

# SERIES 13 · Model 13P

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## ISOLATED SIGNAL CONVERTER

SERIES OEM

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Process



Temperature



Temperature



Temperature



Potentiometer



Resistances

**OEM**  
APPLICATIONS

YOUR CONVERTER!

# SIGNAL CONVERTER I3P

## Signal converter, isolated, multisignal, for OEM applications

Signal converter isolated, multisignal, for OEM applications. Accepts process signals (mA and Vdc) (includes excitation voltage), thermocouples J, K, N, E, T, R and S, Pt100 probes (2 and 3 wires) other Pt and Ni probes (Pt500, Pt1000, Ni100 and Ni1000), NTC probes, resistances and potentiometers.

Output signal in 4/20 mA and 0/10 Vdc, isolated. Universal power supply 18 to 265 Vac/dc isolated. 3 way isolation between input, output and power circuits. Circuit isolation prevents ground loops and transient propagation, protecting remote equipment and signal integrity. Easy and fast configuration through configuration codes. Configuration system (digits and keypad) accessible behind the front cover. Functions to generate low and high output signals, to validate remote instrumentation. 'Password' function to block access to configuration.

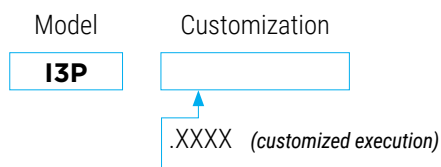
Designed for industrial use, with potential integration into a wide range of applications, reduced cost, excellent quality and optional customization of the instrument.

### USER'S MANUAL

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### 1. How to order



### 2. Material included

The instrument is provided with the following elements:

- 1 x instrument **I3P**
- 4 x plug-in screw terminals
- 1 x quick installation guide

### 3. Installation and start-up



If this is the first time you are configuring this instrument, below are the steps to follow to install and configure the instrument. Read all the manual sections in order to have a full and clear view of the characteristics of the instrument. Do not forget to read the installation precautions at section 12.

1. Install the instrument at the DIN rail
2. Connect the power supply (see section 6)
  - see section 8.1 for an explanation on 'normal mode' of operation
3. Access the 'configuration system' (see section 7)
4. Configure the input signal
  - choose an input signal configuration code (see section 5)
  - introduce the code at the instrument (see section 8.2)
5. Configure the output signal (see section 8.3)
6. Block access to the 'configuration system' (see section 7)
7. Connect the output signal (see section 6)
8. Connect the input signal (see section 6)

### 4. Additional information

User's Manual	<a href="http://www.fema.es/docs/4788_I3P_manual_en.pdf">www.fema.es/docs/4788_I3P_manual_en.pdf</a>
Datasheet	<a href="http://www.fema.es/docs/4790_I3P_datasheet_en.pdf">www.fema.es/docs/4790_I3P_datasheet_en.pdf</a>
Quick installation guide	<a href="http://www.fema.es/docs/4792_I3P_installation_en.pdf">www.fema.es/docs/4792_I3P_installation_en.pdf</a>
CE declaration	<a href="http://www.fema.es/docs/4793_CE-Declaration_I3P_en.pdf">www.fema.es/docs/4793_CE-Declaration_I3P_en.pdf</a>
Warranty	<a href="http://www.fema.es/docs/4153_Warranty1_en.pdf">www.fema.es/docs/4153_Warranty1_en.pdf</a>
Web	<a href="http://www.fema.es/Series_I3">www.fema.es/Series_I3</a>

## 5. Configuration codes - Input signal

Table 1 | Input signal - Configuration codes

Code	Input signal range		See section ...
00 a 09	[no function assigned]		---
10	4/20 mA	Process	9.1
11	0/10 Vdc		
12	0/100 %	Potentiometer	9.2
13	0/100 KOhm	Resistance	9.3
14	0/50 KOhm		
15	0/25 KOhm		
16	0/10 KOhm		
17	0/5 KOhm		
18	0/2.5 KOhm		
19	0/1200 °C	Thermocouple J	9.5
20	0/1000 °C		
21	0/800 °C		
22	0/600 °C		
23	0/450 °C		
24	0/300 °C		
25	0/150 °C		
26	0/1350 °C	Thermocouple K	9.5
27	0/1000 °C		
28	0/800 °C		
29	0/600 °C		
30	0/450 °C		
31	0/300 °C		
32	0/150 °C		
33	0/1300 °C	Thermocouple N	9.5
34	0/1000 °C		
35	0/800 °C		
36	0/600 °C		
37	0/450 °C		
38	0/300 °C		
39	0/150 °C		
40	[no function assigned]		---
41	0/900 °C	Thermocouple E	9.5
42	0/600 °C		
43	0/450 °C		
44	0/300 °C		
45	0/150 °C		
46	0/400 °C	Thermocouple T	9.5
47	0/300 °C		
48	0/200 °C		
49	0/100 °C		

Table 1 | Input signal - Configuration codes

Code	Input signal range		See section ...
50	0/1750 °C	Thermocouple R	9.5
51	0/1500 °C		
52	0/1200 °C		
53	0/900 °C		
54	0/1750 °C	Thermocouple S	9.5
55	0/1500 °C		
56	0/1200 °C		
57	0/900 °C		
58	[no function assigned]		---
59	0/700 °C	Pt100	9.6
60	0/600 °C		
61	0/500 °C		
62	0/400 °C		
63	0/300 °C		
64	0/200 °C		
65	0/100 °C		
66	-50/+50 °C		
67	-100/+100 °C		
68	-200/+200 °C		
69	0/630 °C	Pt500	9.6
70	0/300 °C		
71	-150/150 °C		
72	0/630 °C	Pt1000	9.6
73	0/300 °C		
74	-190/190 °C		
75	-60/180 °C	Ni100	9.6
76	[no function assigned]		9.6
77	-60/180 °C	Ni1000	9.6
78 a 79	[no function assigned]		---
80	-50/50 °C	NTC (R <sub>25</sub> =10K, β=3500)	9.4
81	0/90 °C		
82	-50/50 °C		
83	0/90 °C		
84 a 94	[no function assigned]		---
95	Function 'password'		8.5
96	Parameter 'Alpha'		8.6
97	Reset to default factory parameters		14
98	Firmware version		14
99	[no function assigned]		---
---	Exit de menu without saving changes		---

## 6. Connections and dimensions (mm (inch))

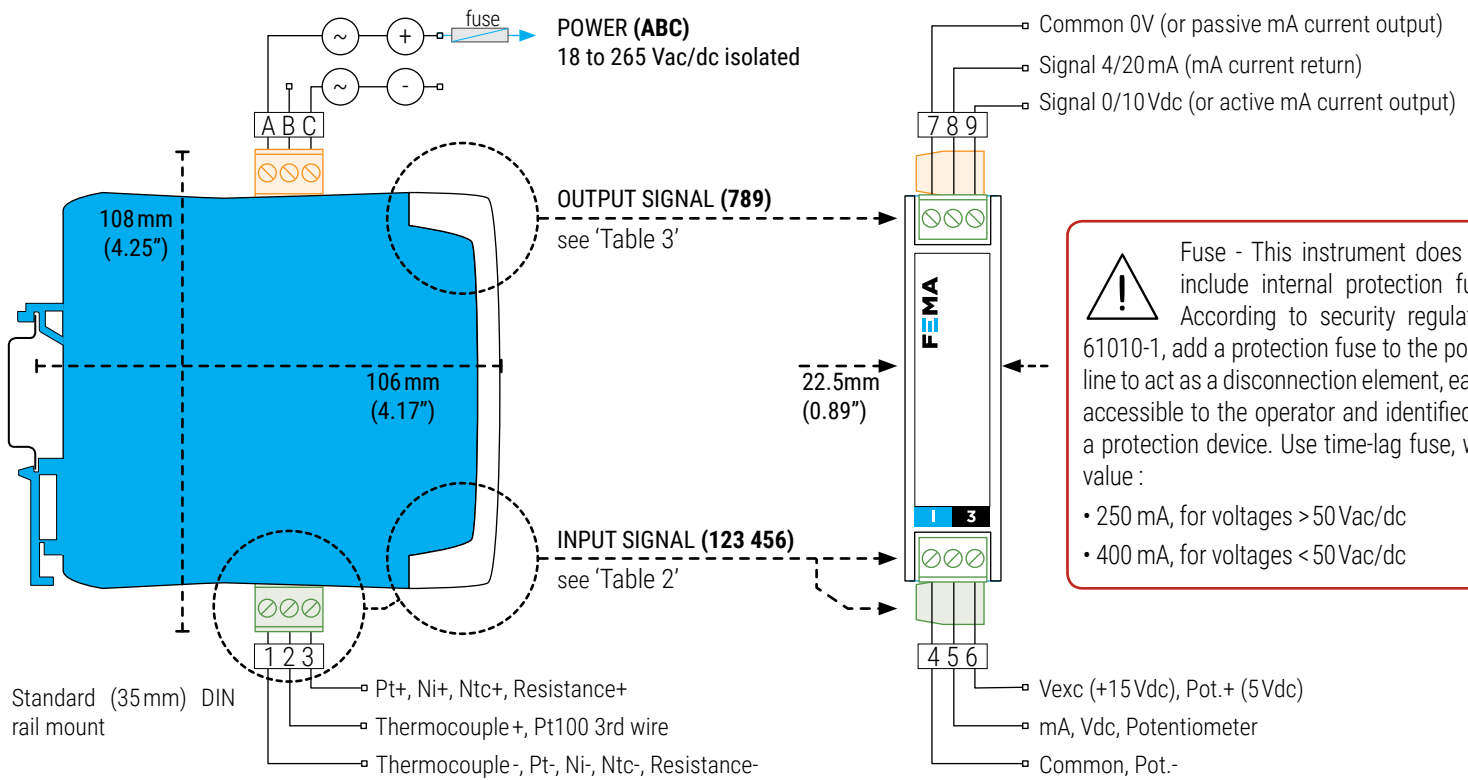


Table 2 | INPUT signal connections

INPUT signal	Input terminals						Section ...
	1	2	3	4	5	6	
4/20 mA passive					mA-	Vexc	9.1
4/20 mA active				mA-	mA+		9.1
0/10 Vdc				common	+Vdc		9.1
0/10 Vdc with Vexc				common	+Vdc	Vexc	9.1
Potentiometer				Pot.-	Signal	Pot.+	9.2
Resistance	Res-		Res+				9.3
NTC	NTC-		NTC+				9.4
Thermocouple	tc-	tc+					9.5
Pt100 (3 wires)	Pt-	Pt- (3rd wire)	Pt+				9.6
Pt100 (2 wires)		Pt- (shortcircuit 1 and 2)	Pt+				9.6
Pt1000, Pt500	Pt-		Pt+				9.6
Ni100, Ni500, Ni1000	Ni-		Ni+				9.6

Table 3 | OUTPUT signal connections

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

## 7. Access the 'Configuration system'

### ACCESS THE 'CONFIGURATION SYSTEM'

1. Remove the output signal terminal
  - make sure that there are no dangerous voltages at the input signal terminals (in case of doubt, remove also the two input signal terminals)
2. Open the front cover
3. Configure the instrument
  - locate the 'configuration digits'
  - locate the 'UP' (▲) and 'SQ' (■) keys

### BLOCK ACCESS TO THE 'CONFIGURATION SYSTEM'

4. Close the front cover
  - remove the output signal terminal (if it was placed)
5. Connect the output signal terminal
  - when connected at place, check that the front cover can not be opened
  - if they were removed, connect the two input signal terminals



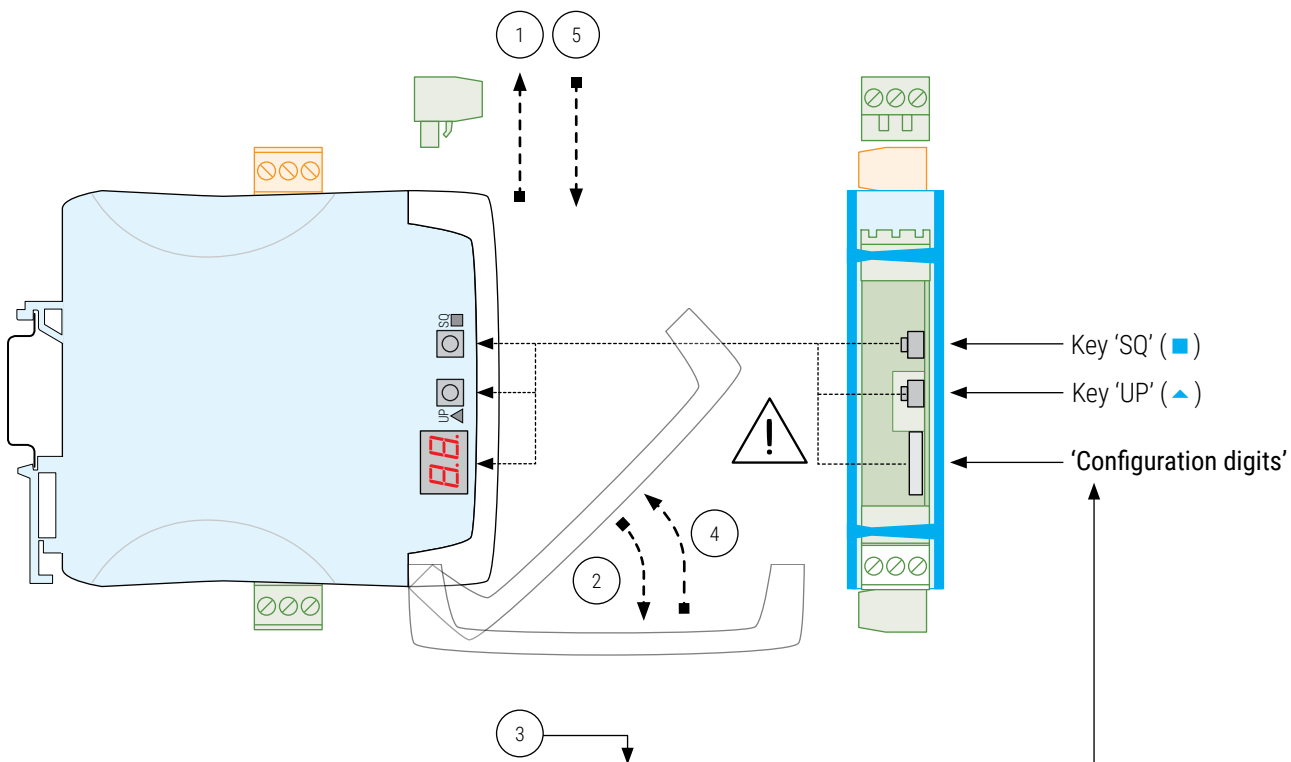
Opening the front cover reduces the security level of the operator. If dangerous voltages are connected to the input terminals, remove both input signal terminals before opening the front cover. When front cover is open :

- the isolation between accessible parts and power supply is reduced to 'basic' level.
- the isolation between accessible parts and input signals is temporarily disabled.

Operations must be performed by qualified operators.

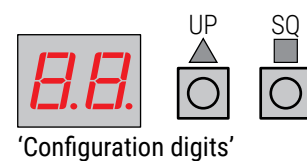


When correctly connected, the output signal terminal prevents the front cover from opening.



### 'CONFIGURATION SYSTEM'

- the 'configuration digits' indicate the active input signal range (see section 5)
- keys 'UP' (▲) and 'SQ' (■) to configure the instrument (see section 8.2)
- the decimal point position indicates the active output signal range (see section 8.3)



## 8. Configuration system

### CONFIGURATION SYSTEM

The Series **13** of isolated signal converters provide a fast and easy configuration system, based on function codes. Configuration is done through an internal key pad, accessible behind the front cover.

### 'CONFIGURATION DIGITS'

The instrument provides two numerical leds, to inform about the actual state of the instrument, active input and output signal ranges, and error codes (see section 11).

### CONFIGURATION KEYS

The configuration keys are located inside the instrument, behind the removable front cover. To access the configuration keys, remove the output signal terminal, and open the front cover (see section 7). The instrument allows to block the key functions, by activating an access code ('password' function) (see section 8.5).

## 8.1. 'Normal mode' of operation

### 'NORMAL MODE'

When the power supply is connected, the instrument:

- activates the 'configuration digits', and displays the code for the actual input signal range (see section 5)
- activates the decimal point (flash), showing the actual output signal range (see section 8.3)
- the instrument is in 'normal mode' of operation

### HOW TO ACCESS THE 'CONFIGURATION MODE' AND THE 'TOOLS' MENU

With the instrument in 'normal mode' of operation, there is access to the 'configuration mode' and the 'tools' menu.

- to access the 'configuration mode', press the 'SQ' (■) key for 1 second (see section 8.2)
- to access the 'tools' menu, press the 'UP' (▲) key for 1 second (see section 8.4)

### 'ECO' FUNCTION ('CONFIGURATION DIGITS' ARE AUTOMATICALLY POWERED OFF)

If there is no interaction from the operator for 60 seconds, the instrument powers off the 'configuration digits'. The decimal point remains active (flashing), indicating that the instrument is working correctly.

### HOW TO POWER ON THE 'CONFIGURATION DIGITS'

To power on the 'configuration digits', press one of the front keys 'SQ' (■) or 'UP' (▲). This will power on the 'configuration digits', and activate the 'normal mode' of operation.

## 8.2. 'Configuration mode'

### HOW TO ACCESS THE 'CONFIGURATION MODE'

With the instrument in 'normal mode' of operation (see section 8.1), press for 1 second the 'SQ' (■) key. The horizontal leds light from bottom to top. When the upper led lights, the instrument activates the 'configuration mode'.



If the key is released before activating the 'configuration mode', the horizontal leds light downwards from top to bottom, and the instrument returns to 'normal mode' of operation.



Inside the 'configuration mode' the decimal point is not active.

Inside the 'configuration mode', the 'configuration digits' display the code of the active input signal range (see section 5). Press the 'UP' (▲) key to increase the code.

- press once to increase the value in +1
- maintain the key pressed to automatically increase the value

When the desired code is reached, press the 'SQ' (■) key. The leds light a round shape while new configuration is stored, and the instrument returns to 'normal mode' of operation.

When exiting the 'configuration mode' without changes ('rollback' activation, selection of 'inactive codes', etc), the horizontal leds light down from top to bottom, and the instrument returns to 'normal mode' of operation.



### 'ROLLBACK' FUNCTION

If there is no interaction from the operator for 30 seconds, the instrument exits the 'configuration mode' and returns to 'normal mode' of operation, discarding changes.

## 8.3. Output 4/20 mA and 0/10 Vdc

### OUTPUT 4/20 mA AND 0/10 Vdc

The Series **13** instruments can be configured for 4/20 mA or 0/10 Vdc output signal. The configured output signal is identified with the active decimal point at the 'configuration digits'.

- active decimal point to the right, for 4/20 mA output
- active decimal point to the left, for 0/10 Vdc output

Table 4 | Decimal point indicates the active output signal

Output 0/10 Vdc (decimal point to the left)	Output 4/20 mA (decimal point to the right)

### HOW TO CONFIGURE THE OUTPUT SIGNAL TO 4/20 mA AND 0/10 Vdc

With the instrument in 'normal mode' of operation, press the 'SQ' (■) key and the 'UP' (▲) key at the same time. The horizontal leds light from bottom to top. When the upper led lights, the actual decimal point position is displayed. After 1 second, the new decimal point position activates. Release the two keys, and the leds light a round shape while the new configuration is stored, and the instrument returns to 'normal mode' of operation.



Connect the output terminals according to the output signal configured (see section 6).

## 8.4. 'Tools' menu

### HOW TO ACCESS THE 'TOOLS' MENU

With the instrument in 'normal mode' of operation (see section 8.1), press for 1 second the 'UP' (▲) key. The horizontal leds light from bottom to top. When the upper led lights, the instrument activates the 'tools' menu.

If the key is released before activating the 'tools' menu, the horizontal leds light downwards from top to bottom, and the instrument returns to 'normal mode' of operation.



Inside the 'tools' menu, the decimal point is not active.



Inside the 'tools' menu, the 'configuration digits' indicate the code of the first function available.

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

To exit the 'tools' menu, press the 'UP' (▲) key until the parameter '- -' appears, and press the 'SQ' (■) key (or wait 30 seconds without pressing any key to wait for the automatic 'rollback').

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



### 'ROLLBACK' FUNCTION

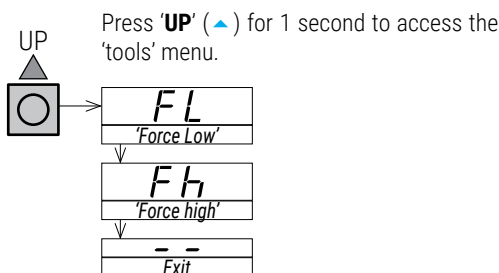
If there is no interaction from the operator for 30 seconds, the instrument exits the 'tools' menu and returns to 'normal mode' of operation.

### AVAILABLE FUNCTIONS

The 'Force Low' ('FL') and 'Force High' ('Fh') functions allow to temporarily force the output signal to the low and high levels of the actual output signal range selected. These tools allow to easily validate the correct function of the remote elements connected to the instrument output

- select 'Force Low' ('FL') function to set the output signal to the minimum value of the selected range (4mA or 0Vdc). The 'FL' flash message indicates that the function is active. Press any key to deactivate and return to the 'Force Low' ('FL') menu entry.
- select 'Force High' ('Fh') function to set the output signal to the maximum value of the selected range (20mA or 10Vdc). The 'Fh' flash message indicates that the function is active. Press any key to deactivate and return to the 'Force High' ('Fh') menu entry.

Table 5 | 'Tools' menu



## 8.5. Configuration block ('password')

### HOW TO BLOCK ACCESS TO 'CONFIGURATION MODE' ('PASSWORD')

Define a 'password' code to prevent access to 'configuration mode' and to 'tools' menu to unauthorized operators. The 'password' code will be requested when any key is pressed.

To activate a 'password' select code '95' inside the 'configuration mode'. The step-by-step process is indicated below.:

- access the 'configuration mode' (see section 8.2)
- access code '95'
- press the 'SQ' (■) key to select
- the 'configuration digits' indicate code '00' flashing
- press the 'UP' (▲) key to select the desired code (for example '73')
- press the 'SQ' (■) key to validate or wait for the automatic 'rollback' (30 seconds) to exit without changes
- the menu returns 'normal mode' (see section 8.1)

Once the 'password' code is applied, when a key is pressed, the 'configuration digits' indicate code '00' flashing. enter the 'password' code to unlock access (code '73' in the previous example).

### HOW TO DEACTIVATE THE 'PASSWORD'

To deactivate the 'password', access again to code '95' and select value '00'. Exit validating changes.

## 8.6. Pt100 'alpha' parameter

### 'ALPHA' VALUE '385' OR '390'

The instrument can be configured to read Pt probes using 'alpha' parameter set to '0.0385' (default value) or '0.0390'. This parameter is a specification of the Pt probe (Pt100, Pt500, Pt1000) and depends on the probe manufacturer.

### HOW TO SET THE 'ALPHA' PARAMETER

To configure the 'alpha' value, access code '96' inside the 'configuration mode'. The step-by-step process is indicated below.

- access the 'configuration mode' (see section 8.2)
- access code '96'
- press the 'SQ' (■) key to select
- the 'configuration digits' indicate code '01' flashing
- press the 'UP' (▲) key, to select value '01' for 'alpha' value of '0.0385' or select '02' for 'alpha' value of '0.0390'
- press the 'SQ' (■) key to validate or wait for the automatic 'rollback' (30 seconds) to exit without changes
- the menu returns 'normal mode' (see section 8.1)

## 9. Input signals

### 9.1. Process



#### MEASURING RANGES FOR PROCESS SIGNALS

The instrument can be configured to measure process signals in 4/20 mA (active and passive) and 0/10 Vdc. The instrument provides excitation voltage to power up transducers when necessary.

To activate the desired input signal range, activate the range code (see Table 7) into 'configuration mode' (see section 8.2).

See connection examples at 'Table 6'.

#### OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc (see section 8.3).

#### MAXIMUM OVERSIGNAL

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

#### EXCITATION VOLTAGE (VEXC)

The instrument provides +15Vdc excitation voltage at terminal '6'. This excitation voltage is provided to power up the transducer that generates the signal, up to a maximum of 30 mA.

Table 6 | Connection examples for process signals

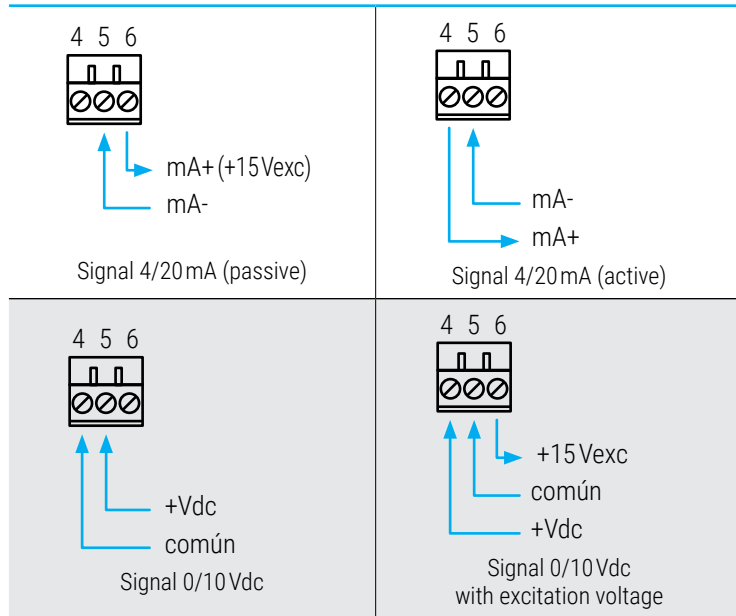


Table 7 | Input ranges for process signals

Input signal	Code	Accuracy (% FS)	Max. overvoltage	Zin
4/20 mA	10	<0.30 %	25 mA	<1.2Vdc voltage drop on terminals
0/10 Vdc	11	<0.30 %	25 Vdc	1 M

### 9.2. Potentiometers



#### MEASURING RANGES FOR POTENTIOMETERS

The instrument can be configured to measure potentiometers (3 wires), with nominal value higher than 500 Ohms and below 20KOhms.

To activate the desired input signal range, activate the range code (see Table 9) into 'configuration mode' (see section 8.2).

See connection examples at 'Table 8'.

#### OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc (see section 8.3).

#### EXCITATION VOLTAGE (Vexc)

The instrument provides +5Vdc excitation voltage at terminal '6'. The excitation voltage is automatically configured when a potentiometer code is selected (see Table 9).

Table 8 | Connection examples for potentiometers

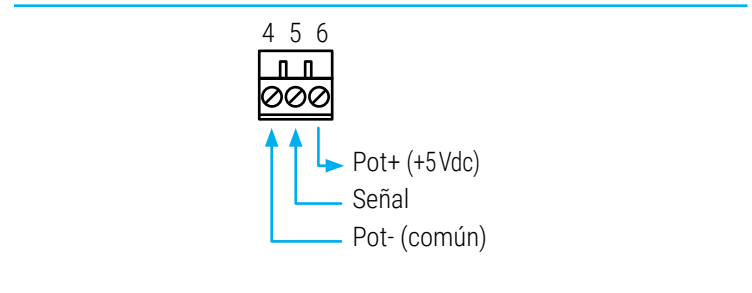


Table 9 | Input ranges for potentiometer signals

Input signal	Code	Accuracy (% FS)	Potentiometers accepted
0/100 %	12	<1.0 %	from 0/500 Ohms up to 0/20 KOhms



## 9 Input signals (cont.)

### 9.3. Resistances



#### MEASURING RANGES FOR RESISTANCES

The instrument can be configured to measure resistance signals. Measurement uses 2 wires.

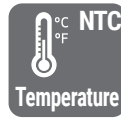
To activate the desired input signal range, activate the range code (see Table 11) into 'configuration mode' (see section 8.2).

See connection examples at 'Table 10'.

#### OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc (see section 8.3).

### 9.4. NTC probes



#### NTC PROBES ACCEPTED

The instrument can be configured to measure temperature from common NTC probes.

Accepts NTC probes with  $R_{25}=10K$  and  $\beta=3500$  and NTC types 44006.

To activate the desired input signal range, activate the range code (see Table 13) into 'configuration mode' (see section 8.2).

See connection examples at 'Table 12'.

#### OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc (see section 8.3).

#### SENSOR BREAK DETECTION

The instrument displays an error message in case of sensor break (see section 11).

Table 10 | Connection examples for resistances

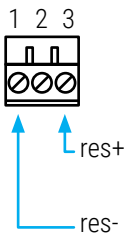


Table 12 | Connection examples for NTC probes

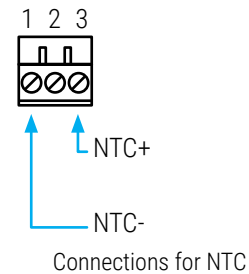


Table 11 | Input ranges for resistances

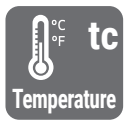
Input signal	Code	Accuracy (% FS)
0/100KOhm	13	<0.7% FS
0/50KOhm	14	<0.7% FS
0/25KOhm	15	<0.7% FS
0/10KOhm	16	<0.7% FS
0/5KOhm	17	<0.7% FS
0/2.5KOhm	18	<0.7% FS

Table 13 | Temperature ranges for NTC probes

Input signal	Code	Measurement range		Total error
		°C	°F	
NTC ( $R_{25}=10K$ y $\beta=3500$ )	80	-50/50	-58/122	<0.7% FS
NTC ( $R_{25}=10K$ y $\beta=3500$ )	81	0/90	32/194	<1.0% FS
NTC (44006)	82	-50/50	-58/122	<0.7% FS
NTC (44006)	83	0/90	32/194	<1.3% FS

## 9 Input signals (cont.)

### 9.5. Thermocouples



#### MEASURING RANGES FOR THERMOCOUPLES

The instrument can be configured to measure temperature from thermocouple probes, types J, K, N, E, T, R and S. The instrument automatically compensates the cold junction.

To activate the desired thermocouple type and measurement range, activate the range code (see 'Table 15' up to 'Table 21') into 'configuration mode' (see section 8.2).

See connection examples at 'Table 14'.

#### OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc (see section 8.3).

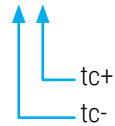
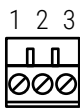
#### SENSOR BREAK DETECTION

The instrument displays an error message in case of sensor break (see section 11).

#### TOTAL ERROR

The 'total error' indicated in the tables below, includes the measuring error, the cold junction error and the output signal error.

Table 14 | Connections for thermocouples



For a correct measure of thermocouple signals, always use compensated cable between the instrument and the thermocouple.

Table 15 | Temperature ranges for thermocouple J

Input signal	Code	Measurement range		Total error (cold junction included)
Thermoc. J	19	0/1200 °C	32/2190 °F	<0.5% FS
	20	0/1000 °C	32/1832 °F	<0.5% FS
	21	0/800 °C	32/1472 °F	<0.5% FS
	22	0/600 °C	32/1112 °F	<0.5% FS
	23	0/450 °C	32/842 °F	<0.7% FS
	24	0/300 °C	32/572 °F	<1.5% FS
	25	0/150 °C	32/302 °F	<2.5% FS

Table 16 | Temperature ranges for thermocouple K

Input signal	Code	Measurement range		Total error (cold junction included)
Thermoc. K	26	0/1350 °C	32/2462 °F	<0.5% FS
	27	0/1000 °C	32/1832 °F	<0.5% FS
	28	0/800 °C	32/1472 °F	<0.5% FS
	29	0/600 °C	32/1112 °F	<0.7% FS
	30	0/450 °C	32/842 °F	<1.0% FS
	31	0/300 °C	32/572 °F	<2.0% FS
	32	0/150 °C	32/302 °F	<3.5% FS

Table 17 | Temperature ranges for thermocouple N

Input signal	Code	Measurement range		Total error (cold junction included)
Thermoc. N	33	0/1300 °C	32/2372 °F	<0.5% FS
	34	0/1000 °C	32/1832 °F	<0.5% FS
	35	0/800 °C	32/1472 °F	<0.5% FS
	36	0/600 °C	32/1112 °F	<0.7% FS
	37	0/450 °C	32/842 °F	<1.5% FS
	38	0/300 °C	32/572 °F	<2.0% FS
	39	0/150 °C	32/302 °F	<3.5% FS

Table 18 | Temperature ranges for thermocouple E

Input signal	Code	Measurement range (* FS for accuracy calculation)		Total error (cold junction included)
Thermoc. E	41	0/900 °C	32/1472 °F	<0.5% FS
	42	0/600 °C	32/1112 °F	<0.5% FS
	43	0/450 °C	32/842 °F	<0.5% FS
	44	0/300 °C	32/572 °F	<0.7% FS
	45	0/150 °C	32/302 °F	<2.0% FS

Table 19 | Temperature ranges for thermocouple T

Input signal	Code	Measurement range		Total error (cold junction included)
Thermoc. T	46	0/400 °C	32/752 °F	<1.0% FS
	47	0/300 °C	32/572 °F	<1.3% FS
	48	0/200 °C	32/392 °F	<2.0% FS
	49	0/100 °C	32/212 °F	<4.0% FS

Table 20 | Temperature ranges for thermocouple R

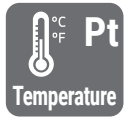
Input signal	Code	Measurement range		Total error (cold junction included)
Thermoc. R	50	0/1750 °C	32/3182 °F	<1.0% FS
	51	0/1500 °C	32/2732 °F	<1.0% FS
	52	0/1200 °C	32/2192 °F	<1.5% FS
	53	0/900 °C	32/1652 °F	<2.0% FS

Table 21 | Temperature ranges for thermocouple S

Input signal	Code	Measurement range		Total error (cold junction included)
Thermoc. S	54	0/1750 °C	32/3182 °F	<1.0% FS
	55	0/1500 °C	32/2732 °F	<1.0% FS
	56	0/1200 °C	32/2192 °F	<1.5% FS
	57	0/900 °C	32/1652 °F	<2.0% FS

## 9 Input signals (cont.)

### 9.6. Pt (Pt100, Pt500, Pt1000) and Ni (Ni100, Ni1000) probes



#### MEASURING RANGES FOR PT AND NI PROBES

The instrument can be configured to measure temperature from Pt probes (Pt100, Pt500 and Pt1000) and Ni probes (Ni100 y Ni1000).

To activate the desired probe type and measurement range, activate the range code (see 'Table 23' and 'Table 24') into 'configuration mode' (see section 8.2).

See connection examples at 'Table 22'.

#### OUTPUT SIGNAL

The output signal is configurable to 4/20 mA (active and passive) and 0/10 Vdc (see section 8.3).

#### SENSOR BREAK DETECTION

The instrument displays an error message in case of of sensor break (see section 11).

#### PT100 WITH 2 AND 3 WIRES

The instrument accepts 2 and 3 wire Pt100 probes. Select the connection according to the wires of the probes (see Table 22).

#### 'ALPHA' TEMPERATURE COEFFICIENT

The instrument is configured 'by default' to work with an 'alpha' value of '0.0385' for Pt probes (Pt100, Pt500, Pt1000). To activate an 'alpha' value of '0.0390' see section '8.6'. This parameter is associated to the probe and depends on the probe manufacturer.

#### CURRENT THROUGH THE PROBE

The instrument generates <900 uA through Pt100 and Ni100 probes. The instrument generates <90 uA through Pt500, Pt1000 and Ni1000 probes.

Table 23 | Temperature ranges for Pt100

Input signal	Code	Measurement range		Total error
Pt100	59	0/700 °C*	32/1292 °F	<0.5% FS
	60	0/600 °C	32/1112 °F	<0.5% FS
	61	0/500 °C	32/932 °F	<0.6% FS
	62	0/400 °C	32/752 °F	<0.6% FS
	63	0/300 °C	32/572 °F	<0.7% FS
	64	0/200 °C	32/392 °F	<1.0% FS
	65	0/100 °C	32/121 °F	<1.5% FS
	66	-50/+50 °C	-58/122 °F	<1.5% FS
	67	-100/+100 °C	-148/212 °F	<1.0% FS
	68	-200/+200 °C*	-328/392 °F	<0.5% FS

Table 22 | Connection examples for Pt100 3 wires and Pt, Ni 2 wires

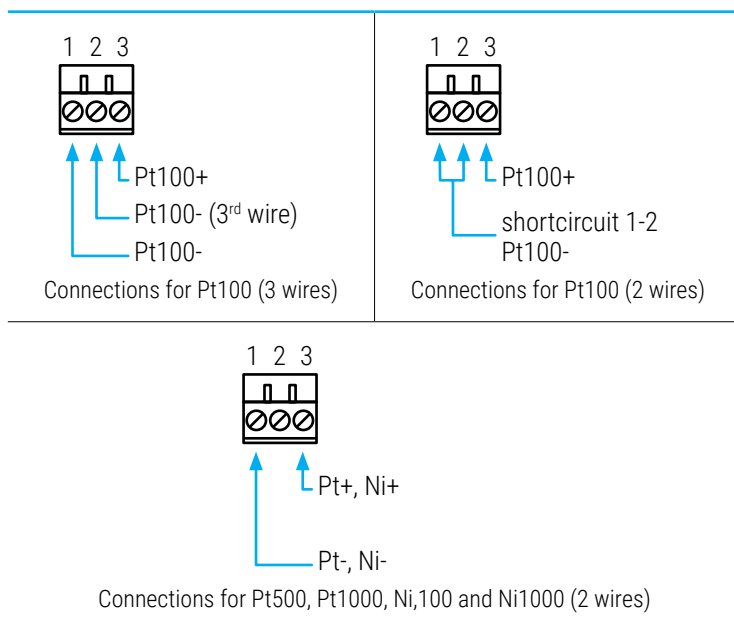


Table 24 | Temperature ranges for Pt500, Pt1000 and Ni

Input signal	Code	Measurement range		Total error
Pt500	69	0/630 °C	32/1166 °F	<0.7% FS
	70	0/300 °C	32/572 °F	<0.7% FS
	71	-150/150 °C	-238/302 °F	<0.7% FS
Pt1000	72	0/630 °C	32/1166 °F	<1.0% FS
	73	0/300 °C	32/572 °F	<0.7% FS
	74	-150/150 °C	-238/302 °F	<0.7% FS
Ni100	75	-60/180 °C	-76/356 °F	<0.7% FS
---	76	---	---	---
Ni1000	77	-60/180 °C	-76/356 °F	<0.7% FS

## 10. Technical specifications

### INPUT SIGNAL RANGES

process	4/20 mA, 0/10 Vdc (active and passive) excitation voltage +15 Vdc @30mA (see section 9.1)
thermocouples	J, K, N, E, T, R and S (see section 9.5)
'Pt' and 'Ni' probes	Pt100 (2 and 3 wires, automatic compensation up to 30 Ohm) Pt500, Pt1000, Ni100, Ni1000 (2 wires) (see section 9.6)
'NTC' probes	(see section 9.4)
resistances	ranges for 100K, 50K, 25K, 10K, 5K y 2.5K (see section 9.3)
potentiometers	nominal value form 500 Ohm to 20KOhm (see section 9.2)

**ACCURACY AT 25 °C** see section for each type of signal

**THERMAL DRIFT** 150 ppm/°

**STEP RESPONSE** <400 mSec. (0% to 99% signal)

### OUTPUT SIGNAL RANGES

active mA signal	4/20mA active, max. 22 mA, min. 1.5 mA, maximum load < 400 Ohm
passive mA signal	4/20mA passive, max. 30 Vdc on terminals
Vdc ranges	0/10 Vdc, max. 11 Vdc, min. -1 Vdc, minimum load > 1 KOhm

### CONFIGURATION

key pad	2 keys
display	2 digits, 7 segments, 5mm height, red color

### POWER SUPPLY

voltage range	18 to 265 Vac/dc isolated (20 to 240 Vac/dc ±10%)
AC frequency	45 to 65 Hz
consumption	<1.5 W
power wires	1 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (AWG17 to AWG14)
overvoltage category	2

### ISOLATION

input - output	2300 Veff (60 seconds)
power - input	2300 Veff (60 seconds)
power - output	2300 Veff (60 seconds)

**IP PROTECTION** IP30

**IMPACT PROTECTION** IK06

### TEMPERATURE

operation	de 0 a +50 °C
storage	de -20 a +70 °C
'warm-up' time	15 minutes

### MECHANICAL

size	106x108x22.5 mm
mounting	standard DIN rail (35x7.5 mm)
connections	plug-in screw terminal (pitch 5.08 mm)
housing material	polyamide V0
weight	<150 grams
packaging	120x115x30 mm, cardboard

## 11. Error codes

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

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

Table 25 | **Error codes**

E1	'Hardware underrange'. Input signal is below the minimum readable signal. Output signal is the minimum available 0 Vdc, 0 mA. Possible sensor break.
E2	'Hardware overrange'. Input signal is above the maximum readable signal. Output signal is the maximum available 10.5 Vdc, 20.5 mA. Possible sensor break.
E3	'Password error'. If 'password' function is active, the password code entered is not correct.

## 12. 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 all external circuits before starting any maintenance and / or installation action.

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

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



Conformity with security regulations EN-61010-1 requires that the front cover is closed. The output terminal prevents the front cover from opening.

## 13. Warranty

This instrument is warranted against all manufacturing defects for a period of 24 months, as requested by the European legislation. This warranty does not apply in case of misuse or accident, and the scope of the warranty is limited to repair of the instrument, not being the manufacturer responsible for additional damages or additional costs. Within the warranty period and after examination by the manufacturer, the unit will be repaired or substituted when found to be defective.

Extended warranty available at (see section 4).

This documentation is valid from serial number 480215.

## 14. Factory default parameters

Input signal	4/20 mA	[10]
Output signal	4/20 mA	[xx.]
Password code	disabled	[00]
Pt100 'alpha'	0.0385	[01]
Display code		[10.]

### RESET TO DEFAULT FACTORY PARAMETERS

To recover the instrument to default factory parameters, select code '97' and activate value '01'.

- access the 'configuration mode'
- access code '97' and press key **'SQ'** (■)
- the 'configuration digits' show code '00' flashing
- press key **'UP'** (▲) to change to value '01'
- press key **'SQ'** (■)
- the leds light a round shape while the new configuration is stored, and the instrument returns to 'normal mode' of operation
- the 'configuration digits' show code '10.' and the default factory configuration is now active

### FIRMWARE VERSION

The instrument 'firmware' version is an alphanumerical code from '00' to 'FF', accessible through the configuration code '98'.

## 15. 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 **I3P**

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

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

### Security rules EN-61010-1

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

### Electromagnetic compatibility rules EN-61326-1

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

For a detailed declaration see document:

[www.fema.es/docs/4793\\_CE-Declaration\\_I3P\\_en.pdf](http://www.fema.es/docs/4793_CE-Declaration_I3P_en.pdf)

Barberà del Vallès, June 2020  
 Xavier Juncà - Product 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.







**DIGITAL PANEL METERS**  
Series Industry



**SIGNAL CONVERTERS**  
Isolated



**LARGE DISPLAYS**  
Series Industry



**PANEL METERS . SERIES OEM**  
Low Cost



**CONVERTERS . SERIES OEM**  
Low Cost



**LARGE DISPLAYS**  
Series Special



**SPECIAL INSTRUMENTS**  
Series Special



**DATA ACQUISITION**  
Series Industry



**'CUSTOMIZED'**  
**INSTRUMENTS**