FEMA ELECTRÓNICA

User's Manual

ELECTRONICS FOR INDUSTRIAL AUTOMATION
PANEL METERS . SIGNAL CONVERTERS . LARGE DISPLAYS

Series C . C40-A

OEM APPLICATIONS
YOUR METER !

Multisignal panel meter

PANEL METERS. OEM APPLICATIONS

Multisignal digital panel meter, accepts process signals, thermocouples, resistive temperature probes (Pt, Ni, PTC and NTC), resistances, AC and DC voltages and AC and DC currents. Configurable. Standard 96 x 48 mm size (1/8 DIN). Scalable reading with 4 digits (9999 / -1999). 'Fast access' function to alarm setpoints, 'external control' to activate predefined functions, 'Eco' mode for low consumption, selectable dual scaling, 5 levels of configurable brightness. Universal AC and DC power. Optional modules for output and control (relays, analog output, Modbus RTU). Recommended for OEM applications.

www.fema.es
Tel. (+34) 93.729.6004 info@fema.es

3987r03

1. Panel meter C40-A

Multisignal 96x48mm panel meter, for OEM applications

Multisignal digital panel meter in 96 x 48 mm size (1/8 DIN) for panel mount, for OEM applications. Accepts process signals (mA and Vdc), thermocouples (K, J, E, N, L, R, S, B, T and C) resistive temperature probes (Pt100, Pt500, Pt1000, Ni100, Ni200, Ni1000, PTC and NTC), AC voltages (from mVac up to 400 Vac), AC currents (up to 5 Aac), DC voltages (up to 400 Vdc) and DC currents (up to 5 Adc). Scalable reading with 4 digits up to 9999 / -1999 with configurable decimal point. Two independent alarms, configurable as maximum or minimum, with hysteresis and setpoint.

Optional 1 or 2 relay outputs, 4/20 mA isolated analog output, and Modbus RTU isolated serial communications.

Front protection IP50, with optional IP54 and 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.

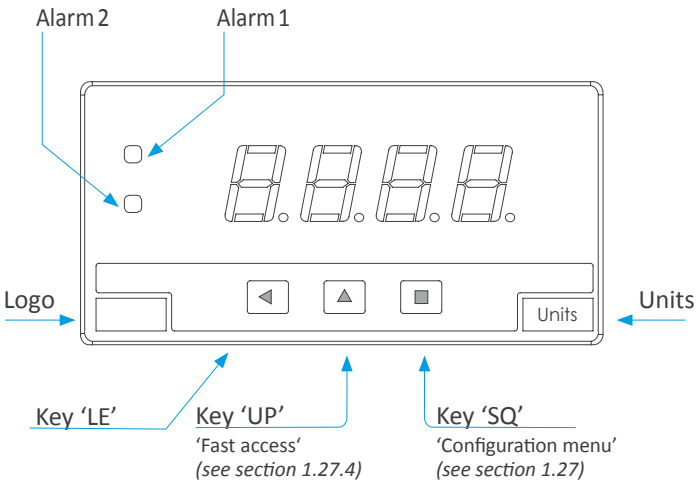
- '**Fast access**' menu at front key UP (▲) configurable for fast access to alarm setpoints *(see section 1.8).*
- '**Eco**' mode reduces power consumption *(see section 1.12).*
- Simplified scaling configuration *(see section 1.9).*
- Optional '**external control**' to activate with contact one predefined function (second scaling, decimal point, reading 'hold', memory of maximum or minimum) *(see section 1.11).*
- 5 configurable brightness levels *(see section 1.27.7).*

1.1 How to order

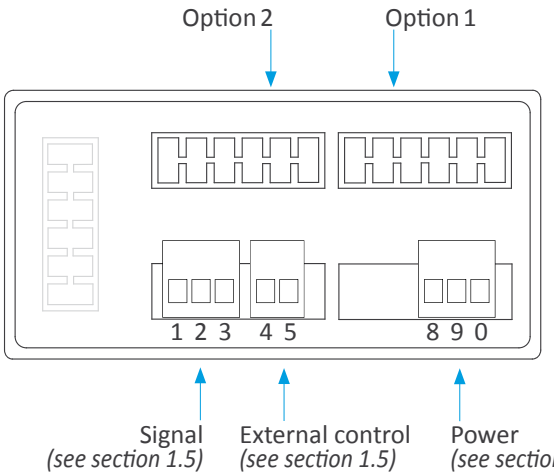
Series	Model	Power	Option 1	Option 2	Others	Customization
C40	A	H				
		-H *(85-265 Vac/dc)* -L *(11/60 Vdc, 24 Vac, 48 Vac)*	-A1 *(1 relay)* -M1 *(analog output)* -S1 *(Modbus RTU)* -(empty)	-A2 *(1 relay)* -(empty)	-EK *(external control)* -NBT *(no front keypad)* -54 *(front IP54)* -65 *(front IP65)* -(empty)	-XXXX *(customized execution)* -(empty)

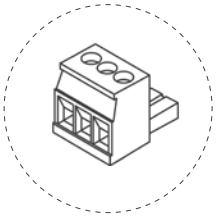
Index

1.2 Front view



1.3 Rear view

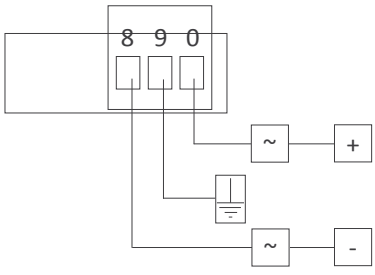




Detail of the plug-in screw terminals provided with the instrument. The instrument is provided with all terminals needed, both male and female.

1.4 Power connections

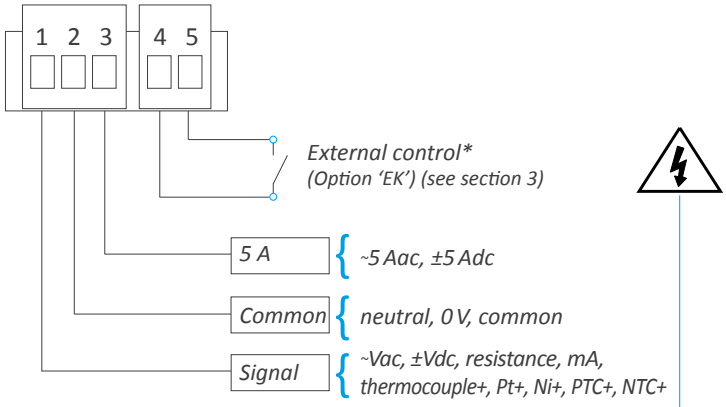
Earth connection - Although a terminal is provided for earth connection, this connection is optional. The instrument does not need earth connection for correct operation nor for compliance with the security regulations.



Fuse - To comply with security regulation 61010-1, add to the power line a protection fuse acting as disconnection element, easily accessible to the operator and identified as a protection device.

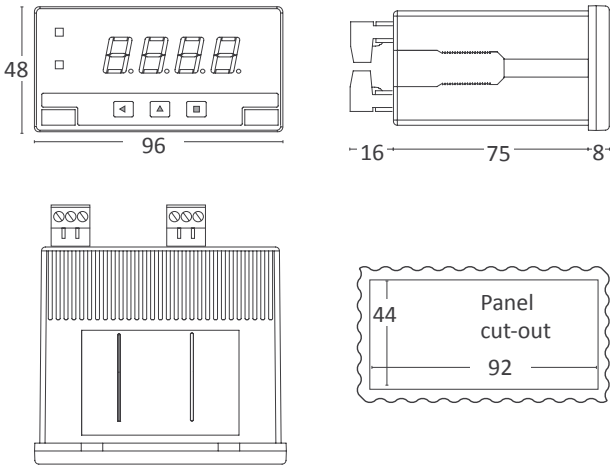
Power 'H'	fuse 250 mA time lag
Power 'L'	fuse 400 mA time lag

1.5 Signal connections



** Risk of electric shock. Input signal 'terminal 2' is internally connected to external contact 'terminal 5'. When measuring signals with dangerous voltages, apply the appropriate protections to the external contact to isolate the operator from dangerous voltages.*

1.6 Mechanical dimensions (mm)



1.7 Installation and start-up

Follow the indicated steps when installing the instrument and at first star-up :

1. Open the instrument as indicated at section *1.24* and access the internal modules.
2. Select the jumpers for the input signal range required, as indicated at section *1.14*.
3. Close the instrument ad indicated at section *1.24.*
4. Connect the input signal and the power supply as indicated at sections *1.4* and *1.5*.
5. Enter the '*configuration menu*' to configure the instrument (scaling, alarms, ...) (*see section 1.27*)

1.8 'Fast access' menu

The '*fast access*' menu allows to configure the front key 'UP' ('▲') as a direct access to the alarm 1 and / or alarm 2 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.

Additionally, when the 'password' function is activated and access to configuration menu is blocked, in order to prevent modifications on the configuration, the functions associated to the '*fast access*' menu are still accessible to the operator. This access allows 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 *1.27.4*.

1.9 Scaling

The instrument provides multiple configurable input signal ranges, some of them with scalable reading (process, AV voltages and currents, DC voltages and currents, and resistances) and some other not scalable (thermocouples, Ni probes, PT probes and NTC probes).

The scalable ranges can be scaled by the operator to any value between 9999 and -1999 and activate the decimal point at any position.

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:

- with ranges for AC voltages and currents, for example 0/400 Vac, configure at the '*d.Lo*' parameter the reading value for a signal of 0 Vac. Configure at the '*d.Hi*' parameter the reading value for a signal of 400 Vac.
- with ranges for DC voltages and currents, for example ±400 Vdc, configure at the '*d.Lo*' parameter the reading value for a signal of 0 Vdc. Configure at the '*d.Hi*' parameter the reading value for a signal of 400 Vdc.
- with process ranges, for example 4/20 mA, configure at the '*d.Lo*' parameter the reading value for a signal of 4 mA. Configure at the '*d.Hi*' parameter the reading value for a signal of 20 mA.
- with resistance ranges, for example 0/10 K, configure at the '*d.Lo*' parameter the reading value for a signal of 0 R. Configure at the '*d.Hi*' parameter the reading value for a signal of 10 K.

To configure the scaling see section *1.27.2*.

1.10 Second scaling

The instrument provides a '*second scaling*', independent and additional to the standard scaling explained at section *1.9*.

The '*second scaling*' allows to scale the signal using two different scales in different situations. To select which scaling is being applied, the instrument provides an optional rear contact called '*External control*' (see 'Option EK' at section *3.4*). Close or open the rear contact to select which scaling is being applied to the reading.

The '*second scaling*' configuration is two steps process :

1. configure the scaling at the configuration menu '*Tools*' \ '*ScL.2*' *(see section 1.27.7)*.
2. associate the external control to the '*second scaling*' function, at the configuration menu '*ScL.2*' set the value '*EXt.c*' ('*External control*') *(see section 1.27.6)*

1.11 External control

The '*external control*' is an optional two pole terminal at the rear of the instrument. A contact must be connected to this terminal. The instrument will read the state of this contact as 'open' or 'closed'. A function can be configured to this terminal, and he function will activate or deactivate based on the contact state. One of the following functions can be assigned to the '*external control*' contact :

- activation of the second scaling
- modify the active decimal point
- 'hold' the reading
- visualize de memory of minimum or maximum

To configure the '*external control*' see the configuration menu at '*Tools*' \ '*External control*' *(see section 1.27.7)*.

1.12 'Eco' mode

The '*Eco*' mode reduces the consumption of the instrument to a level below 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.

The instrument will turn on the display 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 proceeding to the display turn off is configurable from 5 to 255 seconds.

To configure the '*Eco*' mode see the configuration menu at '*Tools*' \ '*Eco*' *(see section 1.27.7)*.

1.13 Offset reading

The '*Offset reading*' ('*oFFS*') parameter allows to configure a number of counts to be added to the reading, both in positive or negative. This value can be used to manually compensate for errors introduced by the wire resistance when measuring resistances or resistance based temperature probes at installation time.

To configure the '*Offset reading*' see the configuration menu at '*Tools*' \ '*oFFS*' *(see section 1.27.7)*.

1.14 Jumpers for input signal range selection

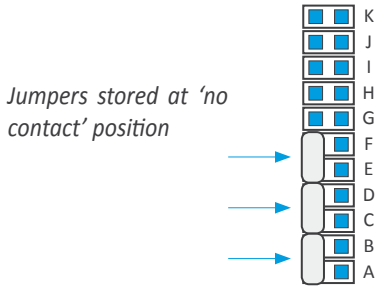
The jumpers for input signal range selection are located at the '*control module*', inside the instrument (see figure 1).

See '*Table 1*' for a list of input signal ranges available and the jumpers to select to activate each range. Additional information and technical specifications for each range can be found at the following sections :

- Ranges for AC voltages and currents, see section *1.16*
- Ranges for DC voltages and currents, see section *1.17*
- Ranges for thermocouples, see section *1.18*
- Ranges for Pt and Ni probes, see section *1.19*
- Ranges for NTC probes, see section *1.20*
- Ranges for PTC probes, see section *1.21*
- Ranges for process signals, see section *1.22*
- Ranges for resistances, see section *1.23*

To open the instrument and locate the internal jumpers, open the housing as explained at section *1.24*.

Jumpers not used can be stored for future used by placing them at the 'no contact' positions indicated below.



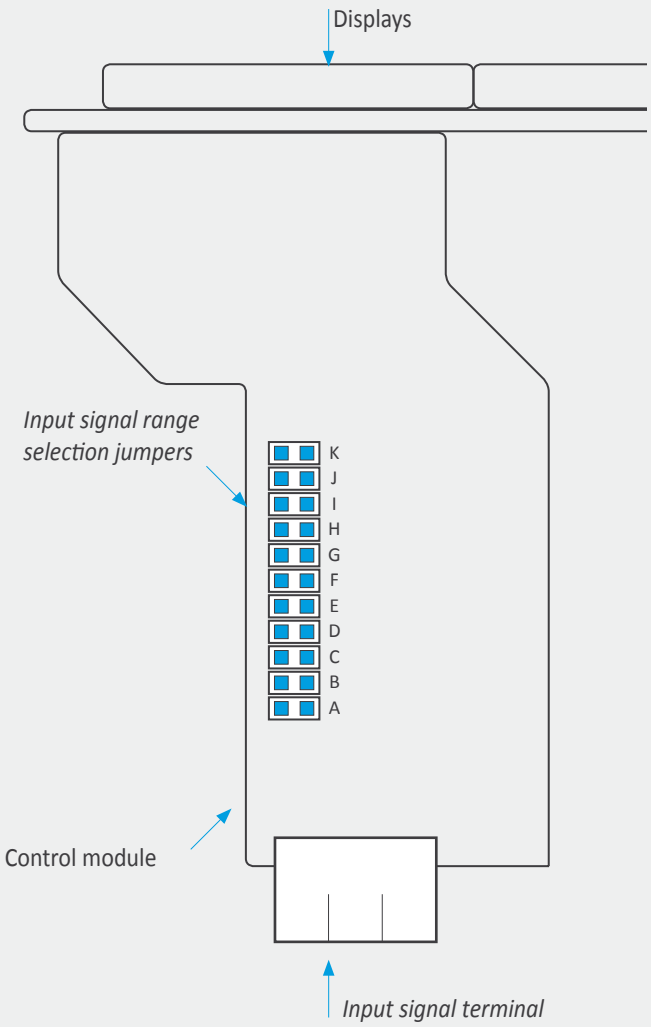


Figure 1

Range	Jumper
AC voltages and currents	
400 Vac	I
200 Vac	A I
20 Vac	B I
2 Vac	C I
200 mVac	D I
60 mVac	E I
5 Aac	I
20 mAac	F I
DC voltages and currents	
±400 Vdc	- - -
±200 Vdc	A
±20 Vdc	B
±2 Vdc	C
±200 mVdc	D
±60 mVdc	E
±5 Adc	- - -
±20 mAdc	F
Process	
4/20 mA	F
0/10 Vdc	B
Resistances	
0 to 10 K	G H K
0 to 100 K	G K

Table 1 - Ranges and jumpers

Range	Jumper
Thermocouples	
Thermocouple K	E
Thermocouple J	E
Thermocouple E	E
Thermocouple N	E
Thermocouple L	E
Thermocouple C	E
Thermocouple R	E J
Thermocouple S	E J
Thermocouple B	E J
Thermocouple T	E J
Pt and Ni probes	
Pt100	G H
Pt500	G
Pt1000	G
Ni100	G H
Ni200	G H
Ni1000	G
NTC probes	
NTC	G K
PTC probes	
KTY 121	G
KTY 210, 220	GHK

Table 1 - Ranges and jumpers

1.15 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 signal

AC voltages and currents	400 Vac, 200 Vac, 20 Vac, 2 Vac 200 mVac, 60 mVac, 5 Aac, 20 mAac *(see section 1.16)*
DC voltages and currents	±400 Vdc, ±200 Vdc, ±20 Vdc, ±2 Vdc ±200 mVdc, ±60 mVdc, ±5 Adc, ±20 mAdc *(see section 1.17)*
thermocouples	K, J, E, N, L, R, S, B, T y L *(see section 1.18)*
temperature 'Pt'	Pt100, Pt500, Pt1000 *(see section 1.19)*
temperature 'Ni'	Ni100, Ni200, Ni1000 *(see section 1.19)*
temperature 'NTC'	*(see section 1.20)*
temperature 'PTC'	*(see section 1.21)*
process	4/20 mA, 0/10 Vdc *(see section 1.22)*
resistances	ranges of 10 K and 100 K *(see section 1.23)*

Accuracy at 25 ºC	*see following sections for each signal*
Thermal drift	*150 ppm/º*

Power supply

power 'H'	85 to 265 Vac/dc
power 'L'	11 to 60 Vdc and 24/48 Vac
isolation*	2500 Veff with power 'H' 1500 Veff with power 'L' **tested for 60 sec.*
consumption (without 'Eco')	<1.5 W meter only <2.5 W meter with options
consumption (with 'Eco')	<0.3 W meter only <1.5 W meter with options

Configuration	3 front push buttons (and internal jumpers)

Functions included		*Section*
Fast access	*to alarm setpoints, maximum and minimum*	*1.8*
External control	*second scaling* *decimal point 0, 1, 2 or 3* *'hold' reading* *memory of maximal* *memory of minimum*	*1.11*
'Eco' mode	*reduced consumption*	*1.12*
Alarms	*setpoint* *hysteresis* *set as max or min type*	*1.27.3*
Offset reading	*add a fixed number of counts to reading*	*1.13*
Display filter	*recursive* *'steps'*	*1.27.7*
Simplified scaling		*1.9*
Memory	*max and min memory*	*1.27.4*
Password	*blocks configuration*	*1.27.7*
Display brightness	*5 levels*	*1.27.7*

Table 2 - Functions included

Front protection	IP50 standard IP54 optional *(see section 3.2)* IP65 optional *(see section 3.2)*
Output options	relay, analog, serial *(see section 2)*

Mechanical

mounting	panel
connections	plug-in screw terminals
housing material	ABS, polycarbonate (V0)
weight	<150 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 +50 ºC
storage	from-20 to +70 ºC
'warm-up' time	15 minutes

1.16 Measuring AC voltages and currents

• *Measuring AC signal ranges*

The instrument accepts the measure of AC voltages and currents. Available voltage ranges start at 60 mVac and go up to 400 Vac, covering from shunt signals to typical power line voltages of 48 Vac, 115 Vac, 230 Vac and even 380 Vac. Accepts measures between phase and neutral and also between phase and phase. In AC currents accepts signals of 5 Aac and has a range of 20 mAac. Available ranges are listed at *'Table 3'* and *'Table 4'* below.

• *'True RMS' measure*

The instrument measures AC voltages and currents in TrueRMS. The measure has a minimum dead band of 10 counts around 0, independent of the range selected. Measures below 10 counts are automatically displayed as 0.

• *Scaling*

When measuring AC voltages and currents the instrument allows to scale the reading to any value from 9999 to -1999. Decimal point can be configured to any position. The '*second scaling*' can also be used. *(see section 1.10)*.

• *Maximum signal accepted*

Signal values higher than those indicated at the '*Max. signal*' parameter on *'Table 3'* and *'Table 4'*, will activate the message '*hardware overrange*' ('*h.ovr*') on display *(see section 1.26)*. These values will not be used to calculate the final TrueRMS value.

• *Destructive oversignals*

Signal values higher than those indicated at the '*Maximum oversignal*' parameter on *'Table 3'* and *'Table 4'*, may cause permanent damage to the instrument.

• *Response times*

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

• *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*. Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

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 5 - Applications with AC signals

Vac ranges (Veff.)	*Scale by default*	*Scalable*	*Jumper (see section 1.14)*	*Accuracy (% FS)*	*Max. signal (Vp)*	*Z_{in}*	*Max. oversignal (Vp)*
400 Vac	*400*	*from 9999 to -1999*	*I*	*<0.25 %*	*600 Vp*	*12 M*	*1000 Vp*
200 Vac	*200.0*		*A I*	*<0.20 %*	*325 Vp*	*4.4 M*	*400 Vp*
20 Vac	*20.00*		*B I*		*32.5 Vp*	*477 K*	*200 Vp*
2 Vac	*2.000*		*C I*		*3.25 Vp*	*45 K*	*100 Vp*
200 mVac	*200.0*		*D I*		*325 mVp*	*4.4 K*	*20 Vp*
60 mVac	*60.0*		*E I*	*<0.25 %*	*132 mVp*	*2.2 K*	*1 Vp*

Table 3 - Measuring ranges in Vac

Aac ranges (Veff.)	*Scale by default*	*Scalable*	*Jumper (see section 1.14)*	*Accuracy (% FS)*	*Max. signal (Ap)*	*Z_{in}*	*Max. oversignal (Ap)*
5 Aac	*5.000*	*from 9999 to -1999*	*I*	*<0.25 %*	*8.5 Ap*	*20mOhm*	*16 Ap*
20 mAac	*20.00*		*F I*	*<0.15 %*	*32 mAp*	*4.7 R*	*125 mAp*

Table 4 - Measuring ranges in Aac

1.17 Measuring DC voltages and currents

• *Measuring DC signal ranges*

The instrument accepts the measure of DC voltages and currents. Available voltage ranges start at 60 mVdc and go up to 400 Vdc, covering applications with current shunt, tachometric dynamos, batteries, process, etc. In DC currents accepts signals of 5 Adc and has a range of 20 mAdc. Available ranges are listed at *'Table 6'* and *'Table 7'* below.

• *Bipolar ranges*

All signal ranges are bipolar, covering both the positive signal range and the negative signal range.

• *Scaling*

When measuring DC voltages and currents the instrument allows to scale the reading to any value from 9999 to -1999. Decimal point can be configured to any position. The '*second scaling*' can also be used. *(see section 1.10)*.

• *Maximum signal accepted*

Signal values higher than those indicated at the '*Max. signal*' parameter on *'Table 6'* and *'Table 7'*, will activate the message '*hardware overrange*' ('*h.ovr*') on display *(see section 1.26)*.

• *Destructive oversignals*

Signal values higher than those indicated at the '*Maximum oversignal*' parameter on *Table 6'* and *'Table 7'*, may cause permanent damage to the instrument.

• *Response times*

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

• *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.* Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

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 Aac and voltages up to 400 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 8 - Applications with DC signals

Vdc ranges	*Scale by default*	*Scalable*	*Jumper (see section 1.14)*	*Accuracy (% FS)*	*Max. signal (Vdc)*	Z_{in}	*Max. oversignal (Vdc)*
±400 Vdc	*400*	*from 9999 to -1999*	*- - -*	*<0.20 %*	*600 Vdc*	*12 M*	*1000 Vdc*
±200 Vdc	*200.0*		*A*		*325 Vdc*	*4.4 M*	*400 Vdc*
±20 Vdc	*20.00*		*B*		*32.5 Vdc*	*477 K*	*200 Vdc*
±2 Vdc	*2.000*		*C*		*3.25 Vdc*	*45 K*	*100 Vdc*
±200 mVdc	*200.0*		*D*		*325 mVdc*	*4.4 K*	*20 Vdc*
±60 mVdc	*60.0*		*E*	*<0.25 %*	*132 mVdc*	*2.2 K*	*1 Vdc (5'')*

Table 6 - Measuring ranges in Vdc

Adc ranges	*Scale by default*	*Scalable*	*Jumper (see section 1.14)*	*Accuracy (% FS)*	*Max. signal (Adc)*	Z_{in}	*Max. oversignal (Adc)*
±5 Adc	*±5.000*	*from 9999 to -1999*	*- - -*	*<0.25 %*	*8.5 Adc*	*20mOhm*	*16 Adc*
±20 mAdc	*±20.00*		*F*	*<0.15 %*	*32 mAdc*	*4.7 R*	*125 mAdc*

Table 7 - Measuring ranges in Adc

1.18 Measuring thermocouples

- ***Thermocouples accepted***

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

- ***Temperature range and total error***

The measured temperature range for each type of thermocouple is indicated on *'Table 9'* below. Errors indicated are total errors, including the error associated to the thermocouple cold junction. For thermocouples K, J, E, N, L and C two error scales are indicated : 4º for temperatures from -50 to 1000 ºC and 7º for the remaining temperature scale.

- ***Cold junction compensation***

The thermocouple cold junction is automatically compensated by the instrument.

- ***Resolution and units***

The instrument resolution when measuring thermocouples is 1º. Reading can be configured in ºC (degrees Celsius) or ºF (degrees Fahrenheit).

- ***Sensor break detection***

In case of sensor break, the instrument will show '*h.ovr*' or '*h.udr*' depending on the broken cable.

- ***Compensated cable***

To correctly measure a thermocouple signal, always use compensated cable, of the thermocouple used, for the connections between the instrument and the thermocouple.

- ***Response times***

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

- ***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.* Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

Thermocouple	*Jumper (see section 1.14)*	*Range in ºC (in ºF)*	*Total error (cold junction included)*
Thermocouple K	*E*	*-200 / 1350 ºC (-328 / 2462 ºF)*	*<3 º*
Thermocouple J	*E*	*-200 / 1200 ºC (-328 / 2192 ºF)*	
Thermocouple E	*E*	*-190 / 1000 ºC (-310 / 1832 ºF)*	
Thermocouple N	*E*	*-200 / 1300 ºC (-328 / 2372 ºF)*	
Thermocouple L	*E*	*-200 / 900 ºC (-328 / 1652 ºF)*	
Thermocouple C	*E*	*0 / 2300 ºC (-32 / 4172 ºF)*	
Thermocouple R	*E J*	*-50 / 1768 ºC (-58 / 3214 ºF)*	
Thermocouple S	*E J*	*-50 / 1768 ºC (-58 / 3214 ºF)*	
Thermocouple B	*E J*	*70 / 1820 ºC (158 / 3308 ºF)*	
Thermocouple T	*E J*	*-200 / 400 ºC (-328 / 752 ºF)*	

Table 9 - Temperature ranges for thermocouples

1.19 Measuring with Pt and Ni probes

• ***Accepted Pt and Ni probes***

The instrument accepts direct connection of Pt100, Pt500 and Pt1000 temperature probes, and also Ni100, Ni200 and Ni1000 temperature probes. The measured temperature ranges for each type of probe is indicated on *'Table 12'* below.

• ***Compensating the resistance of the signal wire***

Pt and Ni probes are measured with 2 wires. 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 1.13)*.

• ***Resolution and units***

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

• ***Sensor break detection***

In case of sensor break, the instrument will show '*h.ovr*' or '*h.udr*' depending on the broken cable.

• ***Alpha***

The instrument accepts Pt probes (Pt100, Pt500, Pt1000) with '*Alpha*' parameter of '*0.0385*' and '*0.0390*' *(see section 1.27.7)*. This parameter is associated to the type of probe connected.

• ***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*. Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

Sensor	*Jumper (see section 1.14)*	*Range in ºC (en ºF)*	*Total error*	*Current at sensor*
Pt100	*G H*	*-200 / 750 ºC (-328 / 1382 ºF)*	*<1º*	*< 900 uA*
Pt500	*G*	*-150 / 630 ºC (-238 / 1166 ºF)*		*< 900 uA*
Pt1000	*G*	*-190 / 630 ºC (-310 / 1166 ºF)*		*< 90 uA*
Ni100	*G H*	*-60 / 180 ºC (-76 / 356 ºF)*		*< 900 uA*
Ni200	*G H*	*-60 / 120 ºC (-76 / 248 ºF)*		*< 900 uA*
Ni1000	*G*	*-60 / 180 ºC (-76 / 356 ºF)*		*< 90 uA*

Table 12 - Ranges of temperature for Pt and Ni probes

1.20 Measuring with NTC probes

• ***Accepted NTC probes***

The instrument accepts direct connection of NTC probes. The NTC probe is a temperature variable resistor ,and the instrument accepts ranges of measure from 100 R to 100 K. The measured ranges are indicated on *'Table 10'* below.

To identify the range of temperature that the instrument can measure, for a defined NTC, check the datasheet provided by the NTC manufacturer and check for the temperatures associated with the resistance values of 100 R and 100 K. Use *'Table 11'* to write down the values obtained.

• ***Parameters 'R_{25}' and 'Beta'***

For a correct measure of temperature with a NTC probe, check the NTC manufacturer datasheet for the resistance value at 25º, usually called 'R_{25}' parameter, and the '*Beta*' parameter. Usually a 10 K NTC has a 'R_{25}' parameter of 10 K. The instrument accepts values of '*Beta*' from 2000 to 5500. Use *'Table 11'* to write down the values obtained.

Instrument C40-A		*NTC probe*		
Range of measure		*Temperature*	*R25*	*Beta*
Rmin	*100 R*			*(accepted values from 2000 to 5500)*
Rmax	*100 K*			

Table 11 - Data obtained from NTC manufacturer datasheet

• ***Resolution and units***

The temperature resolution using NTC temperature probes is configurable to 1º or 0.1º. Reading can be configured in ºC (degrees Celsius) or ºF (degrees Fahrenheit).

• ***Sensor break detection***

In case of sensor break, the instrument will show '*h.ovr*' or '*h.udr*' depending on the broken cable.

• ***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*. Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

NTC 'R_{25}'	*Jumper (see section 1.14)*	*Range of measure*	*Error total (% of reading)*	*Beta (configurable)*
..., 1K, 1.5K, 2K, 2.2K, 3.3K, 4.7K, 5K, 6.8K, 10K, 12K, 15K, 22K, ...	*G K*	*de 100 R a 100 K*	*<1.5% of reading*	*de 2000 a 5000*

Table 10 - Ranges of measure for NTC probes

1.21 Measuring with PTC probes

• ***Accepted PTC probes***

The instrument accepts direct connection of PTC probes. Accepted PTC probes are listed below .

Family	*Sensor*	*Jumper (see section 1.14)*	*Range in ºC (en ºF)*	*Total error*
KTY 121	*KTY81-121* *KTY82-121*	*G*	*-55 / 150 ºC (-67 / 302 ºF)*	*<0.5º*
KTY 210	*KTY81-210* *KTY82-210*	*GHK*		
KTY 220	*KTY81-220* *KTY82-220*	*GHK*		

Table 15 - Ranges of temperature for PTC probes

1.22 Process measures

• ***Measuring process signals***

The instrument accepts the measure of process signals in 4/20 mA y 0/10 Vdc. The instrument does not provide excitation voltage to power transducers.

• ***Scaling***

When measuring process signals the instrument allows to scale the reading to any value from 9999 to -1999. Decimal point can be configured to any position. The '*second scaling*' can also be used.*(see section 1.10)*.

• ***Maximum signal accepted***

Signal values higher than those indicated at the '*Max. signal*' parameter on *'Table 14'*, will activate the message '*hardware overrange*' ('*h.ovr*') on display *(see section 1.26)*.

• ***Destructive oversignals***

Signal values higher than those indicated at the '*Maximum oversignal*' parameter on *'Table 14'*, may cause permanent damage to the instrument.

• ***Response times***

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

• ***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*. Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

1.23 Resistive measures

• ***Measuring resistive signals***

The instrument accepts the measure of resistances and provides two ranges of measure from 0 to 10 K and from 0 to 100 K.

• ***Compensating the resistance of the signal wire***

Resistances are measured with 2 wires. 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 1.13)*.

• ***Scaling***

When measuring resistances the instrument allows to scale the reading to any value from 9999 to -1999. Decimal point can be configured to any position. The '*second scaling*' can also be used.*(see section 1.10)*.

• ***Response times***

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

• ***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*. Jumpers for input signal range selection are located on the internal control module, as shown on section *1.14*.

Ranges of measure	*Scale by default*	*Scalable*	*Jumper (see section 1.14)*	*Accuracy (% of reading)*
0 to 10 K	*9.999*	*from 9999 to -1999*	*G H K*	*<1.5% of reading*
0 to 100 K	*99.99*		*G K*	

Table 13 - Ranges of measure for resistances

Ranges of measure	*Scale by default*	*Scalable*	*Jumper (see section 1.14)*	*Accuracy (% FS)*	*Max. signal*	*Z_{in}*	*Max. oversignal*
4/20 mA	*0/100.0*	*from 9999 to -1999*	*F*	*<0.15 %*	*32 mA*	*4.7mOhm*	*125 mA*
0/10 Vdc	*0/100.0*		*B*	*<0.20 %*	*32.5 Vdc*	*477 K*	*200 Vdc*

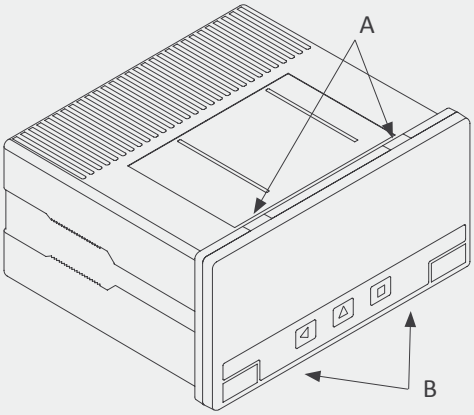
Table 14 - Ranges of measure for process signals

1.24 To open the instrument

To open the housing and access the internal circuits, use a flat screwdriver to unlock the upper clips marked with 'A'. Then unlock the lower clips marked with 'B' and remove the front cover. 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 cover by clipping first the upper clips 'A' and then the lower clips 'B'.

Important - If your instrument was delivered with the IP65 front seal option, accessing the inside of the instrument will permanently break the IP65 seal on the areas of clips 'A' and 'B'.

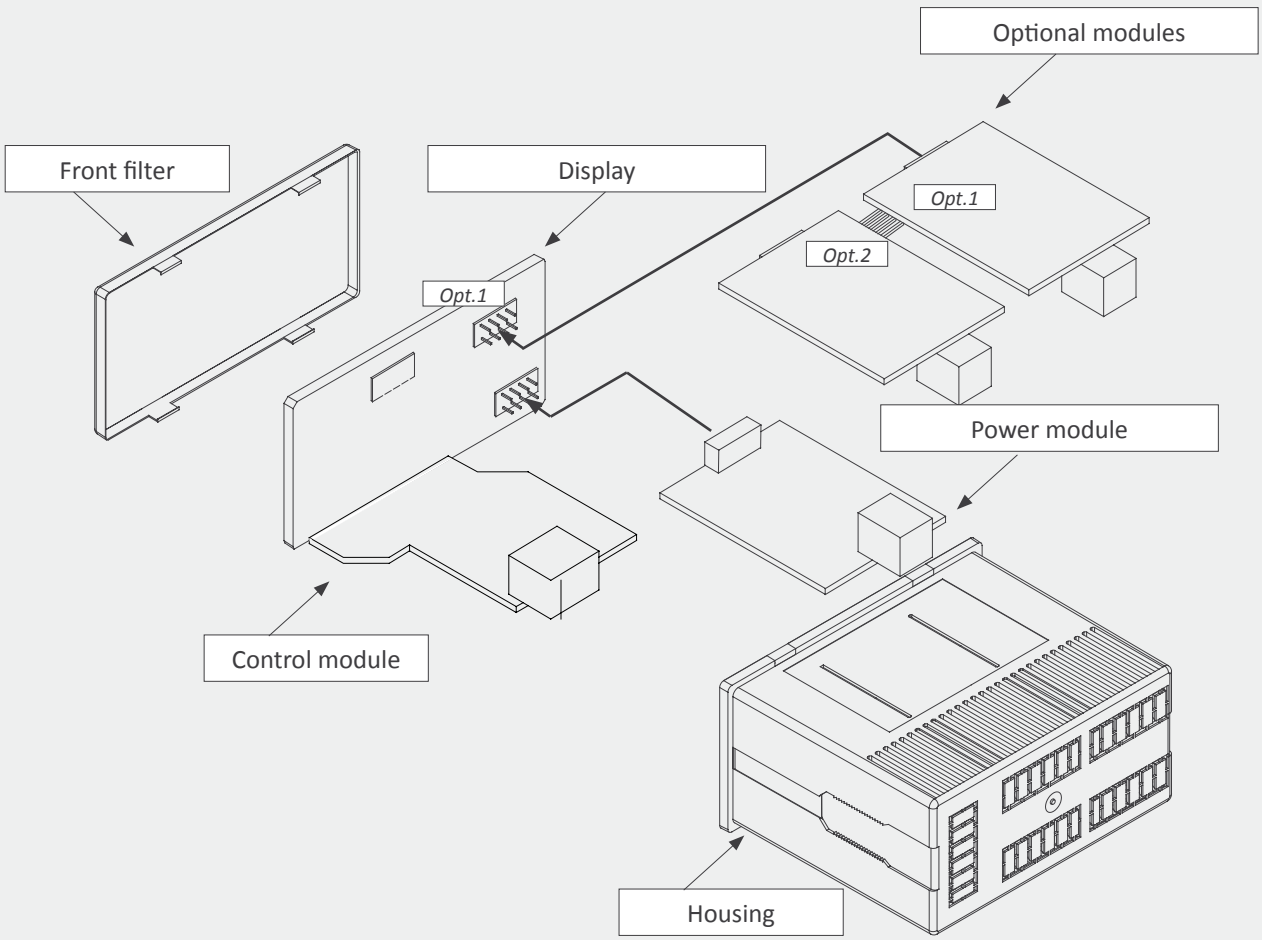


** Risk of electric shock. Removing the front cover will grant access to the internal circuits. Disconnect the input signal to prevent electric shock to the operator. Operation must be performed by qualified personnel only.*

The internal structure of the instrument is shown in the graphic below. Power module is replaceable by removing the old one and replacing by the new one.

Module 'Opt.2' connects to module 'Opt.1'. Module 'Opt.1' connects to the display. Optional modules can be replaced, changed, added or removed simply by placing the proper module at the proper location.

See section *2* for a a list of available optional modules.



1.25 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 *1.10*, and for a full view of the '*configuration menu*' structure see section *1.11*.

'*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 *1.10.6* 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

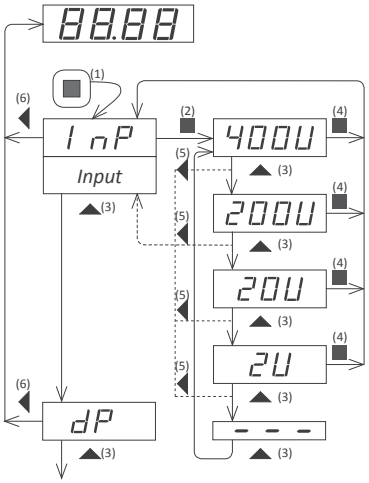
Key SQ (■) - press the SQ (■) key for 1 second to access the '*configuration menu*'. Inside the menu, the SQ (■) key functions as a 'ENTER' key. It selects and accesses the menu option currently displayed. At menus with numerical value entries, it validates the number displayed.

Key UP (▲) - the UP (▲) key gives access to the 'fast access' menu. Inside the menus, 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.

1.26 Messages and errors

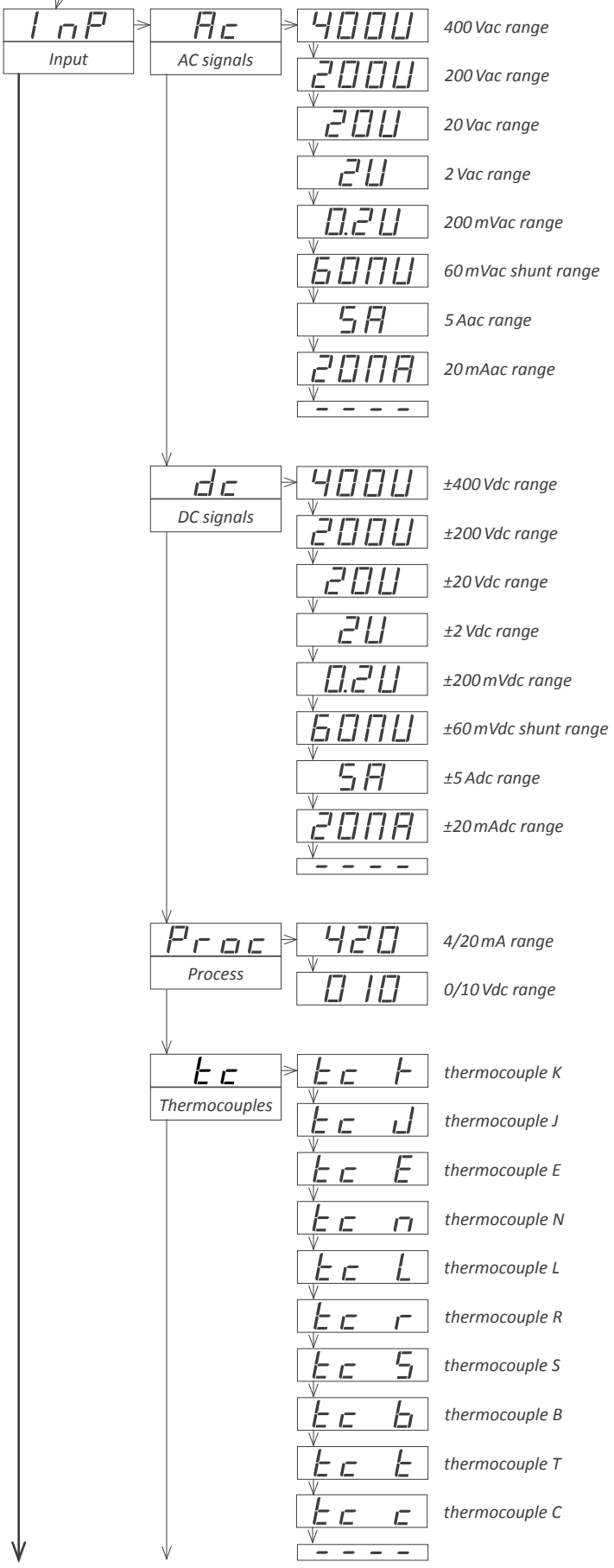
The error messages are shown on display in flash mode.

Messages and errors	
'h.udr' *'h.oVr'*	Hardware underrange ('**h.udr**') / overrange ('**h.ovr**'). Input signal is lower / higher than the minimum / maximum signal the instrument can detect.
'd.udr' *'d.oVr'*	display underrange ('**d.udr**') / overrange ('**d.ovr**'). The instrument already displays the minimum / maximum value possible (9999 / -1999).
*'Err.0'**	at the '**scaling**' ('**ScAL**') menu entry, the defined slope is higher than '5000' (slope almost vertical). Entered values are dismissed and default values are activated.
'Err.1'	incorrect password.

Table 16 - Messages and error codes

1.27 Configuration menu

Press 'SQ' (■) for 1 second to access the '*configuration menu*'. For a description on how to operate inside the menus see section *1.8*. For a full vision of the '*configuration menu*' structure see section *1.11*.



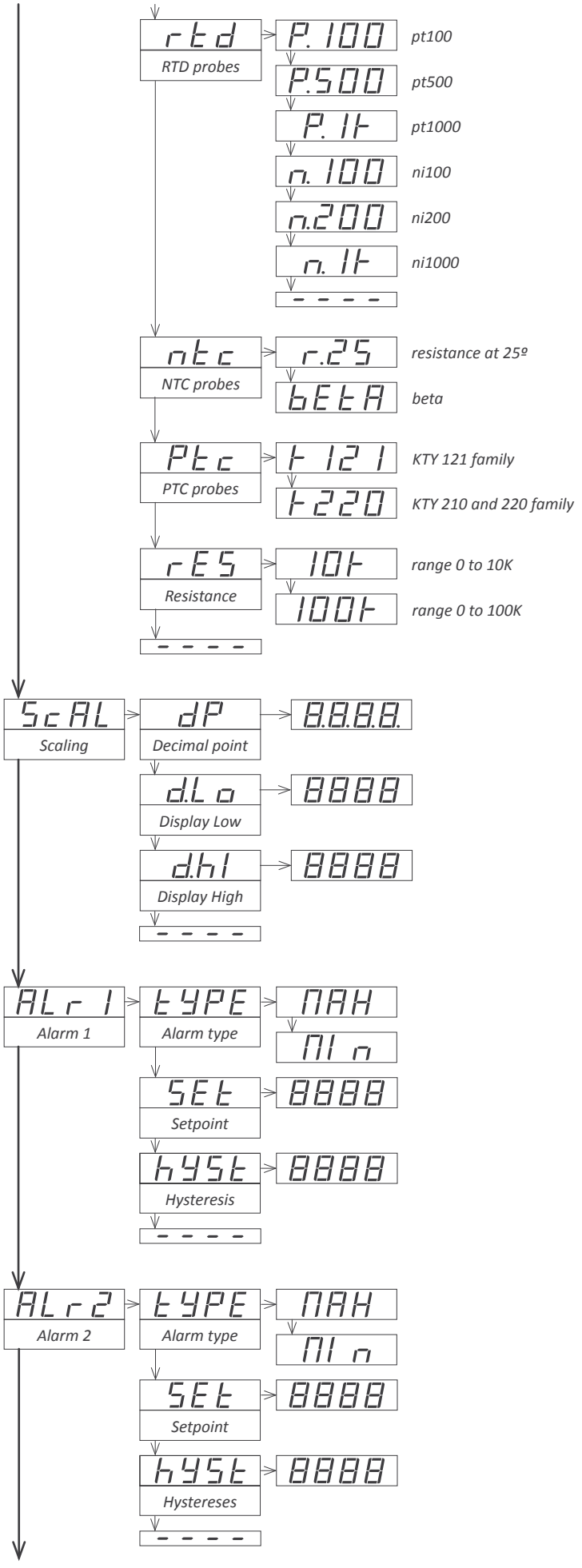
1.27.1 Input signal ranges

Access the '**Input**' ('**InP**') menu to select the input signal range. For a correct reading, the internal range selection jumper *(see section 1.14)* must also be selected accordingly.

The C40-A instrument offers the following signal ranges :

- '**AC signals**' ('**Ac**') - select a range between 400 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 ±400 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 does not provide excitation voltage to power up transducers. For instruments with excitation voltage, see documentation on '*Series M*'.
- '**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.
- '**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, Pt500, Pt1000, Ni100, Ni200 and Ni1000. 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 1.13)*.
- '**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 25º ('**r.25**') and parameter '*beta*' ('**bEtA**'). The instrument accepts beta values between 2000 and 5500. For more information on NTC measures see section *1.20.*
- '**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 *1.21.*
- '**Resistance**' ('**rES**') - select 10 K for a measuring range from 0 to 10 KOhms or select 100 K for a measuring range of 0 to 100 KOhms. 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 1.13)*.

1.27 Configuration menu (cont.)



1.27.2 Scaling

Scale the reading at the '**Scaling**' ('**ScAL**') menu. There are four parameters to configure :

Access the '**Scaling**' ('**ScAL**') menu to configure the reading scaling. Input signal ranges that allow for scaling are :

- all AC signal ranges
- all DC signal ranges
- all process ranges
- all resistance ranges

Temperature ranges (thermocouples, Pt probes, Ni probes and NTC probes) have direct temperature indication and are not scalable.

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 *1.9*.

1.27.3 Alarms

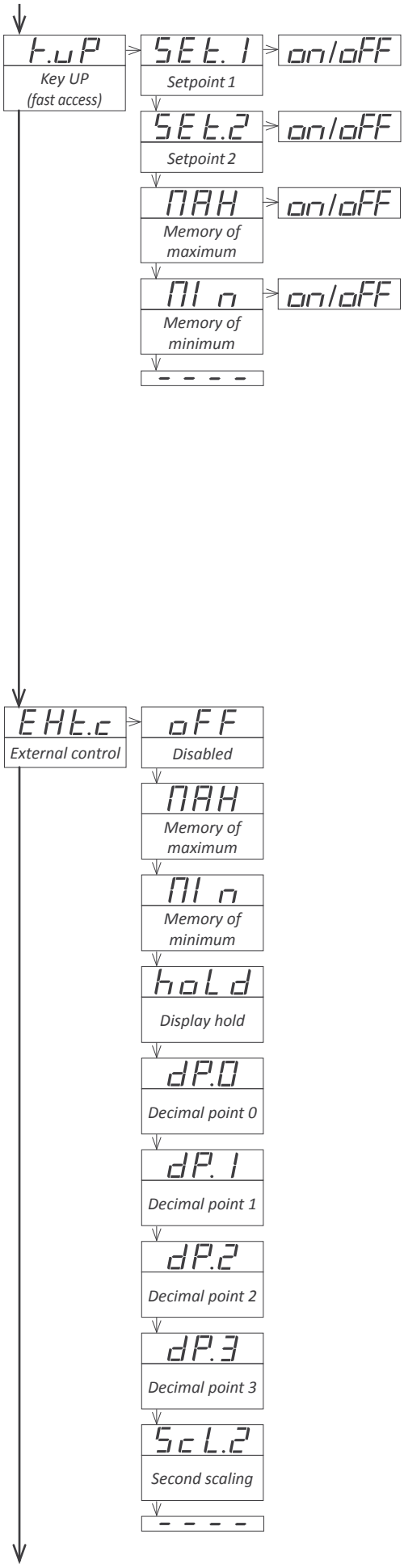
The instrument has 2 independent and configurable alarms.

Control the independent activation of relays A1 installed (optionally) at slots 1 and 2 *(see section 2.1)* from menu entries '**Alarm 1**' ('**ALr1**') and '**Alarm 2**' ('**ALr2**'). Alarms control also the activation of front leds '1' and '2' located as indicated at section *1.2*.

To configure the alarms, enter at the alarm menu ('**ALr1**', or '**ALr2**') 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 1.12.5)*.
- 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.

1.27 Configuration menu (cont.)



1.27.4 Fast access

The key 'UP' (▲) at the front of the instrument gives access to a list of functions configurable by the operator. See section *1.25* 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**' ('**ALr1**') function allows to visualize and modify the setpoint value of alarm 1.
- the '**Setpoint 2**' ('**ALr2**') 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).

1.27.5 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.

1.27.6 External control

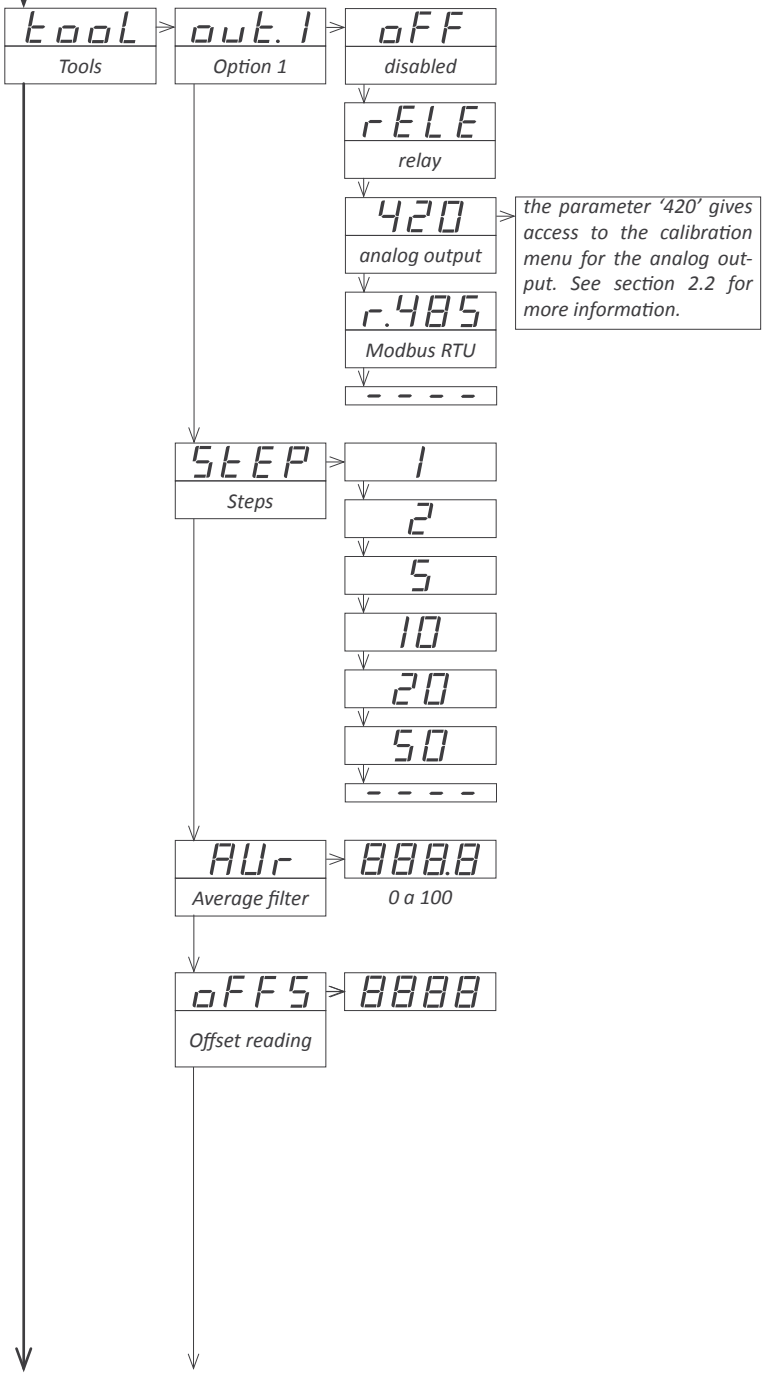
An external on / off control (see '*Option 'EK"* at section *3.4*) can be added as an option to the instrument. The operator can then control the activation of a configurable function based on the state of this control. Function remains activated while the external contact is closed, and will deactivate 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.

Parameters '**Memory of maximum**' ('**MAX**'), '**Memory of minimum**' ('**Min**') and '**Display hold**' ('**hoLd**') show on display a value which is not the actual measured input signal, therefor the values for this parameters will be shown in flash mode, indicating that the actual value is not the actual input value.

- select parameter '**Decimal point 0**' ('**dP.0**') to remove the decimal point on display.
- select parameter '**Decimal point 1**' ('**dP.1**') to activate the decimal point at position XXX.X
- select parameter '**Decimal point 2**' ('**dP.2**') to activate the decimal point at position XX.XX
- select parameter '**Decimal point 3**' ('**dP.3**') to activate the decimal point at position X.XXX

1.27 Configuration menu (cont.)



Parameters '**Decimal point 0**' ('**dP.0**')and similar '**dP.1**', '**dP.2**' and **dP.3**' control which decimal point is on. When the external contact closes, the decimal point selected lights on and the decimal point that was activated before will power off. When the external contact opens, the previous decimal point powers on again while removing the new decimal point. Display does not show in flash mode when decimal point functions are activated.

- select parameter '**Second scaling**' ('**ScL.2**') to activate the second scaling configured at menu '**Tools**' ('**TooL**') \ '**Second scaling**'. The activation of the '*Second scaling*' function is accepted for all signal input ranges based on AC input signals, DC input signals, process and resistances. Display does not show in flash mode when second scaling function is activated. For more information on the '*Second scaling*' seer section *1.10*

1.27.7 Menu 'Tools'

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

- select at the '**Option 1**' ('**out.1**') parameter the module type installed at the 'Opt.1' *(see section 2)* slot. Select '**relay'** ('**rELE**') for the relay output module '*A1*'. Select '**analog output**' ('**420**') for the analog output module '*M1*'. Select '**Modbus RTU**' ('**r.485**') for the Modbus RTU serial output module '*S1*'.

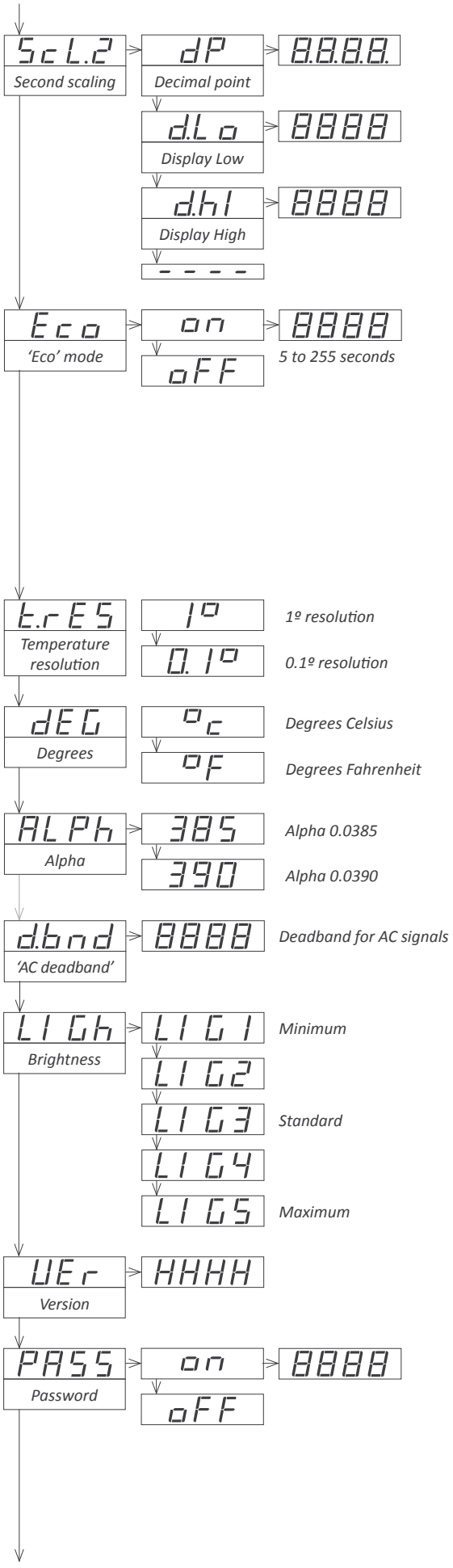
  *Note : the parameter '**420**' gives access to the calibration menu for the analog output module. See section 2.2 for more information about this menu and the calibration.*

- 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 '**Offset reading**' ('**oFFS**') parameter allows to configure a fixed number of counts to be added to 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 *1.13*

1.27 Configuration menu (cont.)



• the '**second scaling**' (**ScL.2**') function allows to configure the reading associated to the 'second scaling', which can be activated by controlling a contact at the 'external control'. For more information on the 'second scaling' function see section *1.10*.

• 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 *1.15*. For more information in 'Eco' mode see section *1.12*. 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 1º or 0.1º. This resolution applies to temperature probes Pt100, Pt500, Pt100, Ni100, Ni200, Ni1000, PTC and NTC. For thermocouple probes resolution is fixed to 1º.

• at the '**Degrees**' ('**dEG**') menu select the temperature values to be read in ºC (degrees Celsius) or in ºF (degrees Fahrenheit).

• at the '**Alpha**' ('**ALPh**') menu select the value for the alpha parameter to '0.0385' o '0.0390'. This parameter affects to Pt probes (Pt100, Pt500, Pt1000) and it depends on the probe.

• 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.

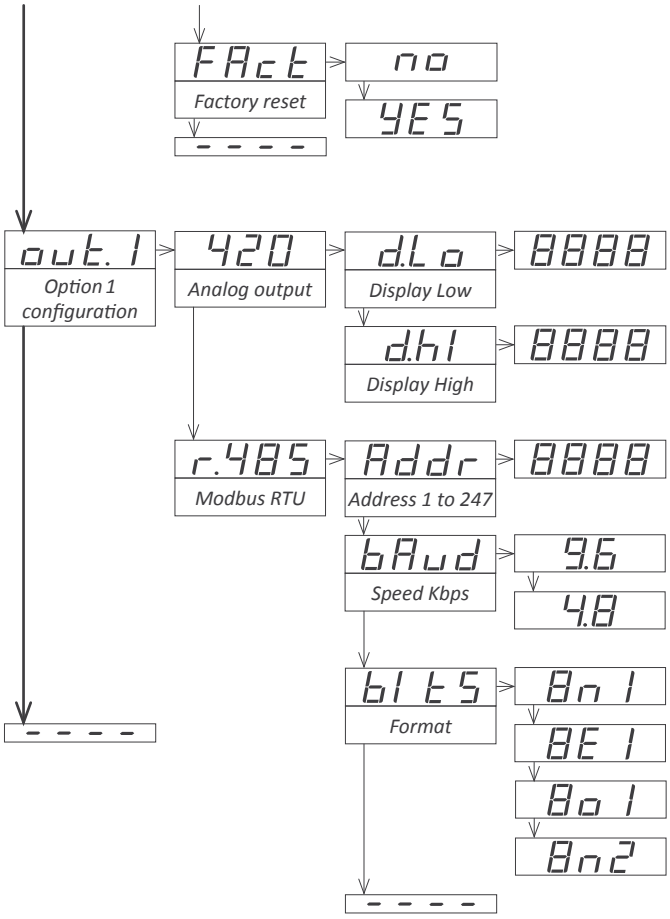
• at the '**Brightness**' ('**LIGh**') menu select between 5 levels of brightness intensity for the display. It adapts the instrument to environments with higher or lower brightness is needed or to adapt the intensity to other meters in the area.

• 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**'.

1.27 Configuration menu (cont.)



• At the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument. See section *1.30* for a list of values at default factory configuration.

1.27.8 Configuring the options

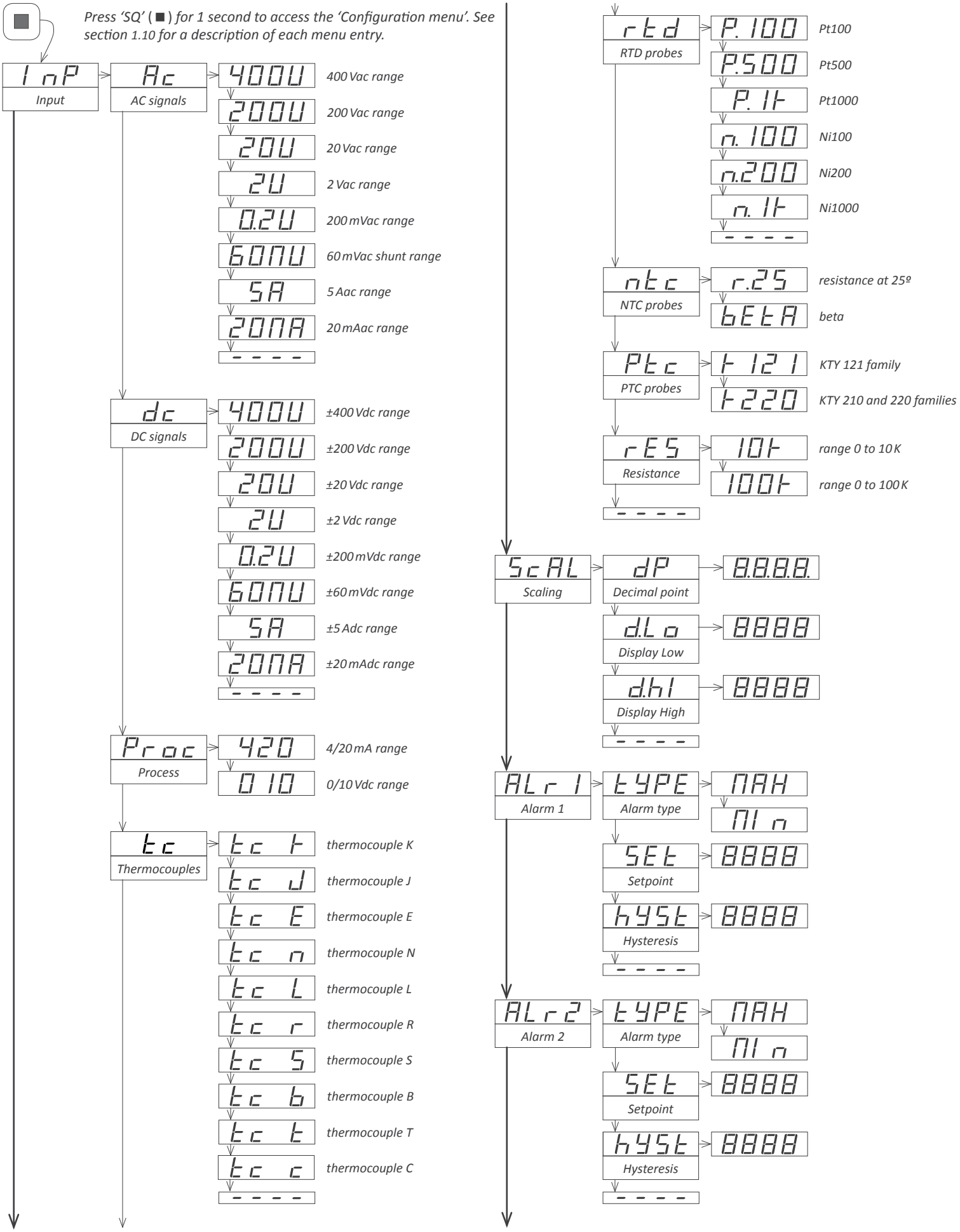
At the '**Option 1 configuration**' ('**out.1**') configure the module installed at slot Opt.1. This menu varies depending on the module installed (relay, analog output or serial output). The type of module installed is indicated at the menu 'Tools' / 'out.1'.

• '**Analog output**' ('**420**') : select '**analog output**' ('**420**') at 'Tools' / 'out.1' / '420', to have the analog output configuration at this menu entry. Introduce the reading value associated to 4 mA (**Display Low** ('d.Lo')) and the reading value associated to 20 mA (**Display High** ('d.Hi'))

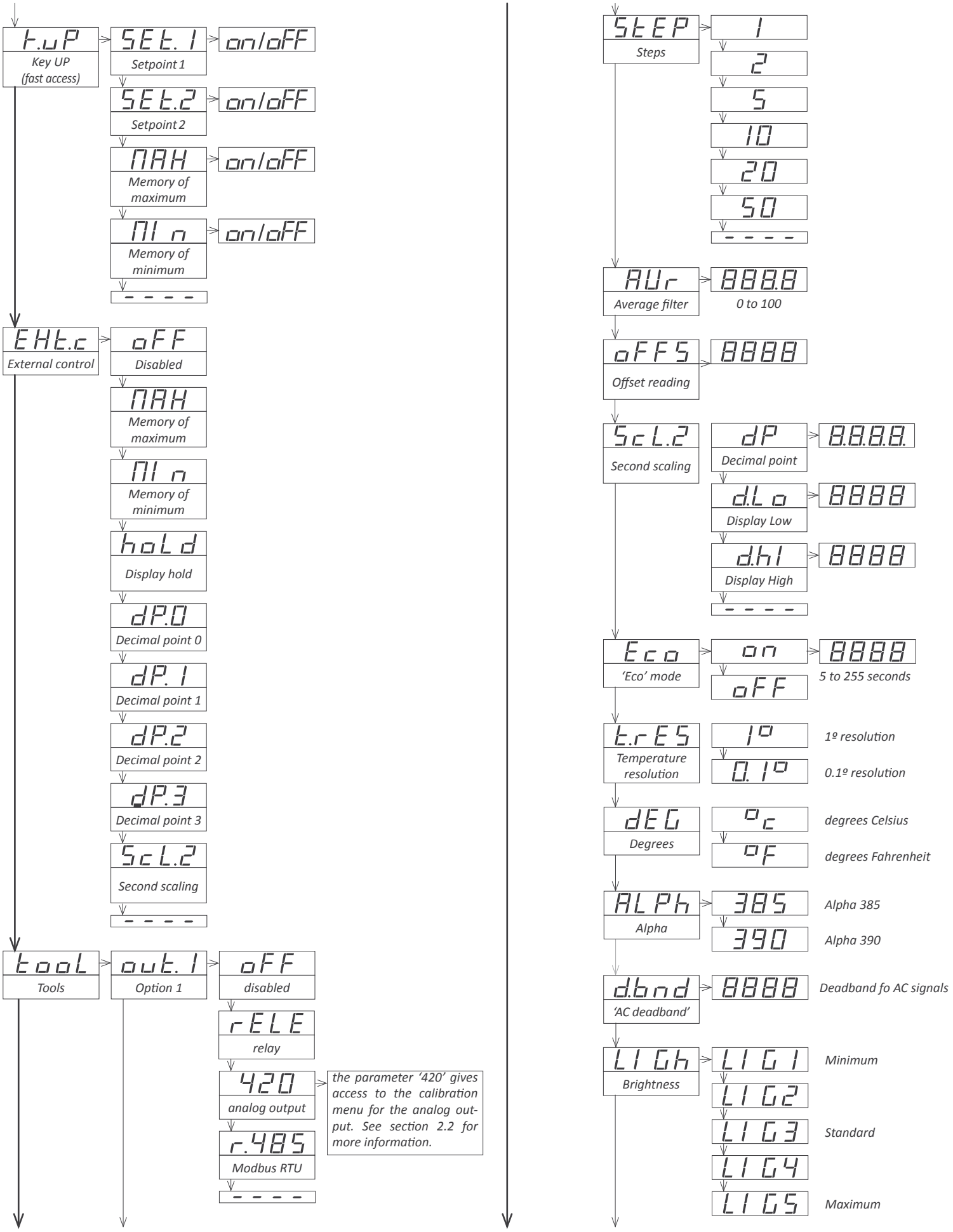
• '**Modbus RTU**' ('**r.485**') : select '**Modbus RTU**' ('**r.485**') at 'Tools' / 'out.1' / 'r.485', to have the serial output configuration at this menu entry. Configure the address for the instrument (parameter '**Address 1 to 247**' ('**Addr**')), the bus speed (parameter '**Speed kbps**' ('**bAud**')) configurable to 9.600 bps or 4.800 bps, and the bus format (parameter '**Format**' ('**bItS**')) configurable at 8n1, 8E1, 8o1 or 8n2.

The slot at Opt.2 allows only for a relay module, and configuration is done through the menu entry '**Alarm 2**' ('**ALr2**').

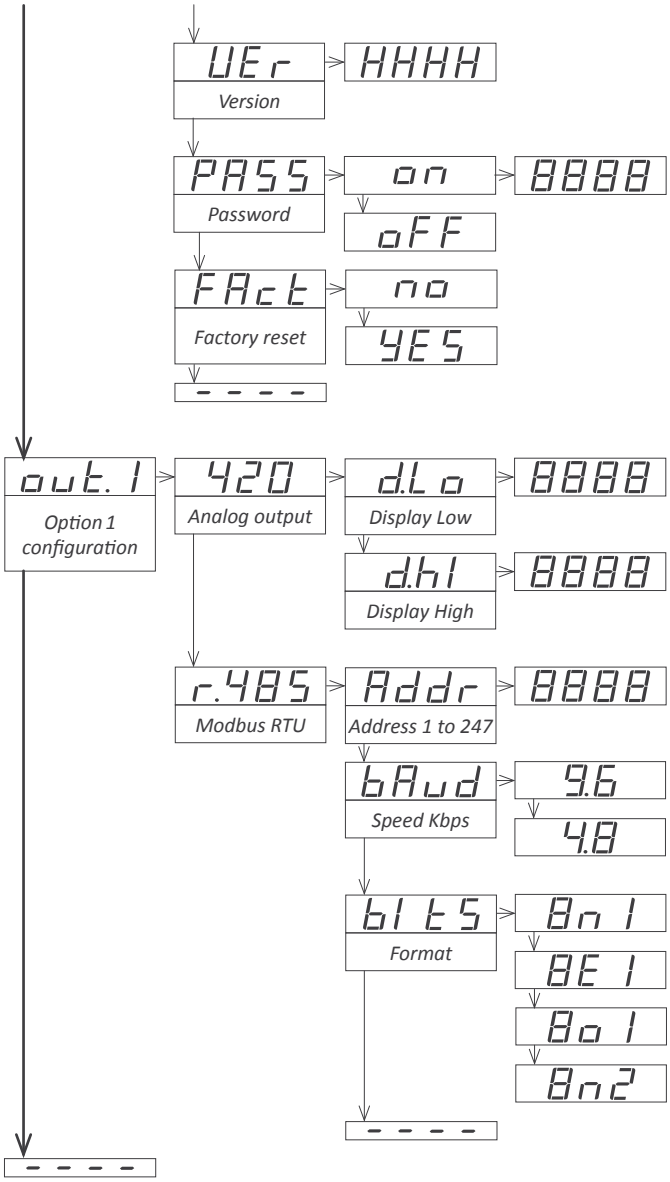
1.28 Full configuration menu



1.28 Full configuration menu (cont.)



1.28 Full configuration menu (cont.)



1.29 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.

1.30 Factory configuration

Range	400 Vac
Scaling and decimal point	0/400 Vac = 0/400
Alarms 1	
Type	alarm as maximum
Setpoint	1000
Hysteresis	0 counts
Alarm 2	
Type	alarm as maximum
Setpoint	1000
Hysteresis	0 counts
External control	off
Fast access	all off
Tools	
Option.1	off
Step	1
Average	0
Offset reading	0
Second scaling	0/400
'Eco' mode	off
Temperature resolution	1º
Degrees	ºC
Alpha	385
AC deadband	20
Brightness	3
Password	off
Option 1 configuration	
Option analog output	0/100.0=4/20 mA
Option serial Modbus RTU	9600 bps, address 1, format 8n1

1.31 Warranty

This instrument is warranted against all manufacturing defects for a period of 24 MONTHS from the shipment date. This warranty does not apply in case of misuse, accident or manipulation by non-authorized personnel. In case of malfunction get in contact with your local provider to arrange for repair. Within the warranty period and after examination by the manufacturer, the unit will be repaired or substituted when found to be defective. The scope of this warranty is limited to the repair cost of the instrument, not being the manufacturer eligible for responsibility on additional damages or costs.

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: C40-A

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

Electromagnetic compatibility directive 2004/108/CE
Low voltage directive 2006/95/CE

Security rules EN-61010-1

Instrument	Fixed Permanently connected
Pollution degree	1 and 2 (without condensation)
Isolation	Double
Category	CAT-II

Electromagnetic compatibility rules EN-61326-1

EM environment: Industrial

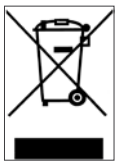
Immunity levels

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

Emission levels

CISPR 11	Instrument Class A, Group 1	Criteria A

Barberà del Vallès October 2015
Daniel Juncà - Quality Manager



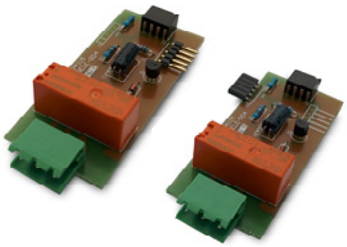
According to directive 2012/19/EU, electronic equipment must be recycled in a selective and controlled way at the end of its useful life.

2. Output and control modules

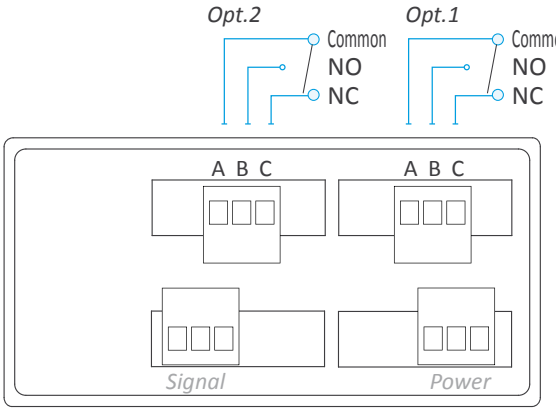
2.1 Modules A1 and A2 (relay output)

The A1 (and A2) modules offer 1 relay output to be installed at slot Opt.1 (module A2 at Opt.2). The relay installed at Opt.1 is controlled by alarm 1, and is configured from the '**Alarm 1**' ('**Alr1**') menu explained at section *1.27.3*. The relay installed at Opt.2 is controlled by alarm 2, and is configured from the '**Alarm 2**' ('**Alr2**') explained at section *1.27.3*. Relay with 3 contacts (Common, Normally closed, Normally open) accepting voltages up to 250V @8A.

The A1 and A2 modules can be ordered installed in to a Series C instrument or standalone for later installation, as they do not require soldering or special configuration..



Type of relay	3 contact relay (NC, NO, common)
Current maximum	8 A per relay (resistive load)
Voltage maximum*	250 Vac continuous
Isolation	3500 Veff
Type of terminal	plug-in screw terminal, pitch 5.08 mm
Slots allowed	Opt.1 for A1 module Opt.2 for A2 module



Terminal A *Common*
Terminal B *NO - Normally open*
Terminal C *NC - Normally closed*

2.2 Module M1 (analog output)

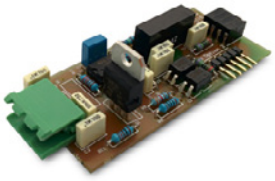
The M1 module offers 1 analog output at 4/20 mA, isolated, to be installed at slot Opt1.

The 4/20 mA output signal is fully scalable, both with positive and negative slopes, and is proportional to the reading of the instrument. The mA output can be connected to work in active loop (the module provides the power of the loop) or passive mode (the power of the loop is not provided by the instrument)

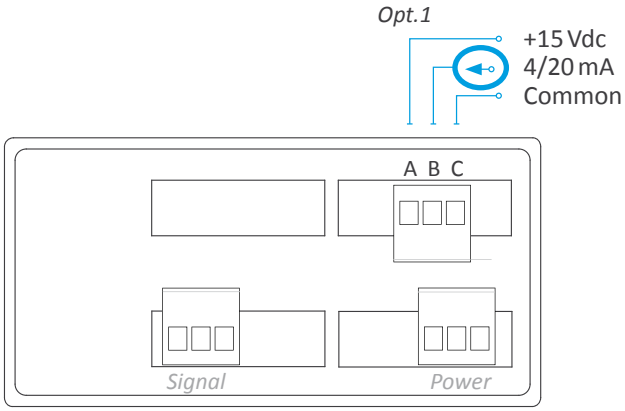
Connections

For an active 4/20 mA loop, connect terminal A ('Vexc +15 Vdc') as current output and terminal B ('Signal in mA') as return of current.

For a passive 4/20 mA loop, connect terminal B ('signal in mA') as current output and terminal C ('GND') as return of current.



Output signal	4/20 mA (active and passive)
Active output	connect terminal A (+15 Vdc) and B (mA) R_L <350 R
Passive output	connect terminal C (GND) and B (mA) R_L < 700 R
Accuracy	<0.5% FS
Response time	<100 mSeg. + meter response time
Isolation	1000 Vdc
Slots allowed	Opt.1



Terminal A *Vexc +15 Vdc*
Terminal B *Signal in mA*
Terminal C *Common*

Configuration

Configuration is done from the front keypad, through the configuration menu. The instrument must be informed that there is a ananlog output module at slot.1 and this is done at the configuration menu 'Tool' \ 'out.1' *(see section 1.27.7).* Then configure the reading associated to the 4 mA output signal and the reading associated to the 20 mA output signal at the configuration menu 'out.1' \ '420' *(see section 1.27.8)*.

Installation and calibration of a M1 module

If the M1 module has been provided already installed at the C40-A instrument, then the calibration process has been already applied and does not need to be repeated.

To install and calibrate for the first time a M1 analog output module you will need a miliammeter to measure the 4/20 mA loop generated and follow the steps below:

1. access the instrument and install the M1 module at slot 1 *(see section 1.24).*

2. connect the miliammeter to measure the 4/20 mA loop generated by the analog output module just installed.

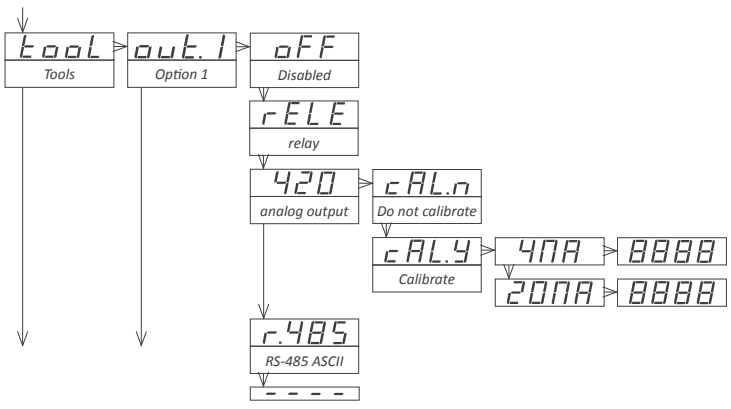
3. inform the instrument that there is a M1 analog output option installed at slot Opt.1 : go to 'Tools' \ 'Opt.1' and select '420'. See below an image of the configuration menu once the '420' value has been selected.

3. When selecting '420' the instrument shows '**cAL.n**'. ('**Do not calibrate**'). Press 'UP' (▲) to read '**cAL.y**' ('**Calibrate**'). At this point the miliammeter must be already connected.

4. When selecting '**cAL.y**' ('**Calibrate**') select '4 mA' and you will see a numerical value. The instrument will then generate 4 mA that you will read at the miliammeter. Increase the numerical value with the key 'UP' (▲) to increase the current generate by the analog output module. Reduce with the key 'LE' (◀). When the miliammeter shows the instrument is at 4.00 mA, validate the value with key 'SQ' (■). The 4 mA output is now calibrated.

5. Repeat with the '20 mA' parameter, and now the measure will be 20 mA at the miliammeter. Once validated with key 'SQ' (■), and use key 'LE' (◀) to exit the configuration menu.

The analog output has been calibrated for this instrument.

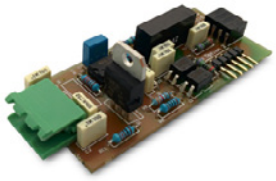


2.3 Module S1 (Modbus RTU)

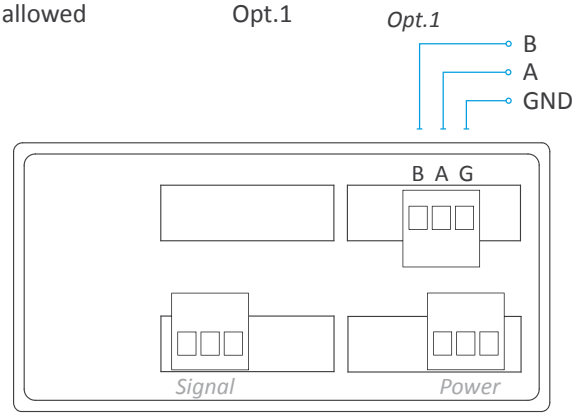
The S1 module offers 1 Modbus RTU serial output, isolated, to be installed at slot Opt1.

Configuration is done from the front keypad, through the configuration menu. The instrument must be informed that there is a Modbus RTU module at slot.1 and this is done at the configuration menu 'Tool' \ 'out.1' *(see section 1.27.7).* Then configure the bus parameters at the configuration menu 'out.1' \ 'r485' *(see section 1.27.8).*

The S1 module can be ordered installed in to a Series C instrument or standalone for later installation, as it does not require soldering or special configuration.



Protocol	Modbus RTU	
Bus type	RS-485, configurable for 9.600 bps or 4800 bps	
Formats	configurable 8n1, 8e1, 8o1, 8n2	
Functions	4	read register
Registers	0	reading value (16 bits)
	1	number of decimals (16 bits)
Errors	0	function not supported
	1	register not accessible
Isolation	1000 Vdc	
Slots allowed	Opt.1	



Terminal B	*B*
Terminal A	*A*
Terminal G	*GND*

3. Other options

3.1 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

3.2 Option 54

O-ring for the panel-meter junction, allows a front protection level of IP54.

3.3 Option 65

Front IP65 protection, with sealing of front filter clips.

** opening the front filter removes the IP65 sealing permanently.*

3.4 Option EK - External control

Rear terminal to connect a contact for external control. One function can be selected to be controlled from the contact state, selectable between : 'second scaling', 'hold', 'decimal point', 'memory of maximum' or 'memory of minimum'. See section *1.11* for more information

3.5 Option 'customized'

Instruments can be adapted to your needs :

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

4. Accessories

4.1 Adapter DRA-M

Adapter for DIN rail mount, for Series C

4.2 Adapter KA96

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

4.3 Protector KIP

Front IP65 protector for Series C of panel meters.

4.4 WME wall housing

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

4.5 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.

Panel meters
Standard 96x48mm

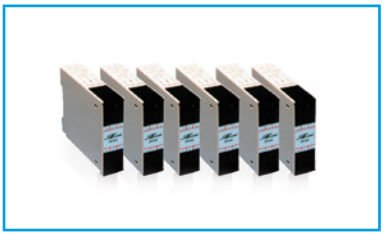
Panel meters
Miniature 48x24mm

Signal converters

Panel meters
Compact 72x36mm

Large format meters

Bar meters



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