminals 1 and 4. Signals for 5 A current (AC and DC) must be connected at terminals 3 and 4. All other signals must be connected between terminals 2 and 4. Terminal 5 is a 'multifunction' terminal, configurable with one of the following functions :

- +15 Vdc excitation voltage (Vexc) for process signals
- +5 Vdc excitation for potentiometer signals
- connection for the Pt100 third wire compensation
- external contact 'EK' function

To select the terminal 5 function, select the position of internal jumper 'T' (see section 1.9).



1.6 Mechanical dimensions (mm)



1.7 Installation and start-up

1. Open the instrument as indicated at section 1.26 and access the internal board.
2. Select jumpers 'S' for the signal range required (see section 1.9).
3. Select jumper 'T' to assign to multifunction terminal 5 the required functionality (see section 1.9).
4. Close the instrument as indicated at section 1.26.
5. Connect the input signal and the power supply as indicated at sections 1.4 and 1.5.
6. Enter the 'configuration menu' to configure the instrument (scaling, alarms, ...) (see section 1.29).

1.8 Technical specifications

Digits	
number of digits	4
led	7 segments led
color	red
height	14 mm
Reading	
max. reading	9999
min. reading	-1999
decimal point	configurable X.X.X.X
readings	3 readings / second
display refresh	3 refresh / second
step response	300 mSec. (0 % to 99 % signal)
overrange	reading flashes at '9999'
underrange	reading flashes at '-1999'
Accepted input signals	
AC voltages and currents	600 Vac, 200 Vac, 20 Vac, 2 Vac 200 mVac, 60 mVac, 5 Aac, 20 mAac (see section 1.10)
DC voltages and currents	±600 Vdc, ±200 Vdc, ±20 Vdc, ±2 Vdc ±200 mVdc, ±60 mVdc, ±5 Adc, ±20 mAdc (see section 1.11)
thermocouples	K, J, E, N, L, R, S, B, T y C (see section 1.12)
temperature 'Pt'	Pt100 (2 and 3 wires with automatic compensation up to 30 R), Pt500, Pt1000 (see section 1.13)
temperature 'Ni'	Ni100, Ni200, Ni1000 (see section 1.13)
temperature 'NTC'	(see section 1.14)
temperature 'PTC'	(see section 1.15)
process	4/20 mA, 0/10 Vdc (active and passive) (see section 1.16)
frequency	up to 100 Hz (see section 1.17)
resistances	ranges of 5 K and 50 K (see section 1.18)
potentiometers	nominal value 500 Ohm up to 20 KOhm (see section 1.19)
Accuracy at 25 °C	see following sections for each signal
Thermal drift	150 ppm/°
Excitation voltage	+15 Vdc (max. 30 mA) for process signals +5 Vdc for potentiometers (at terminal 5, see sections 1.5 and 1.16)
Power supply	
power 'U'	18 to 265 Vac/dc
isolation	1500 Veff. isolation tested for 60 sec.
AC frequency	50/60 Hz
consumption (without 'Eco')	<4.0 W
power wires	1 mm² to 2.5 mm² (AWG24 to AWG11)
Configuration	3 front push buttons
Front protection	IP65
Analog output	
output signal	4/20 mA active (for passive, see below)
max. load resistance	R _L <350 R

Functions included		Section
Fast access	to alarm setpoints, maximum and minimum	1.20
External control	'hold' reading memory of maximum memory of minimum	1.24
'Eco' mode	reduced consumption	1.23
Alarms	setpoint hysteresis set as max or min type	1.29.3
Offset reading	subtract a fixed number of counts to reading	1.22
Display filter	recursive 'steps'	1.29.8
Simplified scaling		1.21
Memory	max and min memory	1.29.5
Password	blocks configuration	1.29.8
Display brightness	5 levels	1.29.8
Table 1 - Functions included		

accuracy	<0.5% FS
response time	<100 mSec. + meter response time
isolation	1000 Vdc
passive output	close internal jumper '7-8' (see section 1.25) terminal 'Vexc' is now 'common' max. load resistance R _L < 700 R plug-in screw terminal, pitch 3.81 mm
type of terminal	

Relay outputs

type of relay	2 contact relay (NO, common)
current maximum	6 A per relay (resistive load)
voltage maximum*	250 Vac continuous
isolation	2500 Veff
type of terminal	plug-in screw terminal, pitch 5.08 mm
* switch power lines with maximum overvoltage of 2500Veff (overvoltage category II) to comply with 61010-1 security regulations.	

Mechanical

mounting	panel
connections	plug-in screw terminals
housing material	ABS, polycarbonate (V0)
weight	<200 grams
front size	96 x 48 mm (1/8 DIN)
panel cut-out	92 x 44 mm
deep	91 mm (including terminals)

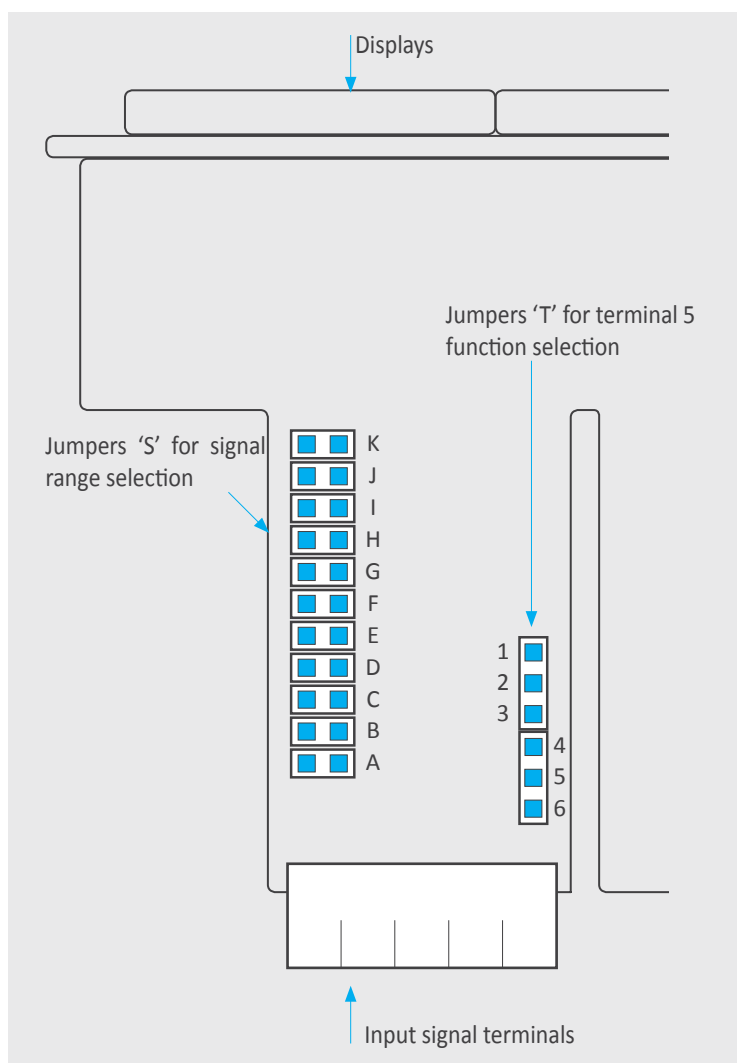
Temperature

operation	from 0 to +55 °C
storage	from -20 to +70 °C
'warm-up' time	15 minutes

1.9 Internal jumpers

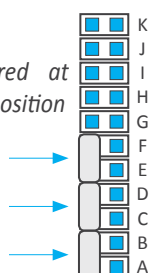
Internal jumpers 'S' are associated to the signal range. The position of internal jumper 'T' assigns the function of the multifunction terminal 5. At 'Table 2' see a list of signal ranges and associated jumper 'S' and 'T'. At 'Table 3' see the position for jumper 'T' associated to each function of the multifunction terminal 5. To access the internal jumpers, open the housing as explained at section 1.26. For additional information on each signal range see the following sections :

- Ranges for AC voltages and currents, see section 1.10
- Ranges for DC voltages and currents, see section 1.11
- Ranges for thermocouples, see section 1.12
- Ranges for Pt and Ni probes, see section 1.13
- Ranges for NTC probes, see section 1.14
- Ranges for PTC probes, see section 1.15
- Ranges for process signals, see section 1.16
- Ranges for frequency signals, see section 1.17
- Ranges for resistance measures, see section 1.18
- Ranges for potentiometer measures, see section 1.19



Jumpers not used can be stored for future use by placing them at the 'no contact' positions indicated below. Only the 3 positions indicated are safe to store jumpers.

Jumpers stored at 'no contact' position



Range	Jumpers 'S'	Jumper 'T'
AC voltages and currents		
~600 Vac	G & I	4-5
~200 Vac	I	
~20 Vac	A & I	
~2 Vac	B & I	
~200 mVac	C & I	
~60 mVac	E & I	
~5 Aac	I	
~20 mAac	D & I	
DC voltages and currents		
±600 Vdc	G	4-5
±200 Vdc	- - -	
±20 Vdc	A	
±2 Vdc	B	
±200 mVdc	C	
±60 mVdc	E	
±5 Adc	- - -	
±20 mAdc	D	
Process		
4/20 mA	D	1-2*
0/10 Vdc	A	
* jumper 1-2 to activate Vexc. Select 4-5 to activate function 'EK'		
Resistances		
0 to 5 K	F & H & K	4-5
0 to 50 K	F & K	
Table 2 - Jumpers 'S' and 'T' and signal ranges		

Table 2 - Jumpers 'S' and 'T' and signal ranges

Range	Jumpers 'S'	Jumper 'T'
Thermocouples		
Tc. K	E	4-5
Tc. J		
Tc. E		
Tc. N		
Tc. L		
Tc. R	E & J	
Tc. S		
Tc. T		
Tc. C	E	
Tc. B	E & J	
Pt and Ni probes		
Pt100 (3 wire)	F & H & J	5-6
Pt100 (2 wire)	F & H	4-5
Pt500	F	
Pt1000	F	
Ni100	F & H	
Ni200	F & H	
Ni1000	F	
NTC probes		
NTC	F & K	4-5
PTC probes		
KTY 121	F	4-5
KTY 210, 220	F & H & K	
Potentiometers		
0/100 %	A	2-3
Table 2 - Jumpers 'S' and 'T' and signal ranges		

Table 2 - Jumpers 'S' and 'T' and signal ranges

Jumpers 'T'	Active function at terminal 5
1-2	Vexc (excitation voltage +15 Vdc) for process
2-3	Potentiometer excitation (+5 Vdc)
4-5	External control ('EK' function)
5-6	Pt100 third wire

Table 3 - Jumpers 'T' and function at multifunction terminal 5

1.10 Measuring AC voltages and AC currents



• AC signal ranges

The instrument accepts the measure of AC voltages and currents, with ranges from 60 mVac up to 600 Vac, covering from shunt signals to typical power line voltages of 48 Vac, 115 Vac, 230 Vac and even 380 Vac. Both phase-to-neutral and phase-to-phase measures are accepted. AC currents signals of up to 5 Aac are accepted, and it has a range of 20 mAac.

• 'True RMS' measure

AC measure are TrueRMS. The instrument assigns a 'dead band' around 0, with a configurable value between 0 and 100. Value is empirical, and by default is set to 20. The 'dead band' can be configured at the 'Configuration menu' (see section 1.29.8).

• Scaling

The instrument allows to scale the reading to 4 digits (9999 / -1999) with configurable decimal point to any position.

• Maximum oversignal

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

• Response times

The response time to a signal step is 300 mSeconds, independent of the signal range selected.

• Terminal 5 'multifunction' - External control

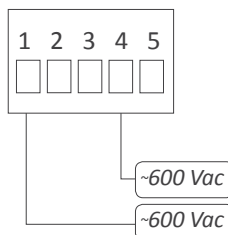
Terminal 5 remains configured as 'EK' external control function. See section 1.9 for a list of available functions.

• Start-up, connections and jumpers

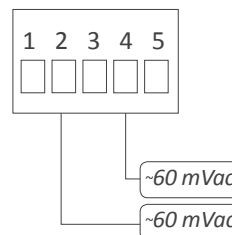
For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below a list of typical connections :

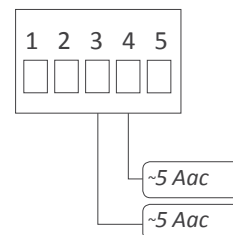
- 600 Vac
- 200 Vac



- 20 Vac to 60 mVac
- 20 mAac



- 5 Aac



Applications

... with shunts ...	measure of AC currents through a current shunt of 60 mV, 100 mV or 150 mV and scaled reading
... with X/5, X/1 current transformers ...	measure of AC currents through a X/5 or X/1 current transformer and scaled reading
... direct measure ...	direct measure of currents up to 5 Aac
... with power line voltages ...	measure of voltages over power lines phase and neutral, of 230 Vac, 115 Vac, ...
... with power voltages ...	measure of phase to phase lines on power lines 380 Vac, 230 Vac, ...
... with AC voltages	measure of AC voltages in panels using 24 Vac, 48 Vac, ...

Table 6 - Applications with measure of AC signals

Vac ranges (Veff.)	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% FS)	Max. oversignal	Connection (terminals)	Z _{in}
~600 Vac*	600	from 9999 to -1999	G & I	4-5	<0.30 % (up to 150 Hz)	800 Vac	1(-) 4(-)	12 MOhm
~200 Vac	200.0		I			800 Vac		12 MOhm
~20 Vac	20.00		A & I			150 Vac	2(-) 4(-)	1 MOhm
~2 Vac	2.000		B & I			100 Vac		100 KOhm
~200 mVac	200.0		C & I			30 Vac		10 KOhm
~60 mVac	60.0		E & I			3 Vac		1 MOhm

Table 4 - Measuring ranges in Vac. *See section 1.32 for category of measure.

Aac ranges (Veff.)	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% FS)	Max. oversignal	Connection (terminals)	Z _{in}
~5 Aac	5.00	from 9999 to -1999	I	4-5	<0.50 % (up to 150 Hz)	7 Aac (max. 7 sec.)	3(-) 4(-)	20mOhm
~20 mAac	20.00		D & I			25 mAac	2(-) 4(-)	4.7 Ohm

Table 5 - Measuring ranges in Aac

1.11 Measuring DC voltages and DC currents



• Measuring DC signal ranges

The instrument accepts the measure of DC voltages and currents, with ranges from 60 mVdc up to 600 Vdc, covering applications with current shunts, tachometric dynamos, batteries, process, etc. DC currents signals of up to 5 Adc are accepted, and it has a range of 20 mAdc.

• Bipolar ranges

All signal ranges are bipolar, and the instrument can measure both the positive and the negative signal.

• Scaling

The instrument allows to scale the reading to 4 digits (9999 / -1999) with configurable decimal point to any position.

• Maximum oversignal

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

• Response times

The response time to a signal step is 300 mSeconds, independent of the signal range selected.

• Terminal 5 'multifunction' - External control

Terminal 5 remains configured as 'EK' external control function. See section 1.9 for a list of available functions.

• Start-up, connections and jumpers

For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

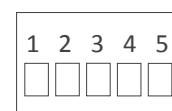
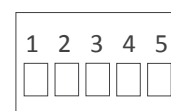
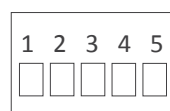
See below a list of typical connections :

• ± 600 Vdc

• ± 200 Vdc

• ± 20 Vdc to ± 60 mVdc • ± 5 Adc

• ± 20 mAdc



Applications

... with shunts ...	measure of DC currents through a current shunt of 60 mV, 100 mV or 150 mV and scaled reading
... direct measure ...	direct measure of currents up to 5 Adc and voltages up to 600 Vdc
... with batteries ...	measure of the battery voltage at 12 Vdc and 24 Vdc
... with tachometric dynamos ...	read the speed in RPM from a tachometric dynamo voltage signal
... with speed variators ...	measure the voltage signal from the variator, proportional to the RPM speed of the motor

Table 9 - Applications with DC signals

Vdc ranges	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% FS)	Max. oversignal	Connection (terminals)	Z _{in}
± 600 Vdc	600	from 9999 to -1999	G	4-5	<0.20 %	800 Vdc	1(+) 4(-)	12 MOhm
± 200 Vdc	200.0		- - -			800 Vdc		12 MOhm
± 20 Vdc	20.00		A			150 Vdc	2(+) 4(-)	1 MOhm
± 2 Vdc	2.000		B			100 Vdc		100 KOhm
± 200 mVdc	200.0		C			30 Vdc		10 KOhm
± 60 mVdc	60.0		E		<0.25 %	3 Vdc		1 MOhm

Table 7 - Measuring ranges in Vdc

Adc ranges	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% FS)	Max. oversignal	Connection (terminals)	Z _{in}
± 5 Adc	± 5.00	from 9999 to -1999	- - -	4-5	<0.25 %	7 Aac (max. 7 sec.)	3(+) 4(-)	20mOhm
± 20 mAdc	± 20.00		D		<0.15 %	25 mAdc	2(+) 4(-)	4.7 Ohm

Table 8 - Measuring ranges in Adc

1.12 Measuring thermocouples



- **Thermocouples accepted**

The instrument accepts direct connection of thermocouples type K, J, E, N, L, R, S, B, T and C.

- **Temperature ranges and total error**

Temperature ranges and total error for each type of thermocouple are indicated on 'Table 10' below.

- **Cold junction compensation**

The thermocouple cold junction is automatically compensated by the instrument. The automatic compensation can be disabled from the configuration menu.

- **Resolution and units**

The instrument resolution when measuring thermocouples is 1°. Reading can be configured in °C (degrees Celsius) or °F (degrees Fahrenheit).

- **Sensor break detection**

In case of sensor break, the instrument will show 'h.ovr' or 'h.udr' (see Table 19) depending on the broken cable.

- **Compensated cable**

To correctly measure a thermocouple signal, always use compensated cable, of the thermocouple used, to connect the instrument and the thermocouple.

- **Response times**

The response time to a signal step is 300 mSeconds, independent of the signal range selected.

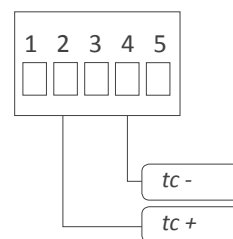
- **Terminal 5 'multifunction' - External control**

Terminal 5 remains configured as 'EK' external control function. See section 1.9 for a list of available functions.

- **Start-up, connections and jumpers**

For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below connections for thermocouple :



Thermocouple	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Range in °C (in °F)	Connection (terminals)	Total error (cold junction included)
Thermocouple K	E	4-5	-100 / 1350 °C (-148 / 2462 °F)	2 (tc +) 4 (tc -)	<3 °C
Thermocouple J			-100 / 1200 °C (-148 / 2192 °F)		
Thermocouple E			-100 / 1000 °C (-148 / 1832 °F)		
Thermocouple N			-100 / 1300 °C (-148 / 2372 °F)		
Thermocouple L			-100 / 900 °C (-148 / 1652 °F)		
Thermocouple R	E & J		0 / 1768 °C (32 / 3214 °F)		<5 °C
Thermocouple S			0 / 1768 °C (32 / 3214 °F)		
Thermocouple T			-100 / 400 °C (-148 / 752 °F)		
Thermocouple C	E		0 / 2300 °C (32 / 4172 °F)		
Thermocouple B	E & J		700 / 1820 °C (1292 / 3308 °F)		

Table 10 - Temperature ranges for thermocouples

1.13 Measuring with Pt and Ni probes



• Accepted Pt and Ni probes

The instrument accepts connection of Pt100, Pt500 and Pt1000 temperature probes, and also Ni100, Ni200 and Ni1000 temperature probes. Temperature ranges for each type of probe are indicated on 'Table 11' below.

• Pt100 with 2 and 3 wires

The instrument accepts connection for 2 and 3 wire Pt100 probes. For 3 wire Pt100 probes, configure internal jumper 'T' at position 5-6 (see section 1.9). For 2 wire Pt100 probes, configure internal jumper 'T' at position 4-5. Compensation of the wire resistance for 2 wire probes can be manually configured with the parameter 'Offset reading' ('oFFS') (see section 1.22) which allows to configure a fixed number of counts to be added to the reading.

• Resolution and units

The temperature resolution using Pt and Ni temperature probes is configurable to 1° or 0.1°. Reading can be configured in °C (degrees Celsius) or °F (degrees Fahrenheit).

• Sensor break detection

In case of sensor break, the instrument will show 'h.ovr' or 'h.udr' (see Table 19) depending on the broken cable.

• Alpha temperature coefficient

The instrument accepts Pt probes (Pt100, Pt500, Pt1000) with 'Alpha' parameter of '0.0385' and '0.0390' (see section 1.29.8). This parameter is associated to the specific model of probe installed.

• Terminal 5 'multifunction' - 'Pt100 3 wire' or 'External control'

To configure for 3 wire Pt100 probes, set internal jumper 'T' at position 5-6 (see section 1.9). Terminal 5 will be assigned to the connection of the third wire of the Pt100 probe, for automatic wire resistance compensation purposes, up to 30 Ohms.

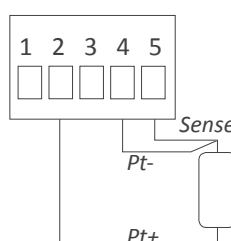
To configure for 2 wire Pt100 probes, set internal jumper 'T' at position 4-5 (see section 1.9). Terminal 5 will be configured as 'EK' external control function. See section 1.9 for a list of available functions.

• Start-up, connections and jumpers

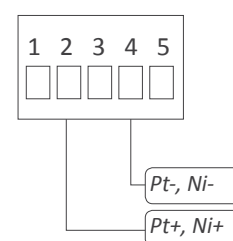
For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below a list of typical connections :

• Pt100 3 wires



• other probes 2 wires



Sensor	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Range in °C (in °F)	Total error	Connection (terminals)	Current at sensor
Pt100 3 wires	F & H & J	5-6	-200 / 700 °C (-328 / 1292 °F)	<1°C	2 (Pt+) 4 (Pt -) 5 (sense)	< 900 uA
Pt100 2 wires	F & H	4-5	-200 / 700 °C (-328 / 1292 °F)		2 (Pt+, Ni+) 4 (Pt -, Ni-)	< 900 uA
Pt500	F		-150 / 630 °C (-238 / 1166 °F)			
Pt1000	F		-190 / 630 °C (-310 / 1166 °F)			
Ni100	F & H		-60 / 180 °C (-76 / 356 °F)			
Ni200	F & H		-60 / 120 °C (-76 / 248 °F)			
Ni1000	F		-60 / 180 °C (-76 / 356 °F)			

Table 11 - Ranges of temperature for Pt and Ni probes

1.14 Measuring with NTC probes



Accepted NTC probes

The NTC probe is a temperature variable resistor with a temperature - resistance curve defined by two parameters called 'R25' and 'beta'. By default, the instrument is configured for a standard NTC with 'R25' of 10K and 'beta' of 3500. The measured temperature ranges from -60 °C to 150 °C.

Different NTC probes can be used, by configuring the instrument for different values of 'R25' and 'beta'. The instrument measures resistance from 100 Ohm up to 1 MOhm. Use 'Table 12' to write down values for your NTC.

Parameters 'R25' and 'Beta'

The instrument accepts values of 'beta' between 2500 and 5500, and values of R25 between 1.0 KOhm and 200.0 KOhm.

Resolution and units

The temperature resolution using NTC temperature probes is configurable to 1° or 0.1°. Reading can be configured in °C (degrees Celsius) or °F (degrees Fahrenheit).

Sensor break detection

In case of sensor break, the instrument will show 'h.ovr' or 'h.udr' (see Table 19) depending on the broken cable.

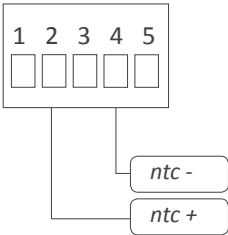
Terminal 5 'multifunction' - External control

Terminal 5 remains configured as 'EK' external control function. See section 1.9 for a list of available functions.

Start-up, connections and jumpers

For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below connections for NTC probe :



NTC 'R25'*	Jumper 'S'	Jumper 'T'	Range	Accuracy	Connection	Beta*
(configurable)	(see section 1.9)	(see section 1.9)	of measure	(% of reading)	(terminals)	(configurable)
10K	F & K	4-5	from -60 °C to 150 °C	<1.5% of reading	2 (NTC +) 4 (NTC -)	3500

Table 13 - *'Beta' is configurable from 2000 to 5500. 'R25' is configurable from 1.0 KOhm up to 200.0 KOhm.

Range of measure	NTC probe		
	Temp.	R25	Beta
100 Ohm			
1 MOhm			

Table 12 - Data from NTC datasheet

1.15 Measuring with PTC probes



Accepted PTC probes

The instrument accepts direct connection of PTC probes. Accepted PTC probes are listed at 'Table 14'.

Resolution and units

The temperature resolution using PTC temperature probes is configurable to 1° or 0.1°. Reading can be configured in °C (degrees Celsius) or °F (degrees Fahrenheit).

Sensor break detection

In case of sensor break, the instrument will show 'h.ovr' or 'h.udr' (see Table 19) depending on the broken cable.

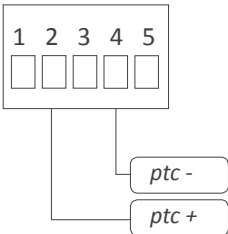
Terminal 5 'multifunction' - External control

Terminal 5 remains configured as 'EK' external control function. See section 1.9 for a list of available functions.

Start-up, connections and jumpers

For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below connections for PTC probe :



Family	Sensor	Jumper 'S'	Jumper 'T'	Range in °C	Total error
		(see section 1.9)	(see section 1.9)	(in °F)	
KTY 121	KTY81-121 KTY82-121	F	4-5	-55 / 150 °C (-67 / 302 °F)	<1°C
KTY 210	KTY81-210 KTY82-210	F & H & K			
KTY 220	KTY81-220 KTY82-220	F & H & K			

Table 14 - Ranges of temperature for PTC probes

1.16 Process measures



• Measuring process signals

The instrument accepts the measure of process signals in 4/20 mA and 0/10 Vdc. The instrument provides excitation voltage to power up transducers.

• Scaling

The instrument allows to scale the reading to 4 digits (9999 / -1999) with configurable decimal point to any position.

• Maximum oversignal

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

• Response times

The response time to a signal step is 300 mSeconds, independent of the signal range selected.

• Terminal 5 'multifunction' - 'Vexc' or 'External control'

To configure the +15 Vdc excitation voltage at terminal 5, set internal jumper 'T' at position 1-2 (see section 1.9). Transducers with a consumption of up to 30 mA can be powered from this terminal.

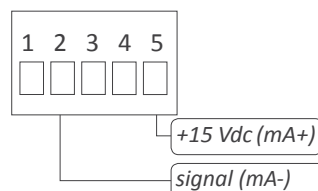
To configure the 'EK' external contact function at terminal 5, set internal jumper 'T' at position 4-5 (see section 1.9). See section 1.9 for a list of available functions.

• Start-up, connections and jumpers

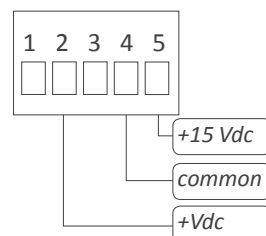
For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below a list of typical connections :

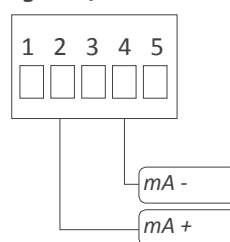
• signal 4/20 mA passive



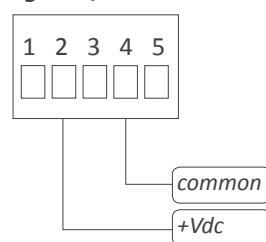
• signal 0/10 Vdc passive



• signal 4/20 mA active



• signal 0/10 Vdc active



Ranges of measure	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% FS)	Max. oversignal	Connection (terminals)	Z _{in}
4/20 mA	passive (needs Vexc.)	0/100.0	D	1-2	<0.15 %	25 mA	2 (signal)	4.7 Ohm
	active			4-5			5 (Vexc)	
0/10 Vdc	passive (needs Vexc.)		A	1-2	<0.20 %	25 Vdc	2 (mA+)	
	active			4-5			4 (mA-)	
							2 (+Vdc)	1 MOhm
							4 (comm.)	
							5 (Vexc)	
							2 (+Vdc)	
							4 (comm.)	

Table 15 - Ranges of measure for process signals

1.17 Measuring frequency



• How the instrument measures frequency

The instrument measures frequency from an AC voltage (Vac) or AC current (Aac) signal. The instrument detects each '0' crossing of the signal, either '0Vac' or '0Aac'. All available Vac and Aac signal ranges are accepted as frequency input signal.

• How to configure the instrument to measure frequency

To measure frequency from a Vac signal, select the internal jumpers for the desired AC voltage range (see section 1.9), connect the signal for the selected voltage range (see section 1.10), and configure the instrument to measure frequency (see section 1.29.1). The same applies to

measure frequency from Aac signals. See example at section below.

• Scaling

The default resolution is 0.1 Hz. The instrument allows to scale the reading to 4 digits (9999 / -1999) with configurable decimal point to any position.

• Maximum and minimum signal

Frequency signals below 15 Hz are measured as '0'. Frequency signals higher than 100 Hz are out of accuracy. Signals higher than 1000 Hz will read 'display overflow' 'd.oVr' error.

• Example

To measure the 50Hz frequency from a 230Vac power line, select jumpers 'GI' for 600Vac signal range (see section 1.9), connect signal to terminals '1' and '4' (see section 1.10), and configure 'frequency' at the input signal configuration menu (see section 1.29.1).

Ranges of measure	Scale by default	Scalable	AC signal (see section 1.9)	Jumper 'T' (see section 1.9)	Response time	Accuracy (% reading)
15 Hz to 100 Hz	0/100.0	from 9999 to -1999	select Vac or Aac range	4-5	70mSec.	<0.15% of reading

Table 16 - Ranges of measure for frequency

1.18 Measuring resistances



• Measuring resistive signals

The instrument accepts the measure of resistances and provides two ranges of measure from 0 to 5 KOhm and from 0 to 50 KOhm.

• Compensating the resistance of the signal wire

Resistances are measured with 2 wires system. To compensate for the possible error introduced by the resistance of the signal wires, the instrument allows to configure a fixed number of counts to be added to the reading, both in positive or negative. This is done with the parameter 'Offset reading' ('oFFS') (see section 1.22).

• Scaling

The instrument allows to scale the reading to 4 digits (9999 / -1999) with configurable decimal point to any position.

• Response times

The response time to a signal step is 300 mSeconds, independent of the signal range selected.

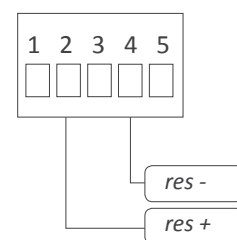
• Terminal 5 'multifunction' - External control

Terminal 5 remains configured as 'EK' external control function. See section 1.9 for a list of available functions.

• Start-up, connections and jumpers

For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below connections for resistance measures :



Ranges of measure	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% of reading)
0 to 5 KOhm	5.000	from 9999 to -1999	F & H & K	4-5	<1.5% of reading
0 to 50 KOhm	50.00		F & K		

Table 17 - Ranges of measure for resistances

1.19 Measuring potentiometers



• Measuring potentiometers

The instrument accepts the measure of 3 wire potentiometers, with a single default range of 0/100 % of the potentiometer span.

• Scaling

The instrument allows to scale the reading to 4 digits (9999 / -1999) with configurable .

• Response times

The response time to a signal step is 300 mSeconds, independent of the signal range selected.

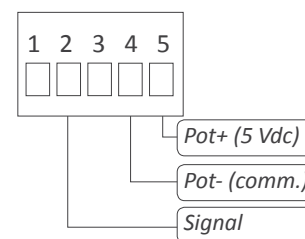
• Terminal 5 'multifunction' - 'Vexc'

To measure potentiometer signals, set internal jumper 'T' at position 2-3 (see section 1.9). Terminal 5 will be assigned to a +5 Vdc excitation voltage for the potentiometer.

• Start-up, connections and jumpers

For instrument start-up follow the steps listed at section 1.7. Signal connections are indicated at section 1.5. Location for internal jumpers is indicated at section 1.9.

See below connections for measure of potentiometers ::



Nominal pot. value	Ranges of measure	Scale by default	Scalable	Jumper 'S' (see section 1.9)	Jumper 'T' (see section 1.9)	Accuracy (% FS)
from 500 Ohm up to 20 KOhm	0 to 100 %	0/100.0	from 9999 to -1999	A	2-3	<0.5%

Table 18 - Ranges of measure for potentiometers

1.20 'Fast access' menu

The '*fast access*' menu allows to configure the front key 'UP' ('▲') as a direct access to the alarm 1, alarm 2, alarm 3 and / or alarm 4 setpoint values, and / or the memory of maximum and minimum reading. The objective is to provide the operator with a fast and direct access to alarm setpoints, without accessing the standard configuration menu.

Access to '*fast access*' menu is still allowed even with active 'password' function, allowing the operator to modify the alarm setpoints, while still blocking any other change on the configuration.

The '*fast access*' menu is configurable, and it allows to assign to the front key none, one, several or all of the available functions. In case of configuring access only to alarm 1, when pushing front key 'UP' ('▲'), the display directly access the setpoint value of alarm 1 (same for alarm 2)

To configure the '*fast access*' menu see section 1.29.5.

1.21 Scaling

The instrument can scale the reading to any value between 9999 and -1999 and configure the decimal point position, for all signal ranges except temperature ranges (thermocouples, Ni and Pt sensors, NTC and PTC sensors) are not scalable. The scaling configuration is a simplified two steps process :

1. configure at the '*Display Low*' ('d.Lo') parameter the reading value associated to the low signal range
2. configure at the '*Display High*' ('d.Hi') parameter the reading value for the high signal range

Some examples are explained below:

- for AC voltage and current ranges, for example 0/600 Vac, configure at '*d.Lo*' the reading for a signal of 0 Vac. Configure at '*d.Hi*' the reading for a signal of 600 Vac.
- for DC voltage and current ranges, for example ± 600 Vdc, configure at '*d.Lo*' the reading for a signal of 0 Vdc. Configure at '*d.Hi*' the reading for a signal of 600 Vdc.
- for process ranges, for example 4/20 mA, configure at '*d.Lo*' the reading for a signal of 4 mA. Configure at '*d.Hi*' the reading for a signal of 20 mA.
- for potentiometer ranges, configure at '*d.Lo*' the reading for a signal of 0% (0 R). Configure at '*d.Hi*' the reading for a signal of 100% (nominal of the potentiometer).

To configure the scaling see section 1.29.2.

1.22 Offset reading

The '*Offset reading*' ('oFFS') parameter allows a number of counts to be subtracted from the reading. This is specially useful to manually compensate for resistance errors due to wire resistance, when measuring with 2 wires Ni and Pt probes, and resistances. Applies to all signal ranges. See configuration menu at '*Tools*' \ '*oFFS*' (see section 1.29.8).

1.23 'Eco' mode

The '*Eco*' mode reduces the consumption of the instrument to a level of 0.3 W. The '*Eco*' mode turns off the display, while the right decimal point remains flashing gently on and off, showing that the instrument is running on the background.

Display will turn on when an alarm activates, or when the operator touches any of the front keys. If no alarms are active, and there is no interaction from the operator, the instrument will turn off the display. The waiting time before display turn off is configurable from 5 to 255 seconds.

To configure the '*Eco*' mode see the configuration menu at '*Tools*' \ '*Eco*' (see section 1.29.8).

1.24 External control

The '*external control*' function allows to activate, by closing a free potential contact, one of the following configurable functions :

- 'hold' the reading
- visualize de memory of maximum (or minimum)

To configure the 'EK' external contact function, set internal jumper 'T' at position 4-5 (see section 1.9). The 'EK' external control function is not compatible with function 'Vexc' (excitation voltage), the measure of 3 wire Pt100, and the measure of potentiometers.

To assign a function to the '*external control*' see the configuration menu at '*External control*' (see section 1.29.7).

The function associated to the 'EK' external control activates when short-circuiting terminal 5 and terminal 4.

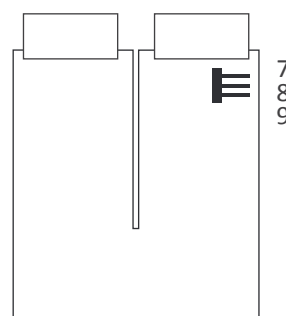


* Risk of electric shock. The 'EK' external control function shares terminal 4 with the common of the input signal connection. When measuring dangerous voltages AND using 'EK' external control contact, apply the appropriate protections to isolate the operator from dangerous voltages.

1.25 Analog output

The default analog output is configured as 'active' 4/20 mA loop (jumper '8-9' closed). To select 'passive' analog output, select internal jumper at position '7-8' at the control module :

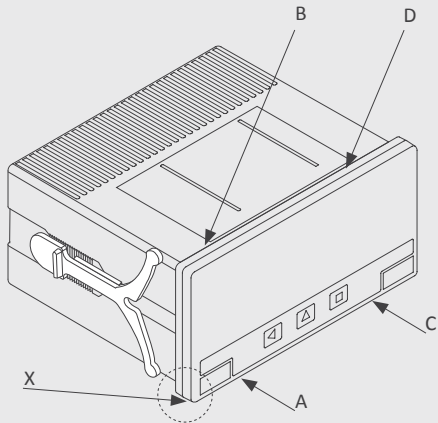
1. Open the instrument as indicated at section 1.26 and access the internal boards.
2. At the top board (the relays board) locate jumper '7 8 9'
3. By default jumper '8-9' is selected (active mA output). Select jumper '7-8' for passive output.
4. Close the instrument as indicated at section 1.26.



1.26 To open the instrument

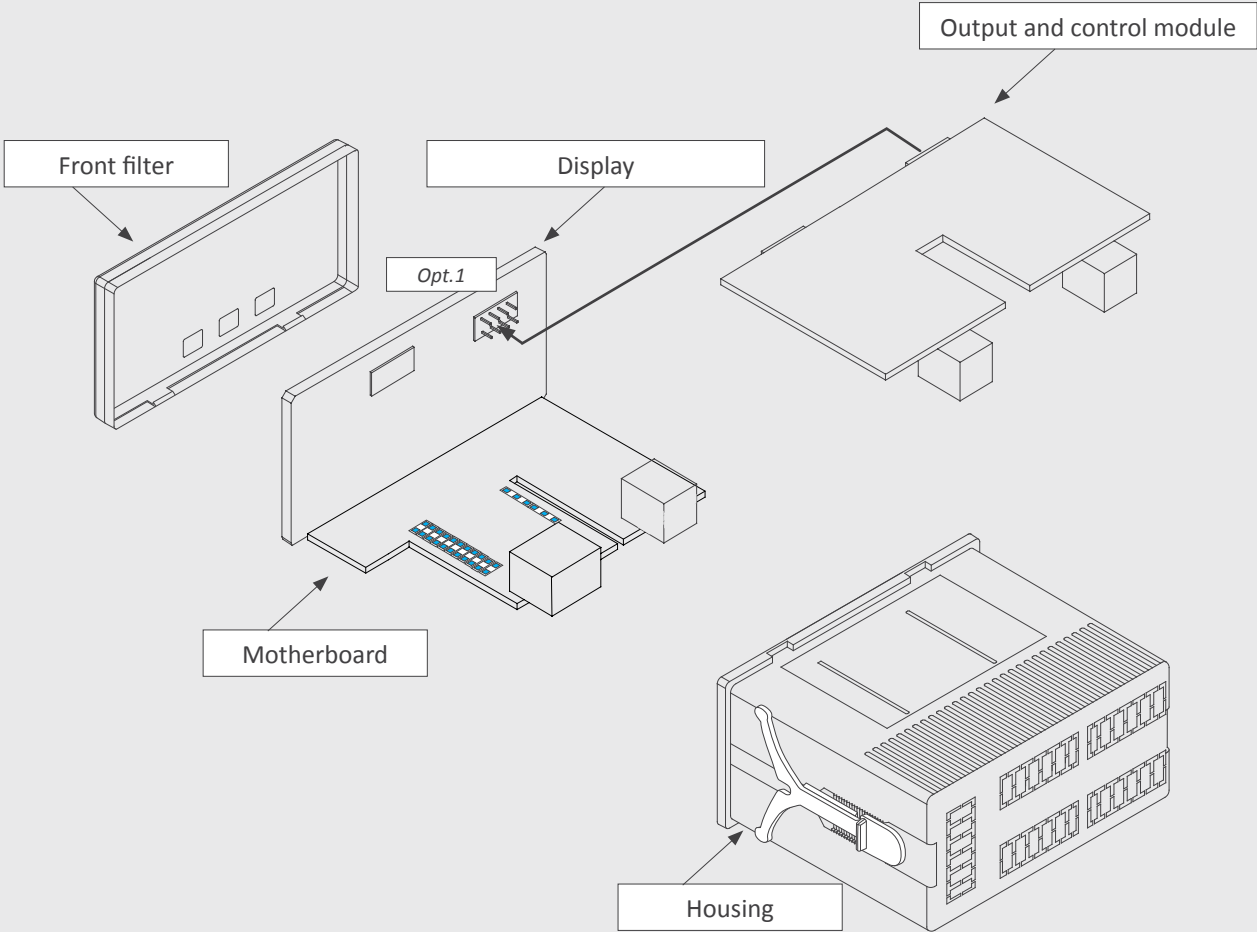
To open the housing and access the internal circuits, use a flat screwdriver to unlock clips 'D', 'C', 'B' and 'A', in this order. Remove the front filter. Let the inside of the instrument slide out of the housing.

To reinsert the instrument make sure that all modules are correctly connected to the pins on the display module. Place all the set into the housing, assuring that the modules correctly fit into the internal guiding slides of the housing. Once introduced, place again the front filter at cover 'X', and then insert clips 'A', 'B', 'C' and 'D', in this order.



** Risk of electric shock. Removing the front cover will grant access to the internal circuits. Disconnect the power and the input signal to prevent electric shock to the operator. Operation must be performed by qualified personnel only.*

The internal structure of the instrument is shown in the graphic below.



1.27 How to operate the menus

The instrument has two menus accessible to the user :

'Configuration menu' (key SQ) (■)

'Fast access' menu (key UP) (▲)

Configuration menu

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

For a detailed explanation on the 'configuration menu' see section 1.30, and for a full view of the 'configuration menu' structure see section 1.30.

'Fast access' menu

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

See section 1.20 for a list of functions eligible for 'fast access' in this instrument. The 'Password' ('PASS') function does not block access to this menu. Accessing and modifying parameters in the 'fast access' menu does not interfere with the normal functionality of the instrument, and it does not generate any system reset when validating the changes.

Front key pad description

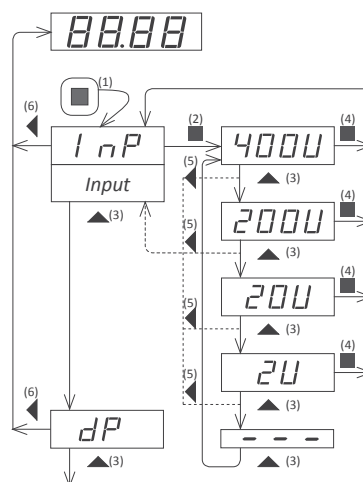
Key SQ (■) - press the SQ (■) key for 1 second to access the 'configuration menu'. Inside the menu, the SQ (■) key functions as a 'ENTER' key. It selects and accesses the menu option currently displayed. At menus with numerical value entries, it validates the number displayed.

Key UP (▲) - the UP (▲) key gives access to the 'fast access' menu. Inside the menu, it moves vertically through the different menu options. At menus with numerical value entries, it modifies the digit selected by increasing its value to 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Key LE (◀) - inside the menus, the LE (◀) key functions as the 'ESCAPE' key. It leaves the selected menu, and eventually, will leave the whole menu. When leaving the 'configuration menu' with the LE (◀) key, the changed parameters are activated. At menus with numerical value entries, the LE (◀) key allows to select the active digit. To modify the value of the selected digit use the UP (▲) key.

Menu 'rollback'

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



Note : example menu indicated above is for information purposes only, and may not match with the actual menu entries of the instrument.

Example of operation inside the 'configuration menu'.

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

1.28 Messages and errors

The error messages are shown on display in flash mode.

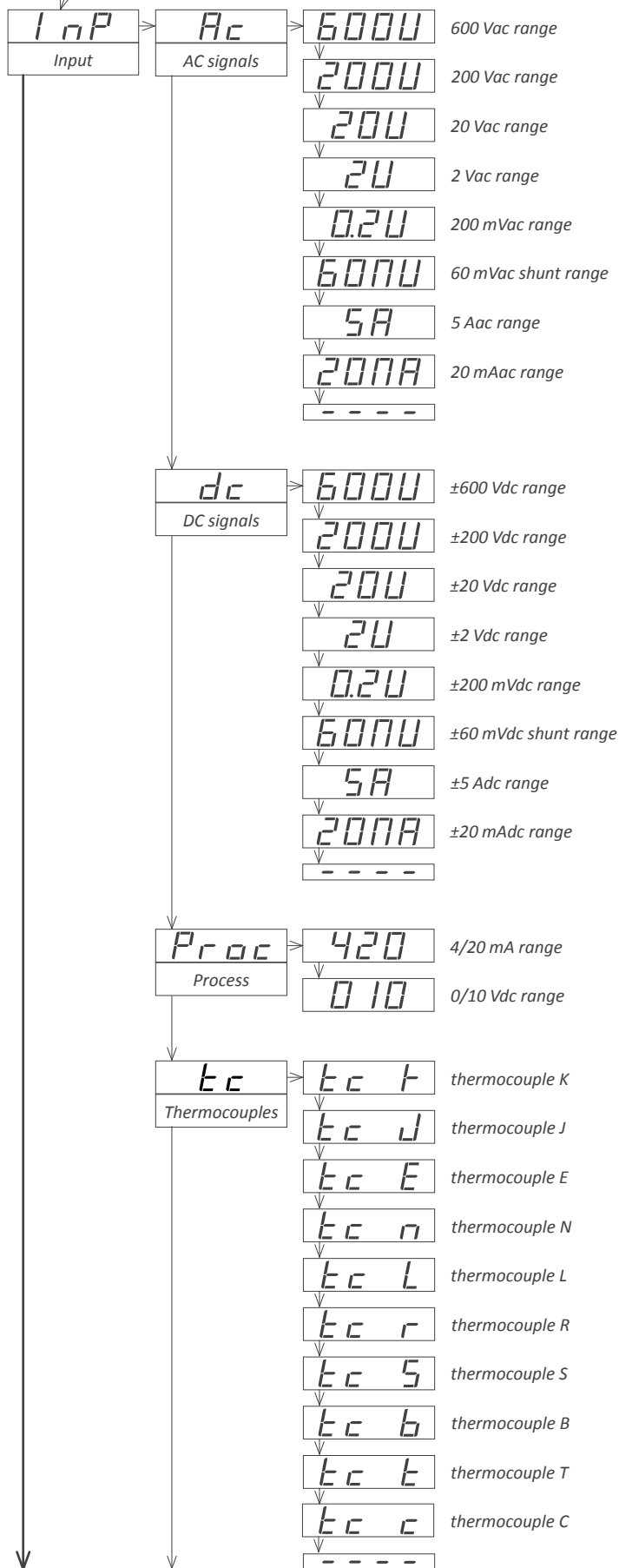
Messages and errors

'h.ldr' 'h.ovr'	Hardware underrange ('h.ldr') / overrange ('h.ovr'). Input signal is lower / higher than the minimum / maximum signal the instrument can detect.
'd.ldr' 'd.ovr'	display underrange ('d.ldr') / overrange ('d.ovr'). The instrument already displays the minimum / maximum value possible (9999 / -1999).
'Err.1'	incorrect password.
'Err.2'	segment linearization error.

Table 19 - Messages and error codes

1.29 Configuration menu

Press 'SQ' (■) for 1 second to access the 'configuration menu'. For a description on how to operate inside the menus see section 1.27. For a full vision of the 'configuration menu' structure see section 1.30.



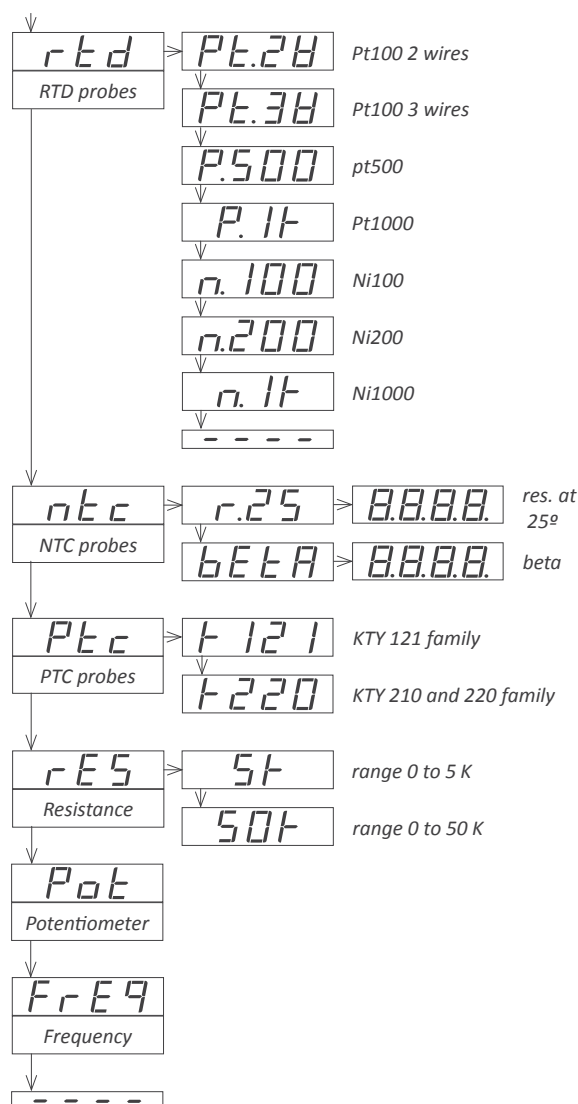
1.29.1 Input signal ranges

Access the 'Input' ('InP') menu to select the input signal range. For a correct reading, the internal jumper 'T' (see section 1.9) must also be selected accordingly.

The instrument offers the following signal ranges :

- **'AC signals' ('Ac')** - select a range between 600 Vac, 200 Vac, 20 Vac, 2 Vac, 200 mVac, 60 mVac, 5 Aac and 20 mAac. The AC measure ranges provide 'True RMS' reading.
- **'DC signals' ('dc')** - select a range between ± 600 Vdc, ± 200 Vdc, ± 20 Vdc, ± 2 Vdc, ± 200 mVdc, ± 60 mVdc, ± 5 Adc and ± 20 mAdc. Dc measures are bipolar.
- **'Process' ('Proc')** - select 4/20 mA or 0/10 Vdc. The instrument provides excitation voltage to power up transducers at terminal 5. To configure the excitation voltage, see section 1.16.
- **'Thermocouples' ('tc')** - select the thermocouple type between K, J, E, N, L, R, S, B, T and C. The instrument automatically compensates for the thermocouple cold junction.

1.28 Configuration menu (cont.)



• **'RTD probes' ('rtd')** - the 'rtd' menu offers temperature resistive probes type Pt (platinum) and Ni (Nickel). Select the type of probe from the available options Pt100 3 wire, Pt100 2 wire, Pt500, Pt1000, Ni100, Ni200 and Ni1000. For measures with 2 wires, a manual compensation for the wire resistance error is available using parameter 'Offset reading' ('oFFS') (see section 1.22).

• **'NTC probes' ('ntc')** - select the 'ntc' menu to configure the input for NTC probes. To correctly configure the measure for NTC, two parameters need to be defined : first the resistance of the NTC probe at 25° ('r.25') and parameter 'beta' ('bEtA'). The instrument accepts beta values between 2000 and 5500, and values of R25 between 1.0 K and 200.0 K. For more information on NTC measures see section 1.14.

• **'PTC probes' ('Ptc')** - select the 'ptc' menu to configure the input for PTC probes. Select K121 for PTC probes from the KTY-121 family (KTY81-121 and KTY82-121). Select K220 for PTC probes from the KTY-210 family (KTY81-210 and KTY82-210) and KTY-220 (KTY81-220 and KTY82-220). For more information on PTC probes see section 1.15.

• **'Resistance' ('rES')** - select 5 K for a measuring range from 0 to 5 KOhms or select 50 K for a measuring range of 0 to 50 KOhms. For a manual compensation for the error introduced by the signal wires, see parameter 'Offset reading' ('oFFS') (see section 1.22).

• **'Potentiometer' ('Pot')** - potentiometer measure has a single range, valid for any potentiometer with nominal value between 500 R and 20 K.

• **'Frequency' ('FrEq')** - frequency measure has no selectable ranges. The instrument reads frequency up to 100 Hz, within accuracy specifications. For more information on frequency measuring see section 1.17.

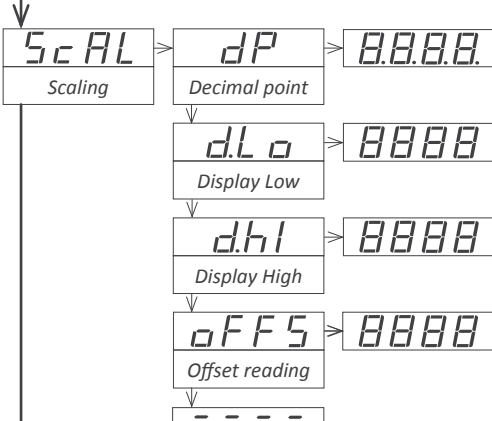
1.29.2 Scaling

Scale the reading at the 'Scaling' ('ScAL') menu. Temperature ranges (thermocouples, Pt and Ni probes, NTC and PTC probes) have direct temperature indication and are not scalable. The 'Offset reading' ('oFFS') parameter applies to all signals, including temperature.

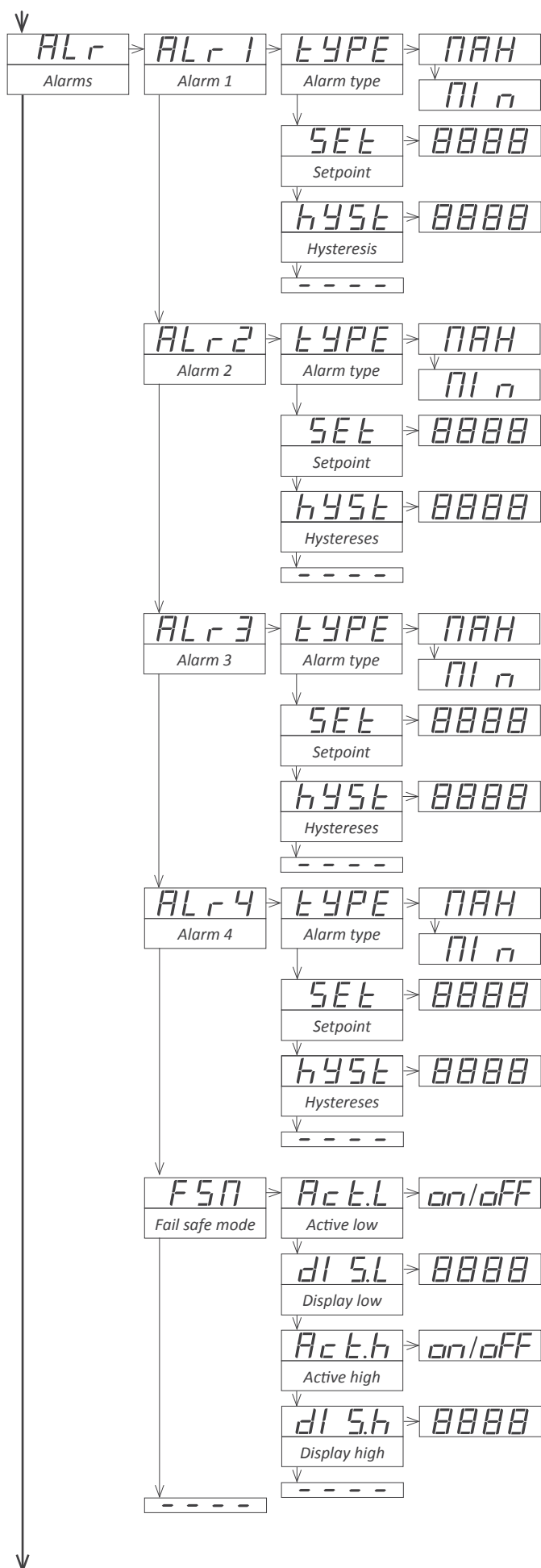
To configure the scaling, enter the 'Decimal point' ('dP') parameter and select the desired position for the decimal point, using key 'LE' (◀).

Then configure at the 'Display Low' ('d.Lo') parameter the reading value associated to the low signal range and configure at the 'Display High' ('d.HI') parameter the reading value for the high signal range. For more information see section 1.21.

the 'Offset reading' ('oFFS') parameter allows to configure a fixed number of counts to be subtracted from the reading. Accepts values from -500 to 500. This function allows to compensate for the possible error introduced by the resistance of the signal wires when measuring Pt probes, Ni probes or resistances. For more information see section 1.22



1.28 Configuration menu (cont.)



1.29.3 Alarms

The instrument has 4 independent and configurable alarms. Each alarm controls the independent activation of relays 1 to 4. Alarms control also the activation of front leds '1', '2', '3' and '4' located as indicated at section 1.2.

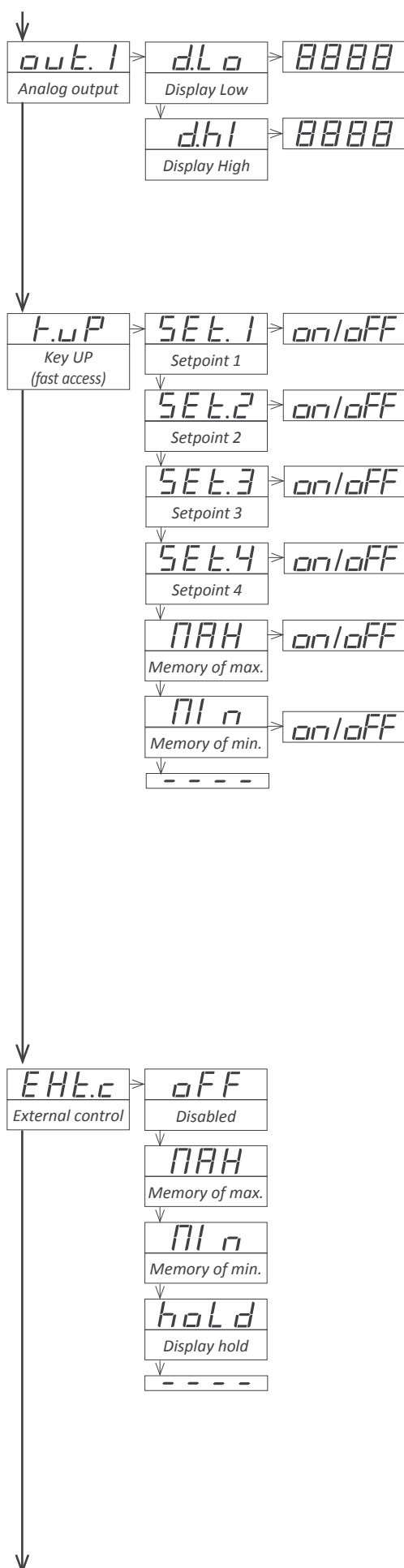
To configure the alarms, enter at the alarm menu ('ALr1', 'ALr2', 'ALr3' or 'ALr4') and configure the following parameters :

- at the '**Alarm type**' ('Type') parameter select alarm as as a maximum type alarm ('MAX') or a minimum type alarm ('MIN'). The maximum type alarm (or minimum type) activates when the display value is higher (or lower) than the setpoint value.
- at the '**Setpoint**' ('SET') parameter enter the value for the alarm activation point. This parameter is eligible for configuration through the '**Fast access**' menu (see section 1.20).
- configure the hysteresis value at '**Hysteresis**' ('hySt'). The hysteresis applies to the deactivation process of the alarm. The alarm deactivates when the reading has passed the setpoint value plus the hysteresis value. Hysteresis helps to avoid repetitive switching of the alarm relays, due to fluctuating input signals around the setpoint.

The operator can configure a 'Fail safe mode' function. The function will disable all alarms (relays and front leds) if the reading exceeds the '**Display high**' ('dIS.h') configured value, or if the reading falls below the '**Display low**' ('dIS.L') configured value.

- at the '**Active low**' ('Act.L') parameter select '**on**' to activate the 'fail safe function' for minimum reading.
- at the '**Display low**' ('dIS.L') parameter configure the minimum reading value. The 'fail safe function' will activate when the reading is below the configured value.
- at the '**Active high**' ('Act.h') parameter select '**on**' to activate the 'fail safe function' for maximum reading.
- at the '**Display high**' ('dIS.h') parameter configure the maximum reading value. The 'fail safe function' will activate when the reading exceeds the configured value.

1.28 Configuration menu (cont.)



1.29.4 Analog output configuration

At the '**Analog output**' ('**out.1**') configure the analog output signal.

- at the '**Display low**' ('**d.Lo**') parameter introduce the reading value associated to the 4 mA signal of the analog output
- at the '**Display high**' ('**d.hI**') parameter introduce the reading value associated to the 20 mA signal of the analog output

1.29.5 Fast access

The key 'UP' (▲) at the front of the instrument gives access to a list of functions configurable by the operator. See section 1.27 for an explanation on how to operate the 'fast access' menu.

The '**Key UP (Fast access)**' ('**K.uP**') menu allows to select which functions will be accessible when pressing the front key 'UP' (▲). Select '**on**' to activate each function.

- the '**Setpoint 1**' ('**Set.1**') function allows to visualize and modify the setpoint value of alarm 1.
- the '**Setpoint 2**' ('**Set.2**') function allows to visualize and modify the setpoint value of alarm 2.
- the '**Setpoint 3**' ('**Set.3**') function allows to visualize and modify the setpoint value of alarm 2.
- the '**Setpoint 4**' ('**Set.4**') function allows to visualize and modify the setpoint value of alarm 2.
- the '**Memory of maximum**' ('**MAX**') or '**Memory of minimum**' ('**Min**') allows to visualize the memory of maximum and minimum reading. The memory resets when the instrument restarts (power off-on cycle, or when leaving the configuration menu with a change to be applied).

1.29.6 Super fast access

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

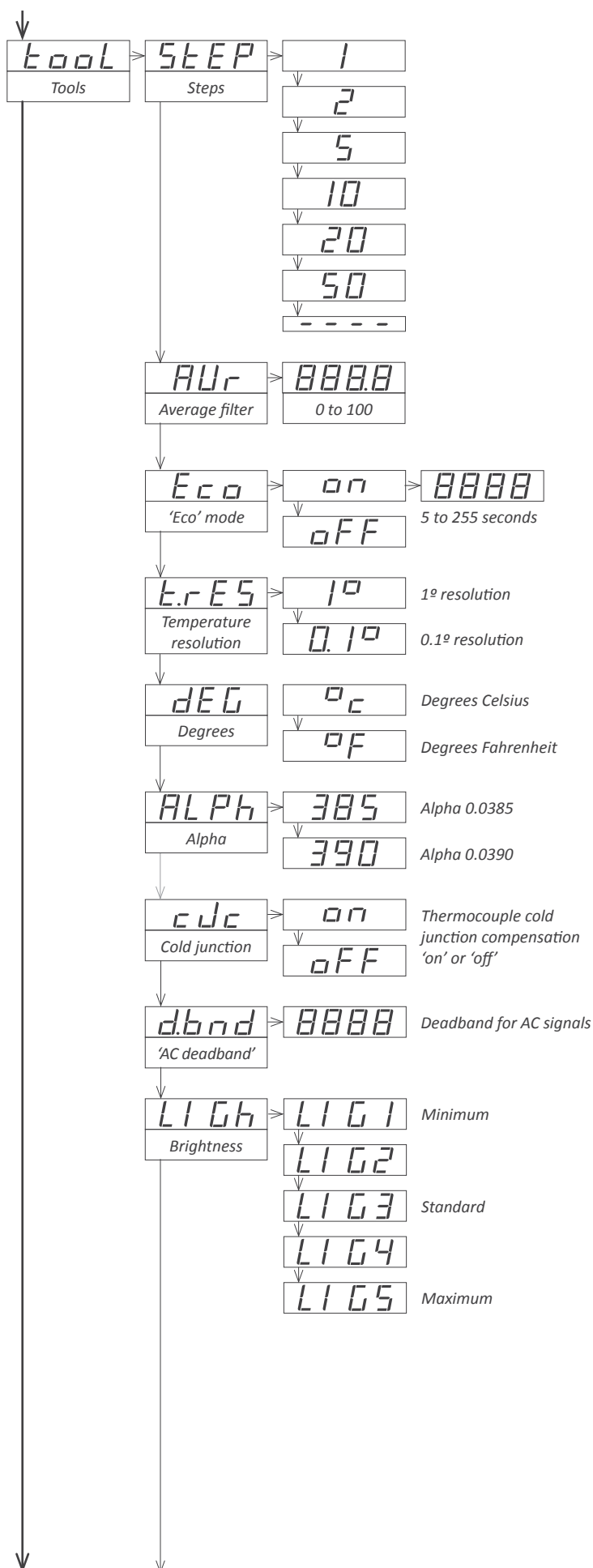
1.29.7 External control

An external on / off control can be connected to the rear of the instrument. The operator can then control the activation of a configured function based on the state of this control. Function remains activated while the external contact is closed, and will deactivate when contact is open. To configure the function associated to the external control, enter the menu '**External control**' ('**Ext.c**').

- select '**Disabled**' ('**oFF**') to have no function associated.
- select parameter '**Memory of maximum**' ('**MAX**') to visualize on display the memory of maximum reading.
- select parameter '**Memory of minimum**' ('**Min**') to visualize on display the memory of minimum reading.
- select parameter '**Display hold**' ('**hold**') to maintain the actual reading 'on hold'. Open the external contact to free the reading.

Values for this parameters will be shown in flash mode, indicating that the actual value is not the actual input value.

1.28 Configuration menu (cont.)

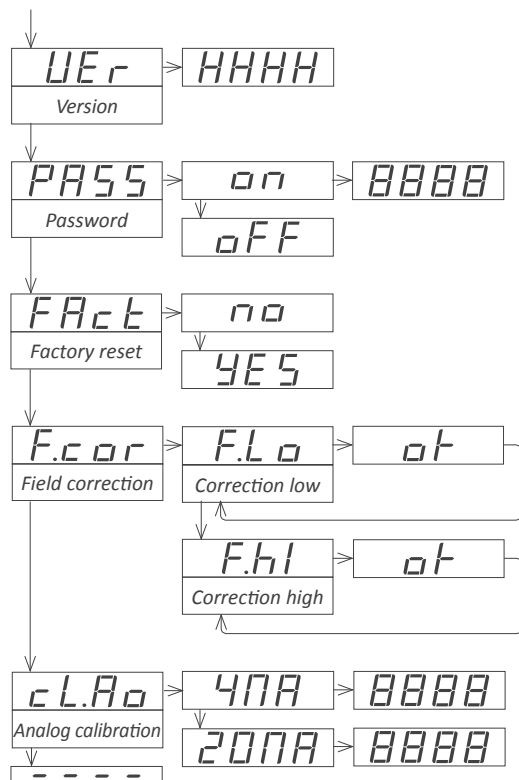


1.29.8 Menu 'Tools'

The **'Tools'** (**'tool'**) menu contains multiple configuration options of the instrument.

- the **'Steps'** (**'StEP'**) parameter allows to configure a defined minimum step change on the reading. Reading will change in steps of 1, 2, 5, 10, 20 or 50 counts.
- the **'Average filter'** (**'AVr'**) function allows to reduce reading oscillations due to noisy signals, by applying a recursive filter on the reading values. The strength of the recursive filter is a value configurable between '0' and '100'. Value '0' means 'filter disabled'. Filter strength increases with the value. Increasing the filter strength, increases the response time of the instrument.
- the **'Eco mode'** (**'Eco'**) is a function to reduce consumption of the instrument, by powering off the display when display is not needed. For consumption data in 'Eco' mode see section 1.8. For more information in 'Eco' mode see section 1.23. The operation of the 'Eco' mode is explained below :
 - the waiting time until display is powered off display is configurable from 5 to 255 seconds.
 - after the configured time is over, without interaction from the operator, the display powers off the reading. It will not power off if the instrument is into 'configuration menu' or in 'fast access' menu or there is an active alarm.
 - the instrument will power on the display when an alarm activates (either alarm 1 or 2) and will remain on if alarm remains active.
 - the instrument will power on the display if the operator press any front key.
- at the **'Temperature resolution'** (**'t.rES'**) menu select the resolution to 1° or 0.1°. This resolution applies to temperature probes Pt100, Pt500, Pt100, Ni100, Ni200, Ni1000, PTC and NTC. For thermocouple probes resolution is fixed to 1°.
- at the **'Degrees'** (**'dEG'**) menu select the temperature values to be read in °C (degrees Celsius) or in °F (degrees Fahrenheit).
- at the **'Alpha'** (**'ALPh'**) menu select the value for the alpha parameter to '0.0385' or '0.0390'. This parameter affects to Pt probes (Pt100, Pt500, Pt1000) and it depends on the probe.
- at the **'Cold junction'** (**'cJc'**) menu select 'on' to activate the thermocouple cold junction compensation. Select 'off' to deactivate.
- the **'AC deadband'** (**'d.bnd'**) parameter applies only to AC measuring ranges. The True RMS measures deal with a considerable noise when signal is near to 0. This parameter allows to set a value between 0 and 100 (by default is 20) to empirically set the signal level at which reading will be forced to 0, when signal is below that level.
- at the **'Brightness'** (**'LIGH'**) menu select between 5 levels of brightness intensity for the display. It adapts the instrument to environments with higher or lower brightness is needed or to adapt the intensity to other meters in the area.

1.28 Configuration menu (cont.)



- the 'Version' ('Ver') menu informs about the firmware version installed on the instrument.

- at the 'Password' ('PASS') menu select a 4 digit code to block access to the 'configuration menu'. Use the 'Password' function to prevent modifications on the instrument configuration. To activate the 'Password' select 'on' and enter the numerical code.

The code will be requested when trying to access the 'configuration menu'. The 'fast access' menu is not blocked by the 'Password'.

- at the 'Field correction' ('F.cor') menu modify the default signal for the input signal range selected. For example, if a range of 0/20Vdc has been selected, it can be modified to 2.3/15.8Vdc range. The input signal must be generated, so the instrument can read the signal and readjust his internal parameters.

To operate the 'Field correction' ('F.cor') generate the minimum input signal and access the 'Field low' ('F.Lo') function. Press SQ (■) and the following sequence will start:

- reading value for the actual input signal will flash
- after 5 seconds, message 'ok' ('ok') appears
- press SQ (■) to return to 'Correction low' ('F.Lo')

Repeat the process generating the maximum input signal and access the 'Field high' ('F.hi') menu. Press SQ (■) and the following sequence will start:

- reading value for the actual input signal will flash
- after 5 seconds, message 'ok' ('ok') appears
- press SQ (■) to return to 'Correction high' ('F.hi')

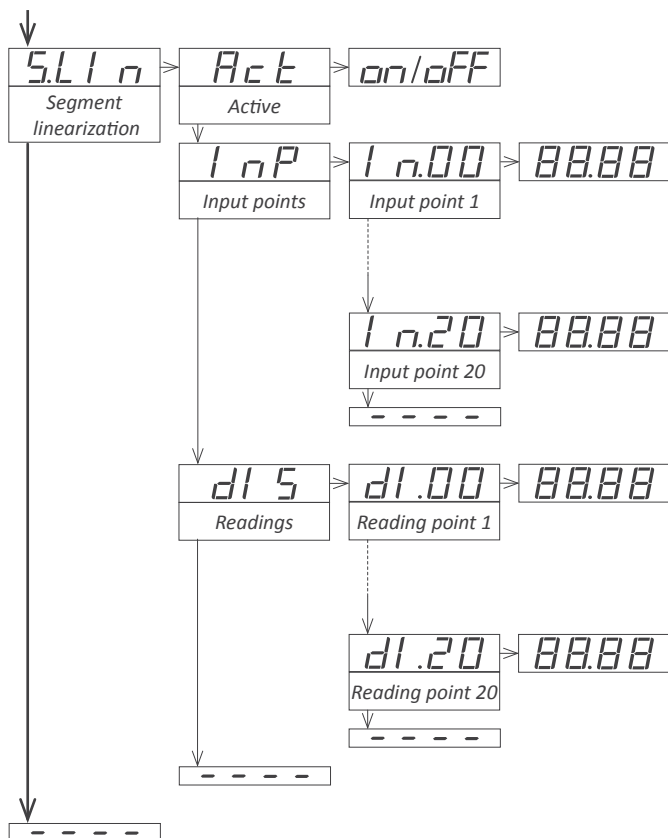
The instrument has now changed the input low and input high point of the scale. This changes can not be undone. You can either apply new corrections to high and low parameters, or do a factory reset to recover factory default configuration.

Example: a 0/40 Bar pressure transmitter provides a 4/20 mA output signal. At installation, the operator configures the instrument to read 0.00 at 4 mA and 40.00 at 20 mA. Then the operator notices that at 0 Bar, reading is 0.34 Bar and that at 40 Bar the reading is 40.72 Bar. Apply the 'Field correction' / 'F.Lo' function while reading is 0.34 Bar and the instrument will automatically correct the reading to 0.00 Bar. Afterwards, apply the 'Field correction' / 'F.Hi' function while reading is 40.72 Bar and the instrument will automatically correct the reading to 40.00 Bar. Internally, the 4/20 mA scale has been changed to 3.86 / 19.71 mA.

- At the 'Factory reset' ('Fact') menu, select 'yes' to load the default factory configuration for the instrument. See section 1.34 for a list of values at default factory configuration.

- At the 'Analog calibration' ('cL.Ao') menu, select '4mA' to force the analog output to generate 4 mA. Measure the value with a milliammeter. Press 'UP' (▲) and 'LE' (◀) to increase or decrease the mA signal. When the output is correct, press SQ (■) to validate. Select '20mA' to repeat the procedure with the 20 mA signal.

1.28 Configuration menu (cont.)



1.29.9 Segment linearization

At the 'Segment linearization' ('S.Lin') configure the linearization of the reading in 20 segments. Segment linearization is only available for process signals ranges '420' (4/20mA) and '010' (0/10Vdc). The 4/20mA range accepts linearization for 0/20mA and the 0/10Vdc range accepts linearization for 0/20Vdc.

- at the 'Active' ('Act') select 'on' to activate the segments configured in the next parameters. Select 'off' to return to standard scaling
- at the 'Input points' ('InP') define the input signal for each point. Values are with two decimal points resolution, expressed in x.xx mA or x.xx Vdc. By default, the values are 0.00 mA (or Vdc) for input point 0, 1.00 mA (or Vdc) for input point 1, ... 20.00 mA (or Vdc) for input point 20.
- at the 'Readings' ('dis') define the reading for each point. Values use the decimal point defined at the 'ScAL \ dP' parameter. By default, the values are 0 for reading point 0, 100 for reading point 1, 200 for reading point 2, ... and 2000 for reading point 20.

Precautions and limitations when validating input points :

- if the 'input point' value is higher than the previous point and lower than the next point, the point value is accepted
- if the 'input point' value is lower than the previous point, the value is not accepted and err.2 is displayed. The menu returns to the input point menu, press SQ to enter again to introduce a valid value.
- if the 'input point' value is higher than the next point, the value is accepted and next 'input point' values are automatically changed to the value of the actual 'input point'.

Precautions and limitations when validating reading points :

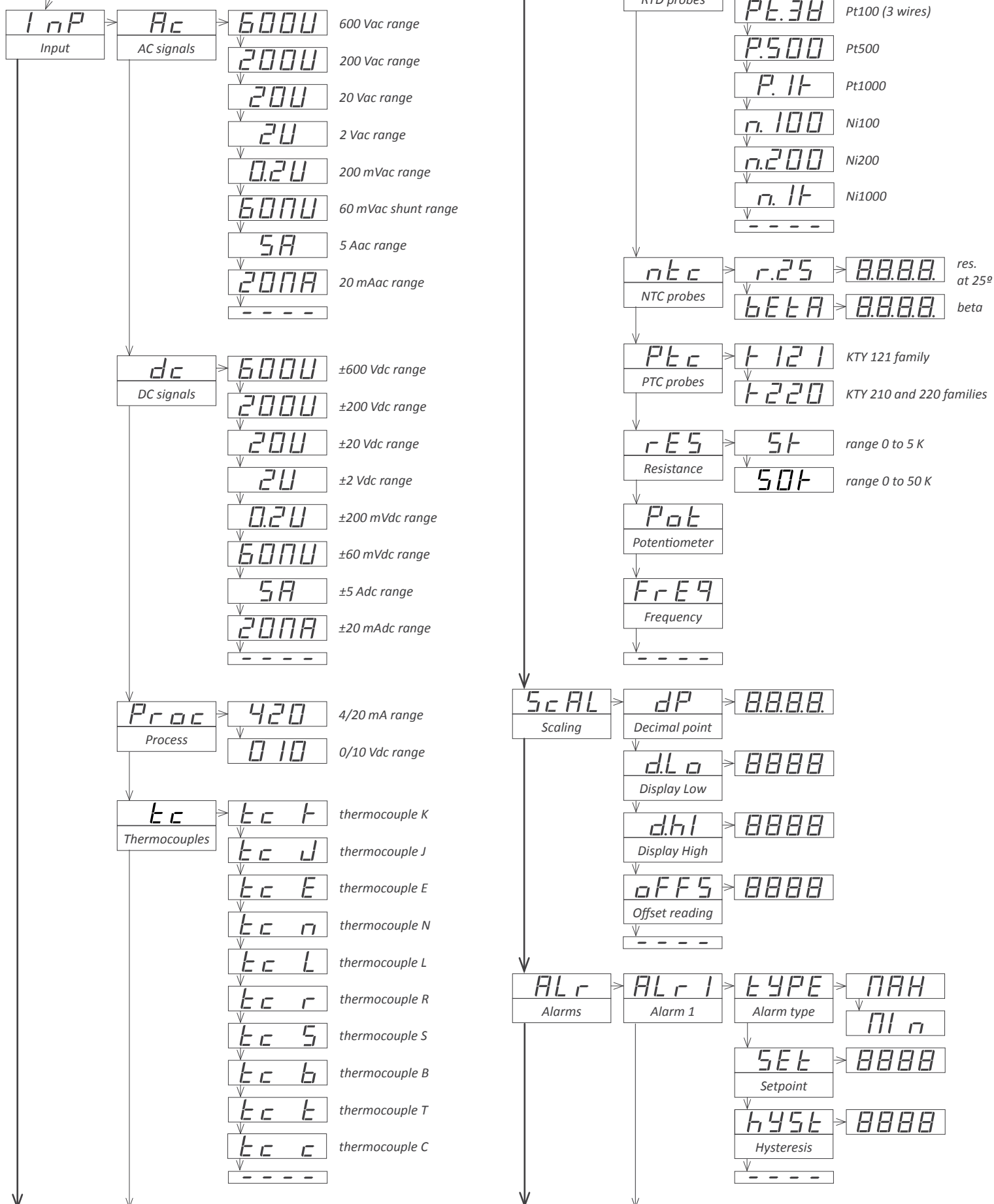
- all reading values from -1999 to 9999 are accepted
- if different 'input points' have the same value (for example, input 7 = 12 mA and input 8=12 mA) then the reading must be the same for both reading points 7 and 8. When validating input 7, err.2 is displayed. The menu returns to the reading input menu, press SQ to enter again to continue with other points or to change the value of input 8.

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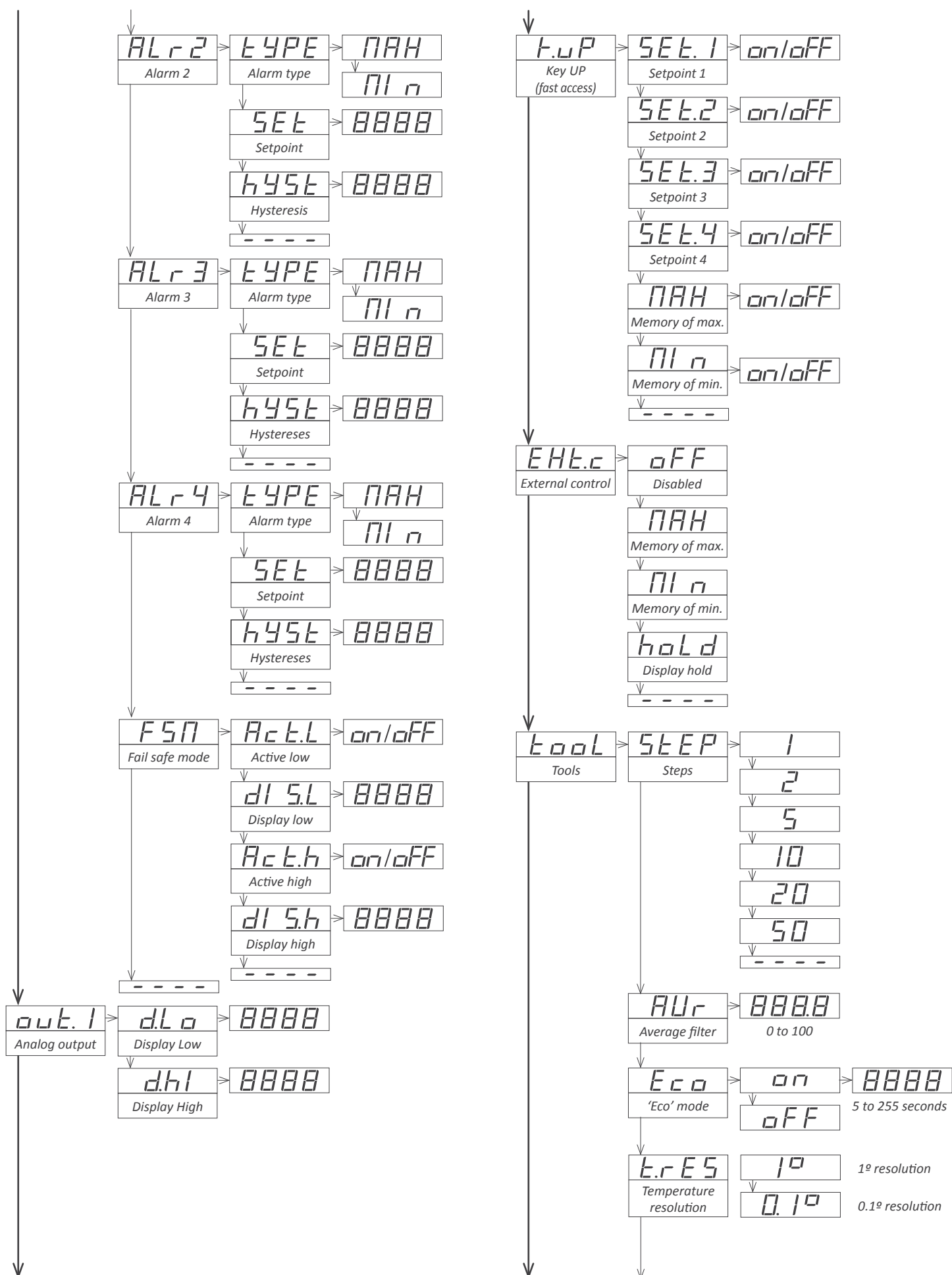
1.30 Full configuration menu



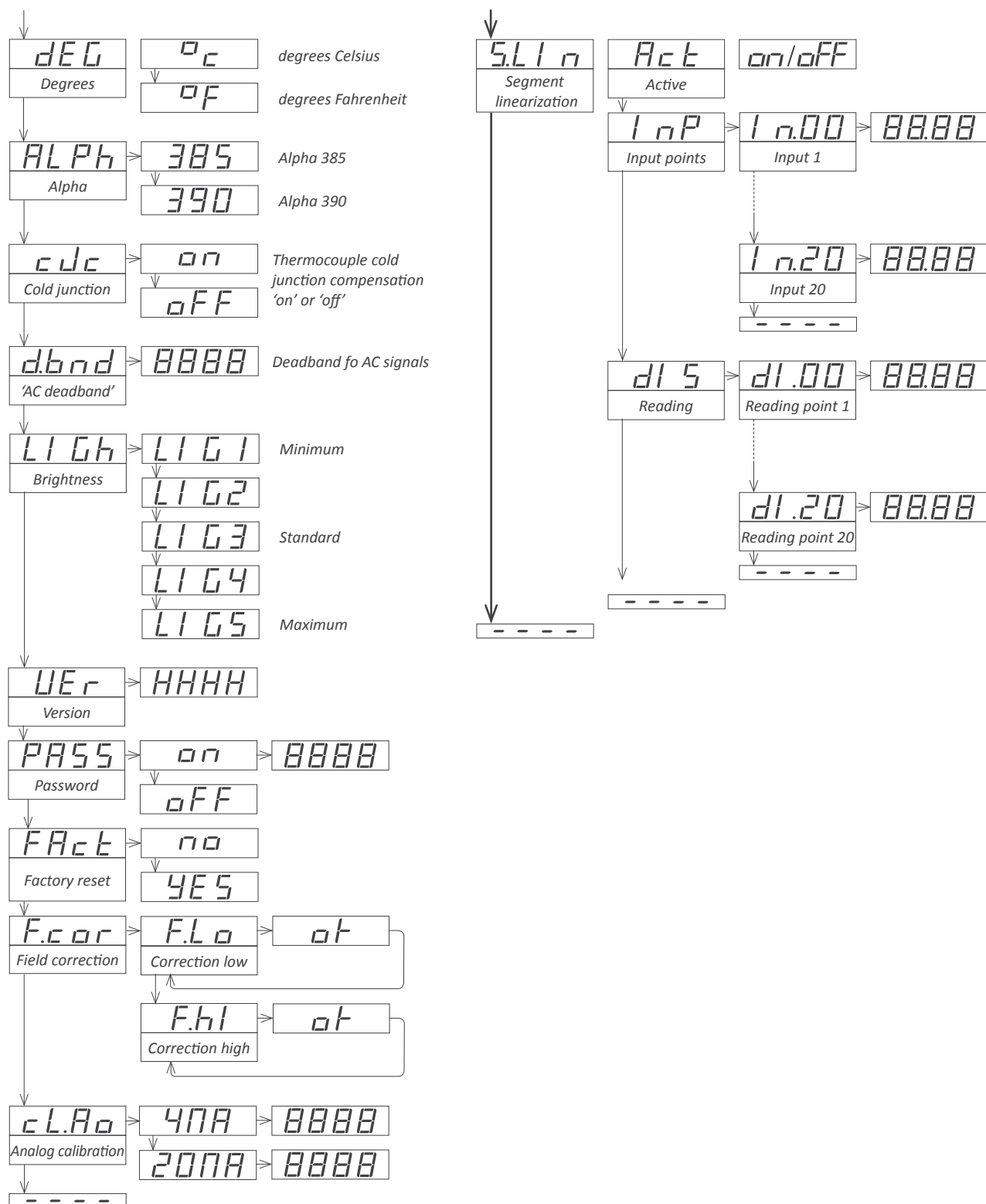
Press 'SQ' (■) for 1 second to access the 'Configuration menu'. See section 1.29 for a description of each menu entry.



1.29 Full configuration menu (cont.)



1.29 Full configuration menu (cont.)



1.31 Precautions on installation



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 power before starting any maintenance and / or installation action.

The instrument does not have a general switch and will start operation as soon as power is connected. The instrument does not have protection fuse, the fuse must be added during installation.

The instrument is designed to be panel mounted. An appropriate ventilation of the instrument must be assured. Do not expose the instrument to excess of humidity. Maintain clean by using a humid rag and do NOT use abrasive products such as alcohols, solvents, etc. General recommendations for electrical installations apply, and for proper functionality we recommend : if possible, install the instrument far from electrical noise or magnetic field generators such as power relays, electrical motors, speed variators, ... If possible, do not install along the same conduits power cables (power, motor controllers, electrovalves, ...) together with signal and/or control cables. Before proceeding to the power connection, verify that the voltage level available matches the power levels indicated in the label on the instrument. In case of fire, disconnect the instrument from the power line, fire alarm according to local rules, disconnect the air conditioning, attack fire with carbonic snow, never with water.

1.32 CE declaration of conformity

Manufacturer FEMA ELECTRÓNICA, S.A.
Altimira 14 - Pol. Ind. Santiga
E08210 - Barberà del Vallès
BARCELONA - SPAIN
www.fema.es - info@fema.es

Products EC4-ZR3

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 2011/65/EU

WEEE directive 2012/19/EU

Security rules EN-61010-1

Instrument Fixed, Permanently connected
Pollution degree 1 and 2 (without condensation)
Isolation Double
Category CAT-III up to 300V
CAT-II up to 600V (only with 'Pollution degree 1')

Electromagnetic compatibility rules EN-61326-1

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

Barberà del Vallès, May 2018
Xavier Juncà - Product Manager

1.33 Warranty

This instrument is warranted against all manufacturing defects for a period of 24 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.

Extended warranty available at www.fema.es/docs/4153_Warranty1_en.pdf

1.34 Factory configuration

Range	4/20 mAdc
Scaling and decimal point	4/20 mAdc = 0/100.0
Offset reading	0
Alarms	
Alarms 1, 2, 3 and 4	
Type	alarm as maximum
Setpoint	1000
Hysteresis	0 counts
Fail safe mode	
Active low	off
Display low	-1999
Active high	off
Display high	9999
Analog output	
Display Low	0
Display High	1000
Key UP (Fast access)	all off
Setpoint 1	on
Setpoint 2	on
Setpoint 3	on
Setpoint 4	on
Memory of maximum	off
Memory of minimum	off
External control	off
Tools	
Step	1
Average	0
'Eco' mode	off
Temperature resolution	1°
Degrees	°C
Alpha	385
cJc	on
AC deadband	20
Brightness	3
Password	off
Segment linearization	
Active	off
Inputs 1 to 20	values 0.00, 1.00, 2.00, 3.00, ..., 19.00, 20.00
Readings 1 to 20	values 0, 100, 200, 300, ..., 1900, 2000
Analog output	0/100.0=4/20 mA active (jumpers 8 & 9)
Jumpers 'S'	range for 4/20 mA (jumper D)
Jumper 'T'	Vexc (jumpers 1-2)



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

2. Other options

2.1 Option NBT

Instruments without front keypad. To configure the instrument, remove the meter from the panel and remove the front filter. Internal press buttons for configuration are accessible. Optionally, request the instrument preconfigured from factory.



Without front keypad

2.2 Option 'customized'

Instruments can be adapted to your needs :

- improved technical specifications
- custom configurations
- special functions
- ...



3. Accessories

3.1 Adapter DRA-M

Adapter for DIN rail mount, for Series C



3.4 WME wall housing

Wall mount housing. Together with the KIP protector, offers a full IP65 protection. For Series C of panel meters.



3.2 Adapter KA96

Adapter 96 x 96 mm for 96 x 48 mm instruments.



3.5 THM benchtop housing

Benchtop housing for Series C and of panel meters. Handle with three selectable positions. Power connector with manual switch and fuse holder.



3.3 Protector KIP

Removable front cover for additional mechanical and IP65 front protection.



3.6 Set of units (included)

Set of labels 'Vdc', 'Vac', 'Adc', 'Aac', 'mVdc', 'mVac', 'mAdc', 'mAac', '%', '°C', '°F', 'ph', 'm', 'cm', 'mm', 'bar', 'psi', 'Pa', 'N', 'Ω', 'KΩ', 'W', 'kW', 'MW', 'kV', 'kA', 'm/min', 'rpm', 'l'

(1 set included with each instrument)

Vdc	Vac	Adc
Aac	mVdc	mVac
mAdc	mAac	%
°C	°F	ph
m	cm	mm
bar	psi	Pa
N	Ω	kΩ
W	kW	MW
kV	kA	m/min
rpm	l	

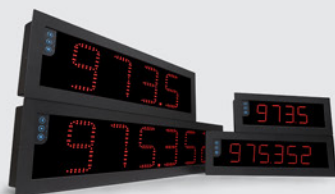
Notes

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Notes



Panel meters
Standard 96x48 mm



Large format meters



Panel meters
Compact 72x36 mm



Bar meters



Signal converters



Panel meters
Miniature 48x24 mm



Isolators



Low Cost



'Customized'
instruments

FEMA

ELECTRÓNICA

FEMA ELECTRÓNICA, S.A.

Altimira 14 - Pol. Ind. Santiga
E08210 Barberà del Vallès
BARCELONA - SPAIN

■ Tel. +34 93.729.6004
Fax +34 93.729.6003

■ info@fema.es
www.fema.es



Process



°C
°F



160°



Vac/Aac



Vdc/Adc



Hz



Modbus



RS-485



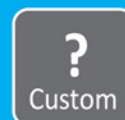
RS-232



BCD



Kg



Custom