FEMA
ELECTRÓNICA

Series K . K40-T

Meter for temperature signals

PANEL METERS

Panel meter for temperature signals, with 20 mm digit height. Accepts signals from Pt100 / RTD (2 and 3 wires) and thermocouples J, K, T, E, S, R, N, C, L and X. Reading configurable in ºC or ºF. Manual offset configurable. Configurable cold junction compensation. Sensor break detection. Standard 96 x 48 mm size (1/8 DIN). Reading with 4 digit display. Fast access to alarm setpoints, 'on power up' function, configurable reading brightness. Universal AC and DC power. Up to 3 optional modules for output and control (relays, analog outputs, Modbus RTU communications, RS-485 ASCII, RS-232, …)

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1. Panel meter K40-T

Panel meter 96x48mm (1/8 DIN) for temperature signals, with 20mm digit height

Panel meter 96x48mm (1/8 DIN) for temperature signals, with 20mm digit height. Accepts signals from Pt100 / RTD (2 and 3 wires) and thermocouples J, K, T, E, S, R, N, C, L and X. Configurable reading in ºCelsius or ºFahrenheit. Thermocouple cold junction compensation configurable *(see section 1.11.2)*. Configurable offset for display reading *(see section 1.11.2)*. Selectable behavior in case of sensor break *(see section 1.11.2)*. Reading with 4 digits and negative sign.

Options for output and control with 1, 2 and 3 relays, isolated analog outputs, communications in Modbus RTU, RS-485 ASCII and RS-232. Special options with 4 and 6 relay outputs.

Independent alarms configurable as maximum or minimum, with 1 or 2 setpoints per alarm, hysteresis, independent activation and de-activation delays and control for inverted relay.
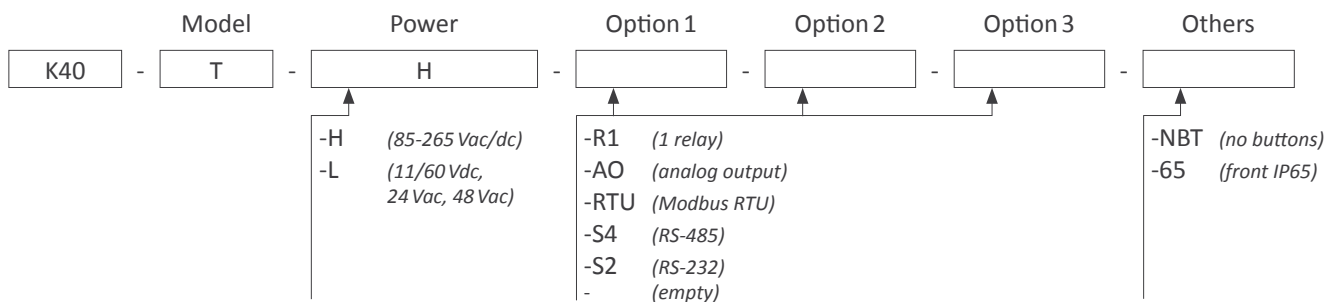
Front protection IP54 with optional IP65. Connections by plug-in screw terminals. For industrial applications.

• '**Fast access**' menu to selected functions, accessible with key UP (▲) *(see section 1.11.5)*

• '**On power up**' for system protection on first 'cold' start-up *(see section 1.11.7)*

Display filters, memory for maximum and minimum reading, password protection, 5 brightness levels.
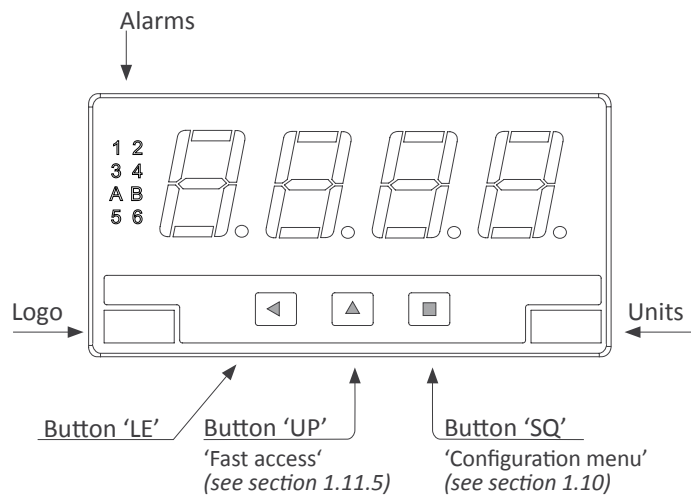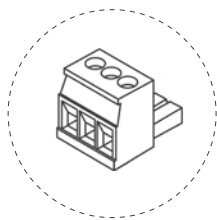
1.1 How to order

Model	Power	Option 1	Option 2	Option 3	Others

K40 - T - H - ___ - ___ - ___ - ___

-H (85-265 Vac/dc)
-L (11/60 Vdc, 24 Vac, 48 Vac)

-R1 (1 relay)
-AO (analog output)
-RTU (Modbus RTU)
-S4 (RS-485)
-S2 (RS-232)
- (empty)

-NBT (no buttons)
-65 (front IP65)

Index

1.2 Front view

Alarms

Logo

Units

Button 'LE'

Button 'UP'
'Fast access'
(see section 1.11.5)

Button 'SQ'
'Configuration menu'
(see section 1.10)

1.3 Rear view

Option 3   Option 1   Option 2

1 2 3   8 9 0

Signal
(see section 1.5 and 1.6)

Power
(see section 1.4)

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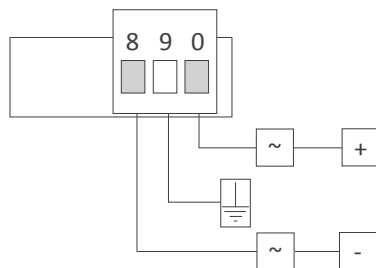
Fuse - To comply with security regulation 61010-1, add to the power line a protection fuse acting as disconnection element, easily accessible to the operator and identified as a protection device.

Power 'H'   fuse 250 mA time lag

Power 'L'   fuse 400 mA time lag

1.5 Signal connections - Pt100 / RTD

For Pt100 / RTD with 2 wires

Pt100 2 wires
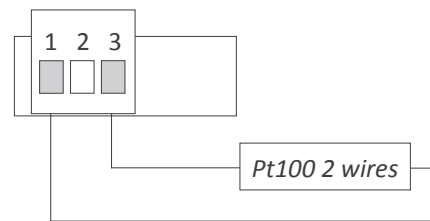
For Pt100 / RTD with 3 wires

Pt100 3 wires
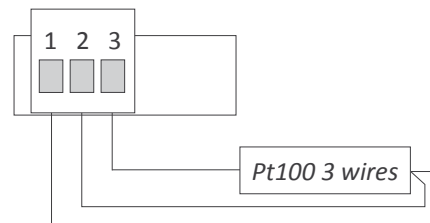
1.6 Signal connections - Thermocouple

+

-

1.7 Mechanical dimensions (mm)

48

96

16   75   8

44   Panel cut-out

92
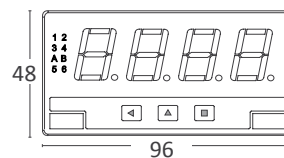
1.8 Technical specifications

Digits
number of digits   4
led   7 segments led
color   red
digit height   20 mm

Reading
overrange   9999 with flash reading
underrange   -1999 with flash reading
in case of sensor break   reading 'to_high' or 'to_low' *(see section 1.11.2)*

Signal ranges   *(see Table 1)*
Accuracy at 25 ºC   *(see Table 1)*
Thermal drift   *(see Table 1)*

Signals accepted   Pt100 / RTD *(see Table 1)*
                        thermocouples *(see Table 1)*
temperature scale   ITS90
units   ºC or ºF, configurable

Pt100 / RTD   2 or 3 wires, configurable
resolution   1º or 0.1º, configurable
ranges   *(see Table 1)*
max. error at 25ºC   *(see Table 1)*
offset drift   *(see Table 1)*
span drift*   *(see Table 1)*
*(*span drift includes offset drift)*
cable compensation   automatic up to 14 Ohms
readings   4 / second

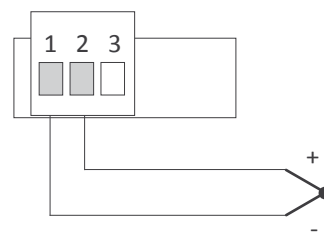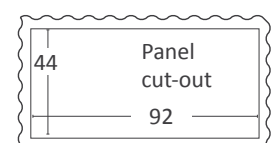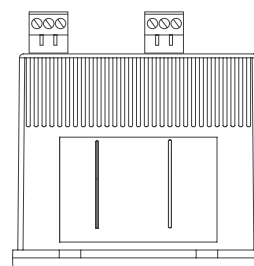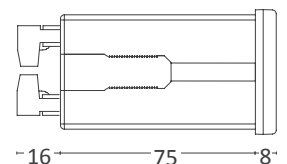**Thermocouples**   J, K, T, E, S, R, N, C, L and X
                        (thermocouple X is 10 uV/ºC linear signal)
resolution   1º
ranges   *(see Table 1)*
max. error at 25 ºC   *(see Table 1)*
offset drift   *(see Table 1)*
span drift*   *(see Table 1)*
*(*span drift includes offset drift)*
thermocouple CJC   automatic *(see section 1.11.2)*
cold junction accuracy <1.0 ºC
cold junction drift   <0.04 º/ºC
readings   3 / second

Power
power 'H'   85 a 265 Vac/dc
power 'L'   11 a 60 Vdc y 24/48 Vac
isolation*   2500 Veff with power 'H'
                        1500 Veff with power 'L'
                        all units tested during 60 seconds
consumption   <1.5 W only meter
                        <4.0 W meter with options

Configuration   3 buttons front keypad
                        (and rear jumper)

Front protection   IP54 standard
                        IP65 optional *(see section 3.2)*

Output and control options relays, analog outputs, serial communications, ... *(see section 2)*

Sensor	Range (en ºC)	Error max. at 25 ºC	Range (en ºF)	Offset drift	Span drift* *includes offset drift*
Pt100 / RTD	800 / -200 ºC	<0.2 ºC	1562 / -328 ºF	0.05 º/ºC	0.10 º/ºC
Thermocouple J	1200 / -200 ºC	<2 ºC	2192 / -328 ºF	0.05 º/ºC	0.20 º/ºC
Thermocouple K	1372 / -200 ºC	<2 ºC	2372 / -328 ºF	0.05 º/ºC	0.20 º/ºC
Thermocouple T	400 / -200 ºC	<2 ºC	752 / -328 ºF	0.02 º/ºC	0.02 º/ºC
Thermocouple E	1000 / -200 ºC	<2 ºC	1832 / -328 ºF	0.05 º/ºC	0.20 º/ºC
Thermocouple S	1768 / -50 ºC	<4 ºC	2282 / -58 ºF	0.20 º/ºC	0.20 º/ºC
Thermocouple R	1600 / -50 ºC	<4 ºC	2912 / -58 ºF	0.20 º/ºC	0.20 º/ºC
Thermocouple N	1300 / -200 ºC	<2 ºC	2372 / -328 ºF	0.05 º/ºC	0.20 º/ºC
Thermocouple C	2320 / 0 ºC	<2 ºC	4192 / 32 ºF	0.02 º/ºC	0.02 º/ºC
Thermocouple L	900 / -200 ºC	<2 ºC	1652 / -328 ºF	0.05 º/ºC	0.20 º/ºC
Thermocouple X	4000 / -200 ºC	<2 ºC	7232 / -328 ºF	0.02 º/ºC	0.02 º/ºC

Table 1 - Technical specifications for each sensor

1.8 Technical specifications (cont.)

Mechanical

mounting	panel
connections	plug-in screw terminal
housing material	ABS, polycarbonate (V0)
weight	<150 grams
front size	96 x 48 mm (1/8 DIN)
panel cut-out	92 x 44 mm
depth from panel	91 mm (including terminals)

Temperature

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

Functions included		*Section*
'Fast access'	*yes*	*1.11.5*
Manual offset	*configurable*	*1.11.2*
Thermocouple cold junction	*configurable*	*1.11.2*
Sensor break detection	*configurable*	*1.11.2*
Display filters	*steps*	*1.11.4*
Memory	*max. and min. readings*	*1.11.4*
Password	*configuration block*	*1.11.9*
Alarms	*double setpoints activation delays deactivation delays hysteresis inverted relays locked alarms*	*1.11.3*
Display brightness	*5 levels*	*1.11.12*
'On Power Up'	*yes*	*1.11.7*
Table 2 - Functions included		

1.9 Messages and errors

The error messages are shown on display in flash mode.

Messages and errors	
'h.oVr'	Hardware overrange ('**h.ovr**'). Input signal is higher than the maximum signal the instrument can detect (80 mV)
'h.udr'	Hardware underrange ('**h.udr**'). Input signal is lower than the minimum signal the instrument can detect (-30 mV).
'd.udr' 'd.oVr'	display underrange ('**d.udr**') / overrange ('**d.ovr**'). The instrument already displays the minimum / maximum value possible (-1999 / 9999).
'brk'	instrument will display 'brk' message in the following cases • when measuring Pt100 / RTD, the resistance measured is higher than 390 Ohms (higher than 850 ºC) • when measuring Pt100 / RTD, the third wire (sense wire) presents an impedance higher than 15 Ohms • when measuring thermocouples, the thermocouple circuit is open circuit
'Err.1'	incorrect password.
'Err.2'	at '**oPt.X**' menu entry. Installed module is not recognized.
Table 3 - Messages and error codes	

1.10 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 *1.12*.

'*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 *1.11.5* 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.
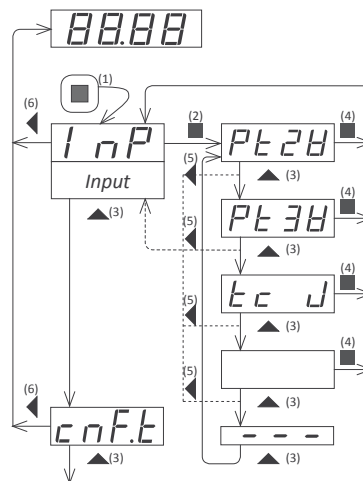
Example of operation inside the '*configuration menu*'.

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.

1.11 Configuration menu

Press 'SQ' (■) for 1 second to access the '*configuration menu*'. For a description on how to operate inside the menus see section *1.10*. For a full vision of the '*configuration menu*' structure see section *1.12*.

InP Input	*Pt2H*	Pt100 / RTD 2 wires
	Pt3H	Pt100 / RTD 3 wires
	tc J	Thermocouple J
	tc F	Thermocouple K
	tc t	Thermocouple T
	tc E	Thermocouple E
	tc 5	Thermocouple S
	tc r	Thermocouple R
	tc n	Thermocouple N
	tc c	Thermocouple C
	tc L	Thermocouple L
	tc H	Thermocouple X
	- - - -	

cnF.t Temperature configuration	*dEG* Degrees	*°c*	Degrees Celsius
		°F	Degrees Fahrenheit
	P.rES Resolution Pt100	*1°*	1º resolution
		0.1°	0.1º resolution
	oFFS Reading offset	*on* → *8888*	
		oFF	
	t.cJc Thermocouple CJC	*on/oFF*	
	on.bt 'On break'	*to h*	Reading to maximum
		to L	Reading to minimum
	ALPh Alpha	*385*	Alpha 385
		390	Alpha 390
	- - - -		

1.11.1 Initial set-up

To configure the initial set up of the instrument, select the type of sensor to be connected to the instrument.

Access the '**Input**' ('**InP**') menu to select the type of sensor. Options available are Pt100 / RTD with 2 and 3 wires, and thermocouples J, K, T, E, S, R, N, C, L and X. Thermocouple X is a linear signal os 10 uV/ºC.

1.11.2 Temperature configuration

The '**Temperature configuration**' ('**cnF.t**') menu allows to configure several functions associated to the measure and working with temperature signals.

• at the '**Degree**' ('**dEG**') menu, select '**ºc**' to measure in Celsius degrees, or select '**ºF**' to measure in Fahrenheit degrees.

• at the '**Resolution Pt100**' ('**P.rES**') menu, select the reading resolution for the Pt100 / RTD. Select '**1º**' for 1º resolution or select '**0.1º**' for 0.1º resolution.

• at the '**Reading offset**' ('**oFFS**') menu, configure a number of counts to be added to the reading. Applies both to the measure in Pt100 / RTD and thermocouples. This offset allows to correct reading errors associated to different types of probes, which can not be corrected by other means. Offset value allows for '±100' display counts.

• the '**Thermocouple CJC**' ('**t.cJc**') menu allows to active or deactivate the automatic compensation of the thermocouple cold junction. When working with a real thermocouple, compensation must be on. In case of using an electronic thermocouple simulator, it may be needed to deactivate the automatic cold junction compensation.

• at the '**on break**' ('**on.bk**') menu select the behavior of the instrument in case of sensor break detection. Select '**to_h**' to set reading to overrange, or select '**to_L**' to set reading to underrange.

• at the '**Alpha**' ('**ALPh**') menu configure the alpha for the Pt100 / RTD. The standard values in industry are '**385**' and '**390**'.
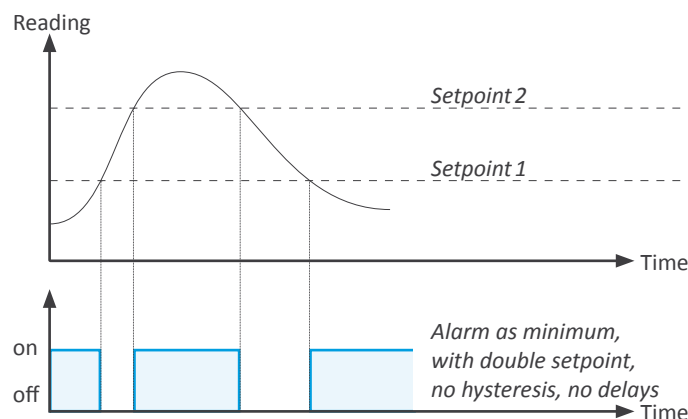
1.11 Configuration menu (cont.)
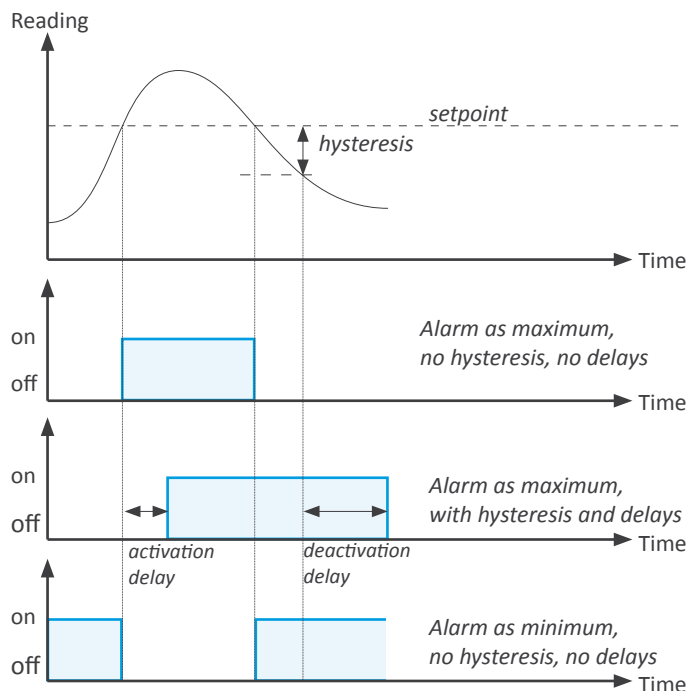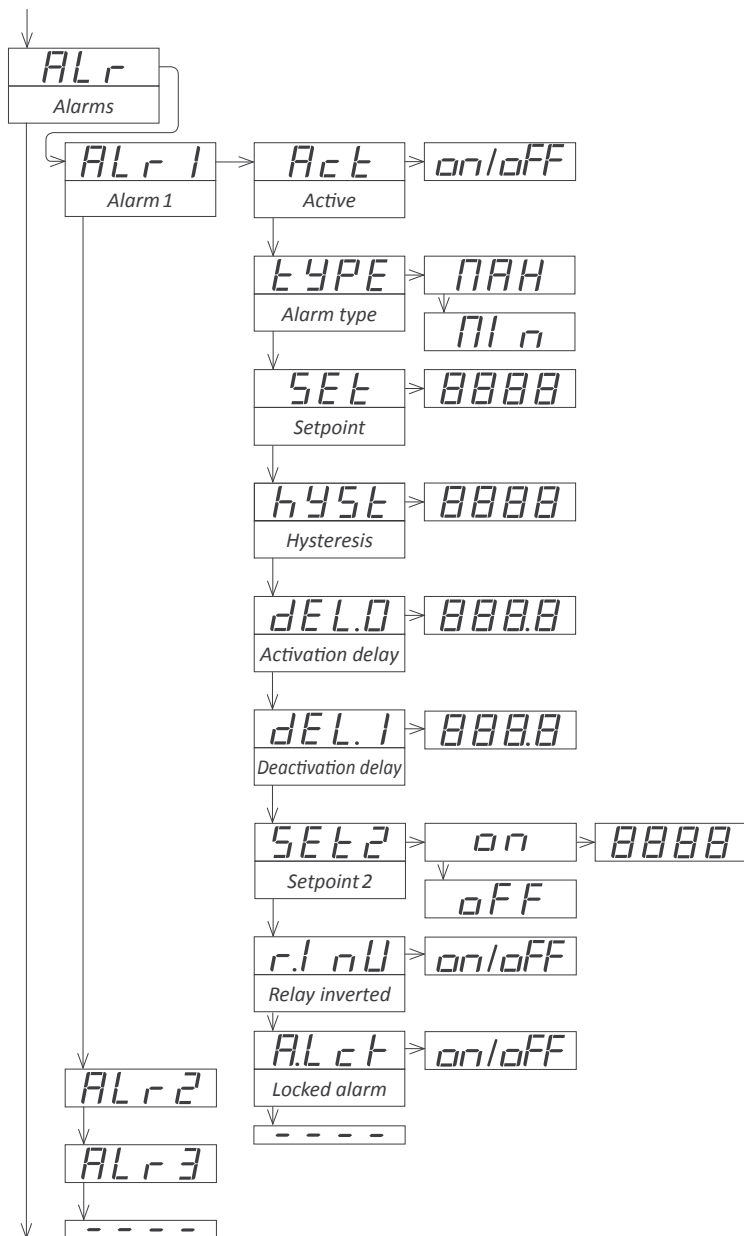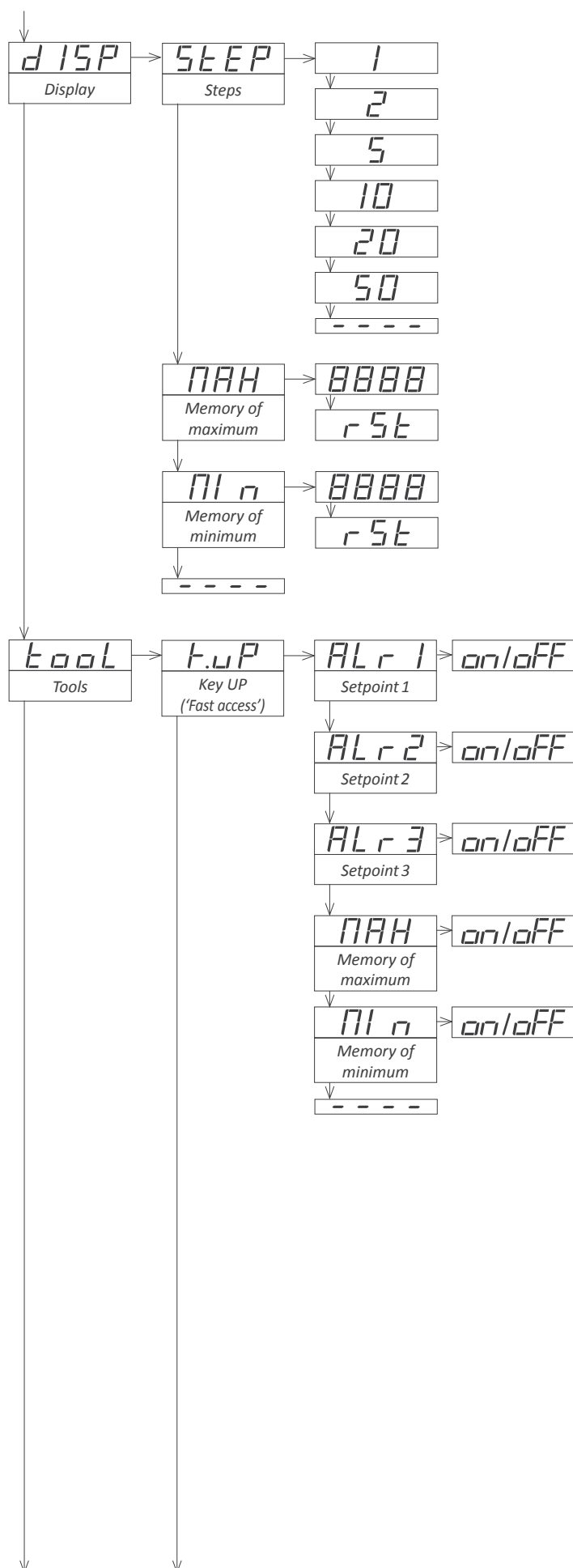

1.11.3 Alarms

The '**Alarms**' ('**ALr**') menu configures the independent activation of up to 3 relay outputs, installed with the R1 optional modules *(see section 2.1)*. For outputs up to 4 and 6 relays, see special modules R2, R4 and R6 at section *2.6*. The alarm states are indicated in the front display with leds marked as '1', '2' and '3'.

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

• select '**Active**' ('**Act**') to '**on**'

• at '**Alarm type**' ('**TypE**') select the alarm acting as a maximum type alarm ('**MAX**') or a minimum type alarm ('**MIn**'). The maximum type alarm (or minimum type alarm) activates when the display value is higher (or lower) than the setpoint value.

• at '**Setpoint**' ('**SEt**') enter the value for the alarm activation point. This parameter is eligible for configuration through the '*Fast access*' menu *(see section 1.11.5).*

• 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.

• at '**Activation delay**' ('**dEL.0**') configure the delay to apply before alarm activation. The activation delay starts counting when the setpoint value is passed. Value from 0.0 to 99.9 seconds.

• at '**Deactivation delay**' ('**dEL.1**') configure the delay to apply before alarm deactivation. The deactivation delay starts counting when the setpoint value plus the hysteresis value, is passed. Value from 0.0 to 99.9 seconds.

• to work with 'windowed alarms' (see graphical example below) activate '**Setpoint 2**' ('**SEt2**') to '**on**' and then configure the desired second setpoint value. Second setpoint must always be higher in value than the first setpoint.

• the '**Relay inverted**' ('**r.Inv**') parameter inverts the normal relay connections. When set to '**on**' the relay will be active when alarm is inactive. For security applications where an inactive relay controls the shutdown of the system.

• the '**Locked alarm**' ('**A.Lck**') parameter disables the automatic deactivation of the alarm. Alarm deactivation must be performed manually, by pressing the 'LE' front button *(see section 1.11.8)*

Alarm as maximum,
no hysteresis, no delays

Alarm as maximum,
with hysteresis and delays

Alarm as minimum,
no hysteresis, no delays

Alarm as minimum,
with double setpoint,
no hysteresis, no delays

1.11 Configuration menu (cont.)

1.11.4 Display filters

The instrument provides several functions associated to the reading of the display values

• the '**Steps**' ('**StEP**') function allows to define minimum reading steps, which will be done in steps of 1, 2, 5, 10, 20 or 50 counts.

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

• the '**Memory of maximum**' ('**MAX**') function displays the maximum reading value stored in memory. It also provides a way to reset the value. This parameter is eligible for configuration through the '*Fast access*' menu *(see section 1.11.5).*

• the '**Memory of minimum**' ('**MAX**') function displays the minimum reading value stored in memory. It also provides a way to reset the value. This parameter is eligible for configuration through the '*Fast access*' menu *(see section 1.11.5).*

1.11.5 Fast access

The 'UP' (▲) key at the front of the instrument gives access to a list of functions configurable by the operator. See section *1.11.2* 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 through the 'fast access' menu. Select '**on**' to activate each function.

• the '**Setpoint 1**' ('**ALr1**') function allows to visualize and modify the alarm 1 setpoint through the 'fast access' menu.

• the '**Setpoint 2**' ('**ALr2**') function allows to visualize and modify the alarm 2 setpoint through the 'fast access' menu.

• the '**Setpoint 3**' ('**ALr3**') function allows to visualize and modify the alarm 3 setpoint through the 'fast access' menu.

• the '**Memory of maximum**' ('**MAX**') or '**Memory of minimum**' ('**MIn**') functions allow to visualize the maximum or minimum reading value stored in memory. To reset this value, visualize the memory value at the 'fast access' menu with key UP (▲) and when message '**rSt**' is displayed, press (■) to reset.

1.11.6 Super fast access

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

1.11 Configuration menu (cont.)

```
on.Pu  →  dLAY  →  8888
On Power-Up   Delay    Seconds

          ALr1  →  on/oFF
          Alarm 1

          ALr2  →  on/oFF
          Alarm 2

          ALr3  →  on/oFF
          Alarm 3

          - - - -


t.LE   →  nonE
Key LE     No function

          A.Lct
          Alarm unlock


PASS   →   on   →  8888
Password
           oFF

FAct   →   no
Factory reset
           YES
```
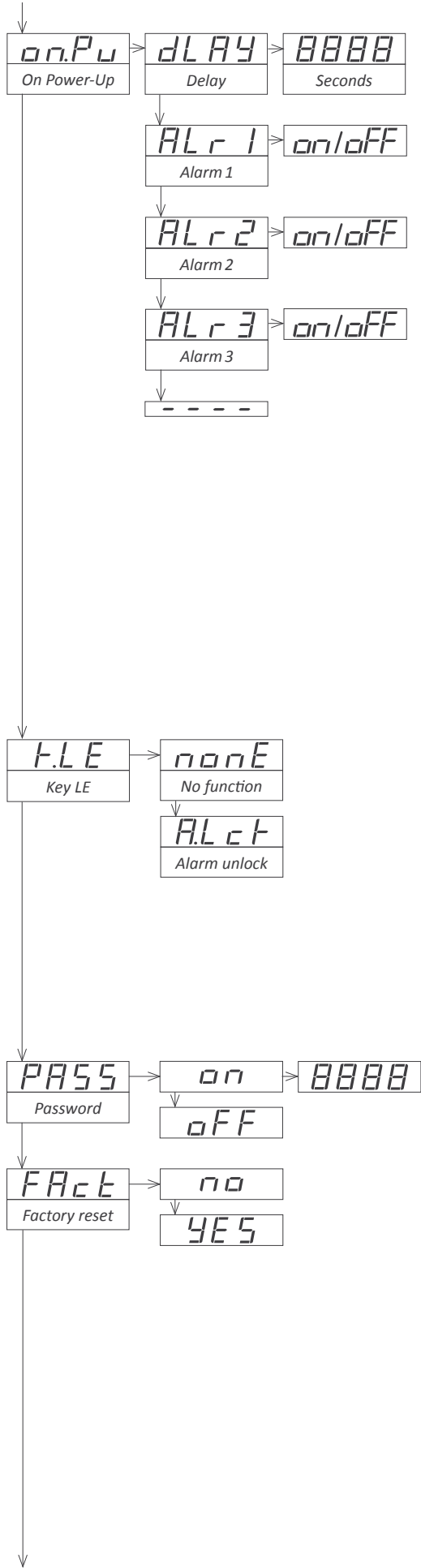
1.11.7 Menu 'On Power Up'

The '**On Power Up**' ('**on.Pu**') menu configures functions to apply at start-up. It applies only to instrument restart after power loss. It does not apply to instrument restart due to change in configuration.

• parameter '**Delay**' ('**dLAy**') assigns a waiting time in seconds. The instrument waits the configured time before starting normal function. During this waiting time, the display shows all decimal points on in flash mode, all alarms are in the state defined at the '**Alarm 1**', '**Alarm 2**' and '**Alarm 3**' entries, there is no signal acquisition and there is no communications or control being performed. After the configured time is over, the instrument starts in normal function. Delay value between 0 and 200 seconds.

Application - the start-up process for an automation system implies that different parts of the system (engines, actuators, controllers, ...) have different start-up times. The 'Delay' function gives time to the instrument to wait until the slowest part of the system is fully functional before executing actions on the system (signal reading, relay activation, ...)

• the '**Alarm 1**' ('**ALr1**'), '**Alarm 2**' ('**ALr2**') and '**Alarm 3**' ('**ALr3**') parameters allow to define the status of the alarms while the instrument is starting from a power loss. Select '**on**' for active alarm, select '**oFF**' for deactivated alarm.

1.11.8 Menu 'Key LE'

The 'LE' (◄) key at the front of the instrument can be configured to activate several functions. Only one function can be assigned to the 'LE' (◄) key

• the '**No function**' ('**nonE**') value assigns no function.

• the '**Alarm unlock**' ('**A.Lck**') value assigns the manual unlock of the alarms function, for instruments with the '**Locked alarms**' ('**A.Lck**') function activated *(see section 1.11.3)*

1.11.9 Function 'Password'

At the '**Password**' ('**PASS**') menu select a 4 digit code to block access to the '*configuration menu*'. Instrument configuration will not be accessible to non authorized personnel. To activate the '**Password**' select '**on**' and introduce the code.

The code will be requested when trying to access the '*configuration menu*' (key 'SQ' (■)). The '*fast access*' menu is not password protected.

1.11.10 Factory reset

At the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument *(see section 1.16).*

1.11 Configuration menu (cont.)
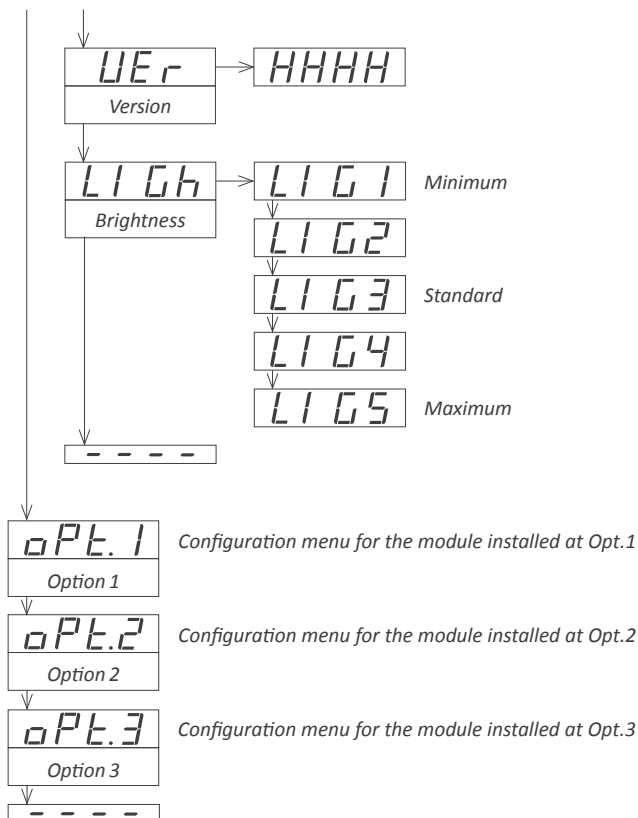
1.11.11 Firmware version

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

1.11.12 Brightness

At the '**Brightness**' ('**LIGh**') menu select the light intensity for the front leds. With this function it is possible to adapt the instrument to the environment light intensity.

1.11.13 Access to optional modules

Menus '**OPt.1**', '**OPt.2**' and '**OPt.3**' give access to the '*configuration menus*' of the output and control modules installed at slots Opt.1, Opt.2 and Opt.3.

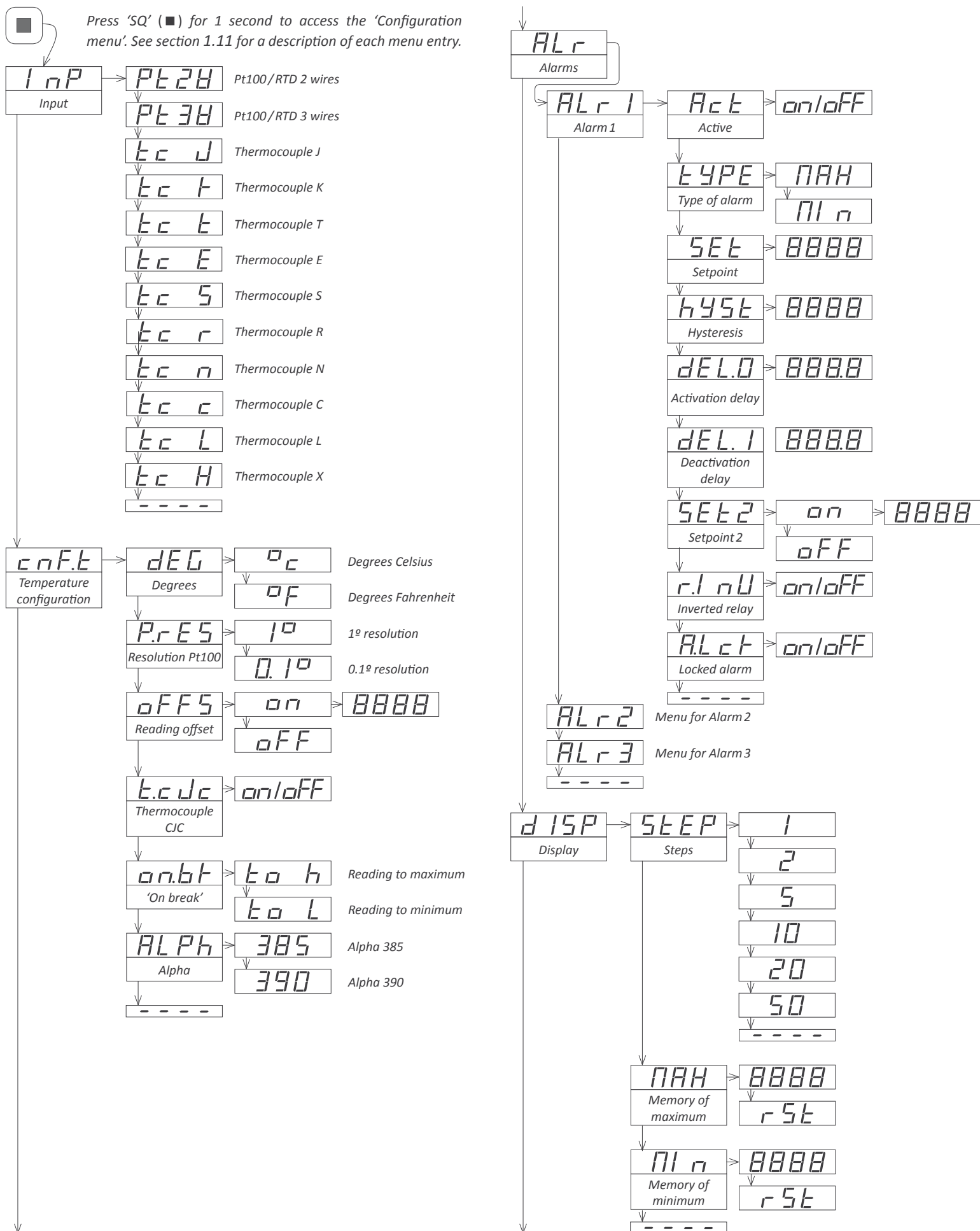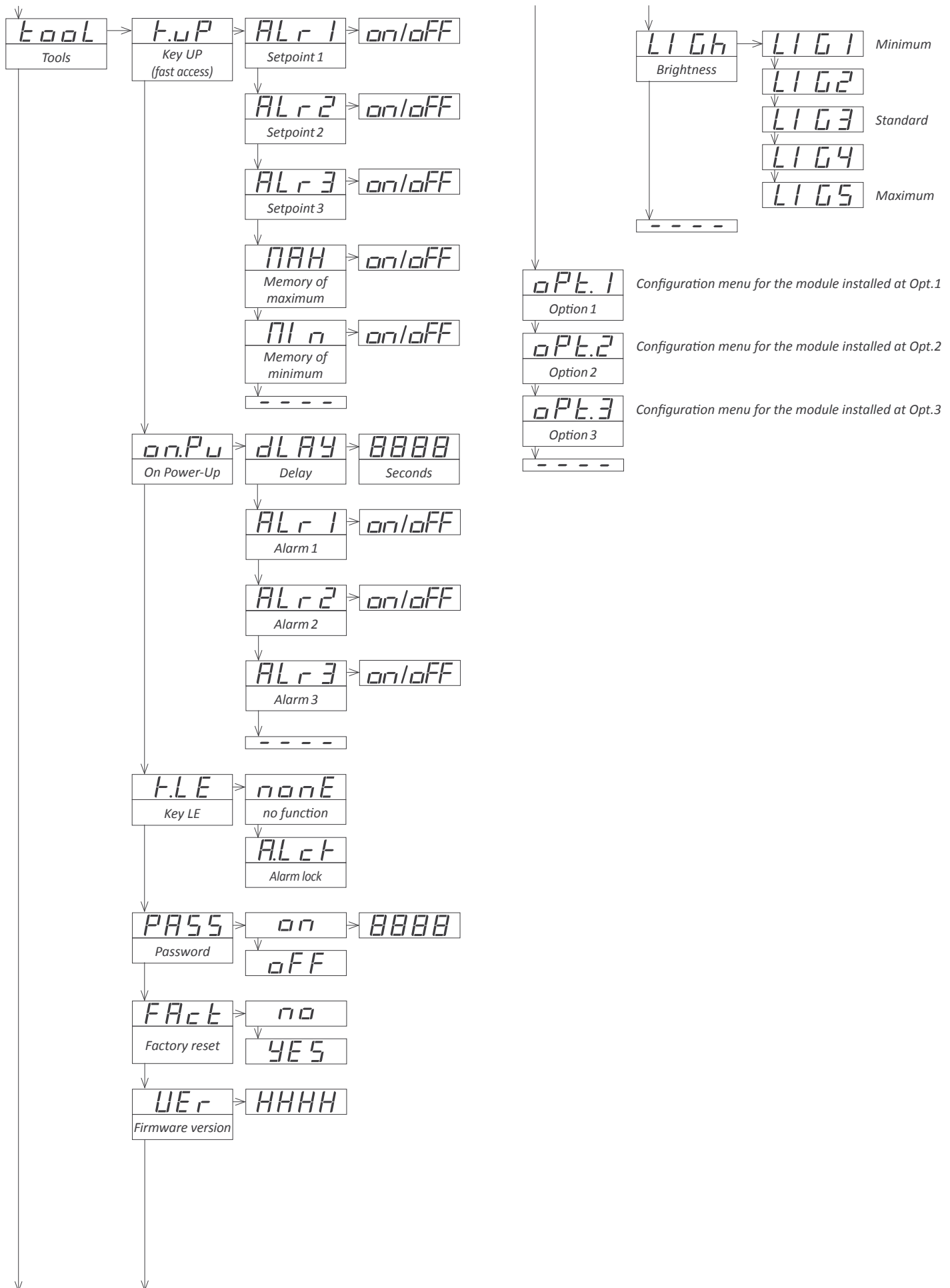See section *2* for a list of output and control modules available for each slot. The '*configuration menu*' of each module is described at the User's Manual of each module.

1.12 Full configuration menu

■ Press 'SQ' (■) for 1 second to access the 'Configuration menu'. See section 1.11 for a description of each menu entry.

I n P — Input

Pt2H	Pt100 / RTD 2 wires
Pt3H	Pt100 / RTD 3 wires
tc J	Thermocouple J
tc F	Thermocouple K
tc t	Thermocouple T
tc E	Thermocouple E
tc S	Thermocouple S
tc r	Thermocouple R
tc n	Thermocouple N
tc c	Thermocouple C
tc L	Thermocouple L
tc H	Thermocouple X
- - - -	

cnF.t — Temperature configuration

dEG — Degrees	°C	Degrees Celsius
	°F	Degrees Fahrenheit
P.rES — Resolution Pt100	1°	1º resolution
	0.1°	0.1º resolution
oFFS — Reading offset	on → 8888	
	oFF	
t.cJc — Thermocouple CJC	on/oFF	
on.bt — 'On break'	to h	Reading to maximum
	to L	Reading to minimum
ALPh — Alpha	385	Alpha 385
	390	Alpha 390
- - - -		

ALr — Alarms

ALr1 — Alarm 1

Act — Active	on/oFF	
tYPE — Type of alarm	MAH	
	MIn	
SEt — Setpoint	8888	
hYSt — Hysteresis	8888	
dEL.O — Activation delay	888.8	
dEL.1 — Deactivation delay	888.8	
SEt2 — Setpoint 2	on → 8888	
	oFF	
r.InU — Inverted relay	on/oFF	
A.Lct — Locked alarm	on/oFF	
- - - -		

ALr2 — Menu for Alarm 2

ALr3 — Menu for Alarm 3

- - - -

dISP — Display

StEP — Steps	1
	2
	5
	10
	20
	50
	- - - -
MAH — Memory of maximum	8888
	rSt
MIn — Memory of minimum	8888
	rSt
	- - - -

1.11 Full configuration menu (cont.)

tooL — Tools

t.uP — Key UP (fast access)
- **ALr1** → on/oFF — Setpoint 1
- **ALr2** → on/oFF — Setpoint 2
- **ALr3** → on/oFF — Setpoint 3
- **MAH** → on/oFF — Memory of maximum
- **MIn** → on/oFF — Memory of minimum
- - - - -

on.Pu — On Power-Up
- **dLAY** → **8888** — Delay / Seconds
- **ALr1** → on/oFF — Alarm 1
- **ALr2** → on/oFF — Alarm 2
- **ALr3** → on/oFF — Alarm 3
- - - - -

t.LE — Key LE
- **nonE** — no function
- **A.Lct** — Alarm lock

PASS — Password
- **on** → **8888**
- **oFF**

FAct — Factory reset
- **no**
- **YES**

UEr → **HHHH** — Firmware version

LIGh — Brightness
- **LIG1** — Minimum
- **LIG2**
- **LIG3** — Standard
- **LIG4**
- **LIG5** — Maximum
- - - - -

oPt.1 — Option 1 — Configuration menu for the module installed at Opt.1

oPt.2 — Option 2 — Configuration menu for the module installed at Opt.2

oPt.3 — Option 3 — Configuration menu for the module installed at Opt.3
- - - - -

1.13 To access the instrument

You may need to access the inside of the instrument to add or re-place internal modules. 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'.
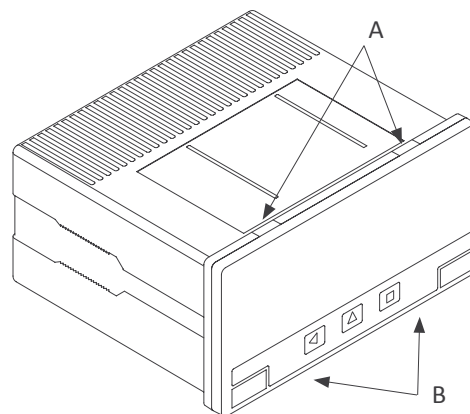
Risk of electric shock. Removing the front cover will grant access to the internal circuits. Disconnect the input signal to prevent electric shock to the operator. Operation must be performed by qualified personnel only.

1.14 Modular system

K Series panel meters are designed to create a modular system. This modular system allows for addition, replacement or substitution of any of the internal modules conforming the instrument. Below is a graphic explanation for the position of each module.
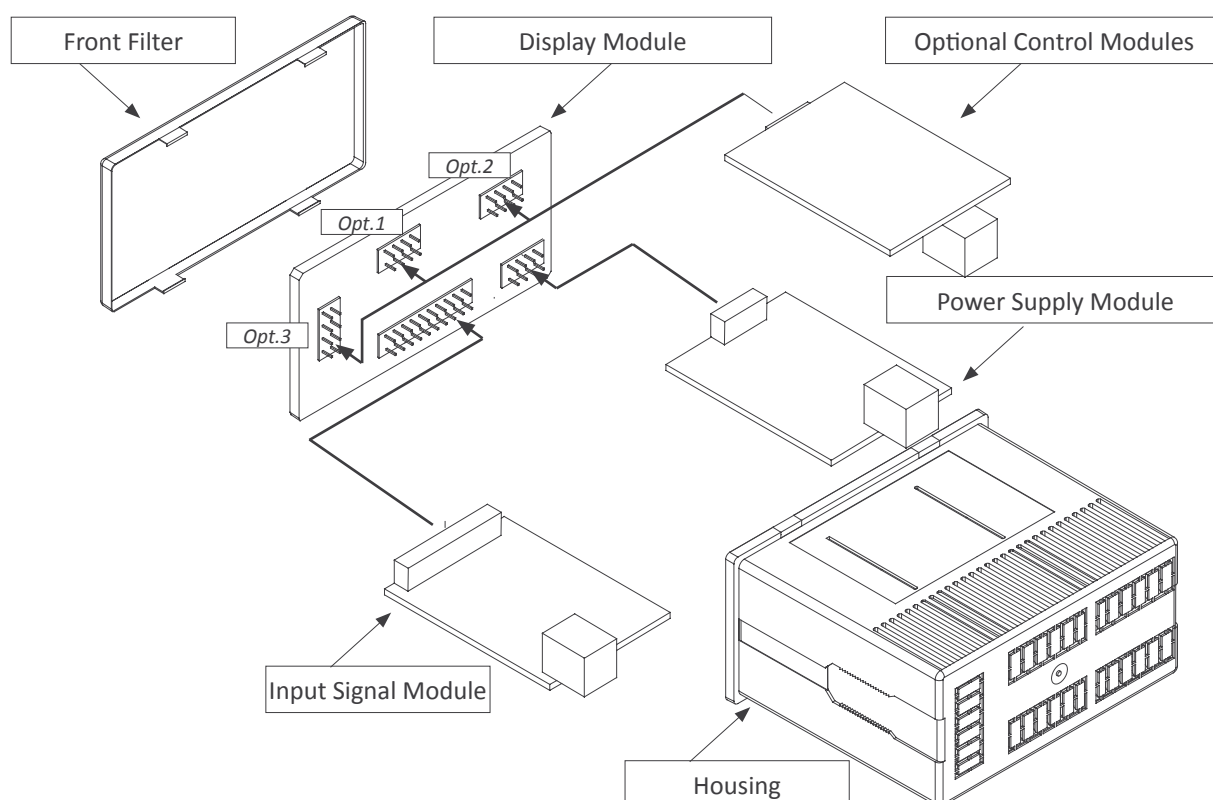
1.15 Precautions on installation

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

▣ Instrument protected with double isolation. No earth connection required.

$C\epsilon$ 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

1.16 Factory configuration

Sensor	Pt100 / RTD 2 wires
Temperature configuration	
Pt100 / RTD resolution	0.1º
Reading offset	0 counts
Thermocouple CJC	on
On break	to_h
Alpha	385
Symbol 'º'	oFF
Alarms 1,2 and 3	
Active	off (disabled)
Type	alarm as maximum
Setpoint	1000
Hysteresis	0 counts
Activation delay	0.0 seconds
Deactivation delay	0.0 seconds
Setpoint 2	off
Inverted relay	off
Locked alarms	off
Display	
Steps	off
Maximum memory	-1999
Minimum memory	9999
Tools	
'Fast access'	off
'On power-up'	
Delay	0 seconds
Alarm 1	off
Alarm 2	off
Alarm 3	off
Key LE	no function
Password	off
Brightness	3

1.17 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.

of the instrument must be assured. Do not expose the instrument to excess of humidity. Maintain clean by using a humid rag and do NOT use abrasive products such as alcohols, solvents, etc.

General recommendations for electrical installations apply, and for proper functionality we recommend : if possible, install the instrument far from electrical noise or magnetic field generators such as power relays, electrical motors, speed variators, ... If possible, do not install along the same conduits power cables (power, motor controllers, electrovalves, ...) together with signal and/or control cables.

Before proceeding to the power connection, verify that the voltage level available matches the power levels indicated in the label on the instrument.

In case of fire, disconnect the instrument from the power line, fire alarm according to local rules, disconnect the air conditioning, attack fire with carbonic snow, never with water.

1.18 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	K40-T

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

Emission levels

CISPR 11	Instrument Class A, Group 1	Criteria A

Barberà del Vallès May 2015
Daniel Juncà - Quality Manager

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

2. Output and control modules

2.1 Module R1

The R1 module provides 1 relay output to K Series panel meters. Up to a maximum of 3 R1 modules can be installed in a single instrument (3 relays).

Note : for more than three relays per instrument or larger relay density per module, see special modules R2, R4 and R6 at section 2.6.

Relays with 3 contacts each (common, normally closed, normally open), with switching capability up to 250V @ 8A.

Modules R1 are configured from the 'ALr1', 'ALr2' and 'ALr3' alarm menus of the panel meter. The 'ALrX' menus provide configuration for main setpoint, hysteresis, independent activation and deactivation delays, and a second setpoint to create windowed alarms.

Modules R1 are installed on slot '*Opt.1*', '*Opt.2*' or '*Opt.3*' *(see section 1.14)* and are configured from instruments front keypad.

The R1 module can be ordered pre-installed into a K Series panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.
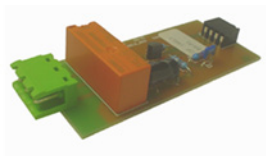
Type of relay	3 contact relay (NC, NO, common)
Current maximum	8A per relay (resistive load)
Voltage maximum*	250 Vac continuous
Isolation	3500 Veff
Type of terminal	plug-in screw terminal, pitch 5.08 mm
Slots allowed	'Opt.1', 'Opt.2', 'Opt.3' *(see section 1.14)*

Terminal A	Common
Terminal B	NO - Normally Open
Terminal C	NC - Normally Closed
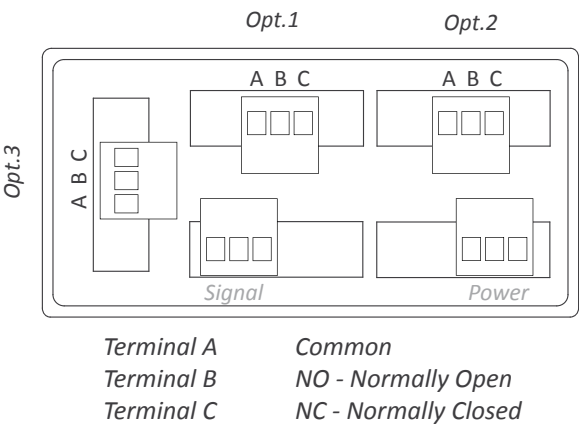
For more information see document 3543_MODULE-K_R1_manual_i.pdf

2.2 Module AO

The AO module provides 1 analog output with 4/20 mA or 0/10 Vdc configurable output range. Output current loop configurable as active (the instrument provides the excitation for the loop) or passive (the loop is externally powered). Signal output proportional to the instruments reading. Fully configurable scaling, in direct (positive slope) or inverse (negative slope) scaling.
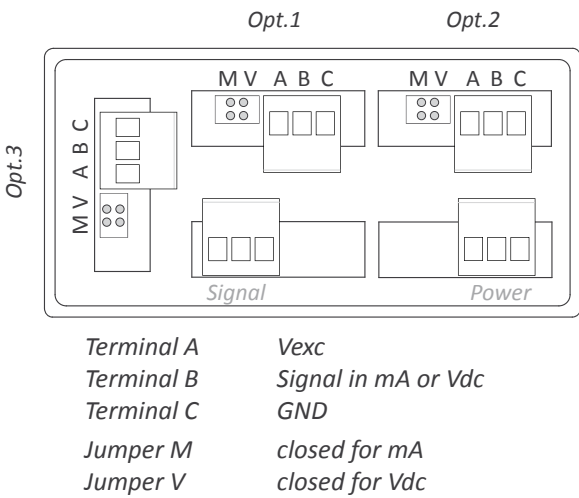
Up to a maximum of 3 analog output modules can be installed in a single instrument, all outputs isolated between them and isolated from the power and input signal circuits.

Configuration from instrument front keypad, through menu entries 'Opt.1', 'Opt.2' or 'Opt.3', depending on the position the module is installed *(see section 1.14)*.

The AO module can be ordered pre-installed into a K Series panel meter, or standalone for delayed installation, as it does not require soldering or special configuration.

Output ranges	4/20 mA active, 4/20 mA passive 0/10 Vdc
Accuracy (at 25 ºC)	<0.1% FS
Isolation	1000 Vdc
Slots allowed	'Opt.1', 'Opt.2', 'Opt.3' *(see section 1.14)*

Terminal A	Vexc
Terminal B	Signal in mA or Vdc
Terminal C	GND
Jumper M	closed for mA
Jumper V	closed for Vdc

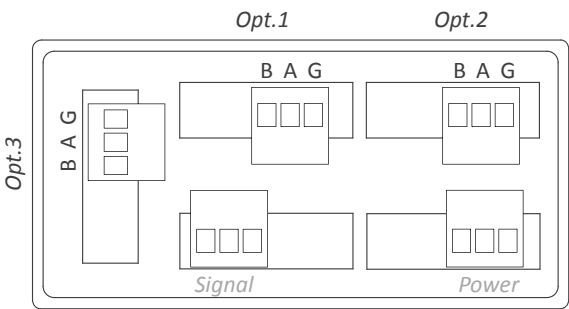For more information see document 3541_MODULE-K_AO_manual_i.pdf

2.3 Module RTU

The RTU module provides a Modbus RTU communications module for K Series of panel meters. The RTU module implements function '4' ('Read Input Registers') of the Modbus RTU protocol, to access the instrument registers (reading value, alarm status, memory of maximum and minimum, ...)

Configuration from instrument front keypad, through menu entries 'Opt.1', 'Opt.2' or 'Opt.3', depending on the position the module is installed *(see section 1.14)*.

The RTU module can be ordered pre-installed into a K Series panel meter, or standalone for delayed installation, as it does not require soldering or special configuration.

2.4 Module S4

The S4 module provides a RS-485 communications module for K Series of panel meters. ASCII protocol with 'Master' / 'Slave' architecture. Addressable with up to 31 modules. Frames codified in representable ASCII characters (codes 32 to 255), directly visible using 'hyperterminal' or similar programs.
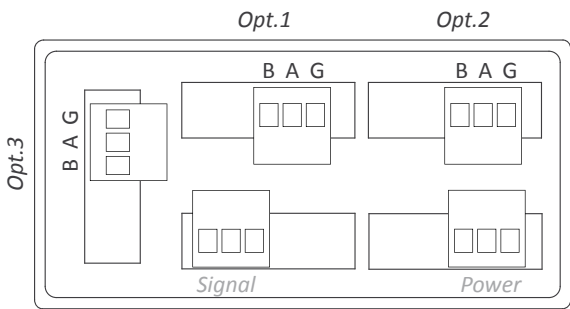
• Configurable for direct retransmission to remote meter of K Series (20 mm digit height) and BDF Series (60 mm and 100 mm digit height).

• Access to display values, alarm status, memory of maximum and minimum, alarm setpoints, ...

Configuration from instrument front keypad, through menu entries 'Opt.1', 'Opt.2' or 'Opt.3', depending on the position the module is installed *(see section 1.14)*.

The S4 module can be ordered pre-installed into a K Series panel meter, or standalone for delayed installation, as it does not require soldering or special configuration.

Protocol	Modbus RTU
Functions implemented	4 (Read_Input_Registers)
Bus type	RS-485, up to 57.6 Kbps
Isolation	1000 Vdc
Slots allowed	'Opt.1', 'Opt.2', 'Opt.3' *(see section 1.14)*

Protocol	ASCII
Bus type	RS-485, up to 57.6 Kbps
Isolation	1000 Vdc
Slots allowed	'Opt.1', 'Opt.2', 'Opt.3' *(see section 1.14)*

Terminal B	*B signal from RS-485 bus*	
Terminal A	*A signal from RS-485 bus*	
Terminal G	*GND*	

Terminal B	*B signal from RS-485 bus*	
Terminal A	*A signal from RS-485 bus*	
Terminal G	*GND*	

For more information see document 3545_MODULE-K_RTU_manual_i.pdf

For more information see document 3547_MODULE-K_S4_manual_i.pdf

2.5 Module S2

The S2 module provides a RS-232 communications module for K Series of panel meters. ASCII protocol with 'Master' / 'Slave' architecture. Addressable with up to 31 modules. Frames codified in representable ASCII characters (codes 32 to 255), directly visible using 'hyperterminal' or similar programs.

• Access to display values, alarm status, memory of maximum and minimum, alarm setpoints, ...

Configuration from instrument front keypad, through menu entries 'Opt.1', 'Opt.2' or 'Opt.3', depending on the position the module is installed *(see section 1.14)*.

The S2 module can be ordered pre-installed into a K Series panel meter, or standalone for delayed installation, as it does not require soldering or special configuration.
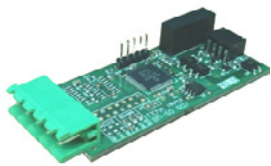
Protocol	ASCII
Bus type	RS-232, up to 57.6 Kbps
Isolation	1000 Vdc
Slots allowed	'Opt.1', 'Opt.2', 'Opt.3' *(see section 1.14)*
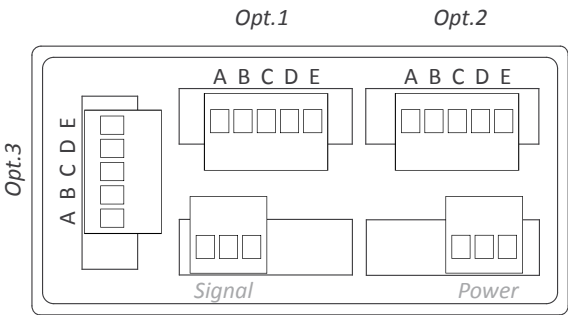
Terminal A	GND
Terminal B	Rx1
Terminal C	Tx1
Terminal D	Rx2
Terminal E	Tx2

For more information see document 3549_MODULE-K_S2_manual_i.pdf

2.6 Modules R2, R4, R6

The R2, R4 and R6 modules provide 2, 4 and 6 relay outputs for K Series panel meters. Relays with 3 contacts each, with switching capability up to 250 V @ 6 A.

Modules R2, R4 and R6 are installed on slot 'Opt.1' *(see section 1.14)* and are configured from instruments front keypad, and provide setpoint configuration, hysteresis, independent activation and deactivation delays, and second alarm setpoint for windowed alarms.

Only one module R2, R4 or R6 can be installed per instrument. Modules R2, R4 and R6 are not compatible with standard R1 modules.

The R2, R4 and R6 modules can be ordered pre-installed into a K Series panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Type of relay	3 contact relay (NC, 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 3.81 mm

* terminals approved for 300 V (according to UL1059, groups B and D) and 160 V (according to VDE on CAT-III and pollution degree 3).

Module R2	occupies Opt.1
Module R4	occupies Opt.1 and Opt.2
Module R6	occupies Opt.1, Opt.2 and Opt.3
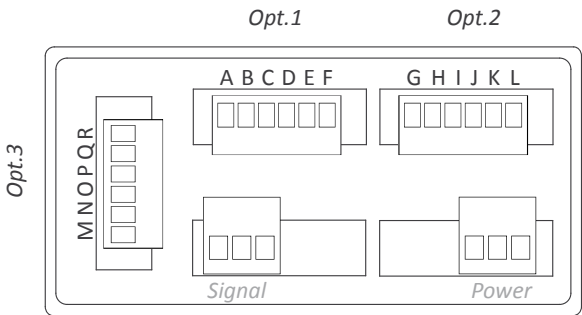
Relay	Common	Normally Open (NO)	Normally Closed (NC)
relay 1	A	B	C
relay 2	D	E	F
relay 3	G	H	I
relay 4	J	K	L
relay 5	M	N	O
relay 6	P	Q	R

Table 4 - Connections for modules R2, R4 and R6

For more information see document 3551_MODULES-K_R2-R4-R6_manual_i.pdf

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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 65

Front IP65 protection, with sealing of front filter clips.

* opening the front filter removes the IP65 sealing permanently.

4. Accessories

4.1 THM benchtop housing

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

4.2 Adapter DRA-M

Adapter for DIN rail mount, for Series M and Series K of panel meters.

4.3 Adapter KA96

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

4.4 WME housing

Wall mount housing. Together with the KIP protector, offer a full IP65 protection. For Series M and Series K of panel meters.

4.5 Protector KIP

Front IP65 protector for Series M and Series K of panel meters.

Notes

Notes

Notes

Notes

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.

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E08210 Barberà del Vallès
BARCELONA - SPAIN

- Tel. +34 93.729.6004
  Fax +34 93.729.6003

- info@fema.es
  www.fema.es

mA	Vac TrueRMS	Aac TrueRMS	Hz	(clock)	MODBUS
Vdc	Vac	Aac	X/5	Load	RS-485
Pt100	Vdc	Adc	X/1	(pulse)	RS-232
TC	Shunts	Pt100	Pot	BCD	Custom ?