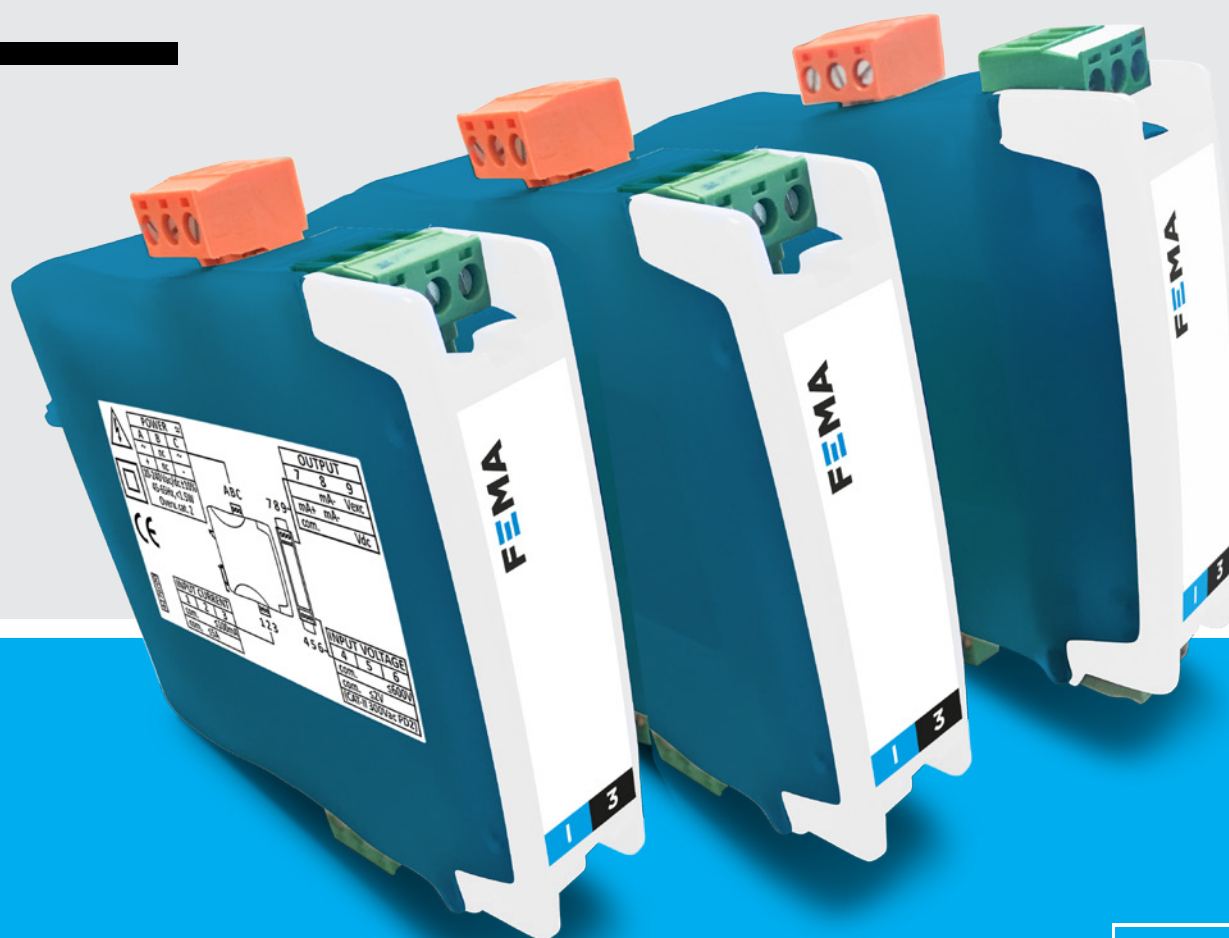


SERIES I3 · Model I3D

ISOLATED SIGNAL DUPLICATOR

Section OEM



OEM
APPLICATIONS

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PROCESS SIGNAL DUPLICATOR I3D

Signal duplicator for process signals, isolated 4 ways, for industrial applications



Signal duplicator and signal converter, for process signals, isolated, for industrial applications. Accepts process signals in 4/20 mA and 0/10 Vdc, provides excitation voltage if needed. Dual output with 4/20 mA signals. Isolated 4 ways between power, input signal, output 1 and output 2.

Universal power supply 24 to 240 Vac/dc $\pm 10\%$, isolated. 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. Integrated 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

INDEX

1. How to order	2
2. Material included	2
3. Installation and start-up	2
4. Additional information	2
5. Configuration codes	3
6. Typical applications	3
7. Technical specifications	3
8. Connections and dimensions (mm (<i>inch</i>))	4
9. Access the 'Configuration system'	6
10. Operate the configuration system	7
10.1. 'Normal mode' of operation	7
10.2. 'Configuration mode'	7
10.3. 'Tools' menu	8
10.4. Configuration block ('password')	8
10.5. Working mode	8
11. Precautions on installation	9
12. Warranty	9
13. Factory default parameters	9
14. CE declaration of conformity	9
15. Error codes	10
16. FAQ's	10
16.1. Signal quadrupler - 4 analog outputs	10

1. How to order

Reference	Description
I3D	Signal duplicator
I3D.1442	Signal duplicator with custom features

2. Material included

The instrument is provided with the following elements:

- 1 x instrument **I3D**
- 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 11.

1. Install the instrument at the DIN rail
2. Connect the power supply (see section 8)
 - see section 10.1 for an explanation on 'normal mode' of operation
 - if no input signal is connected, the instrument will display error 'E3' ('Hardware error') (see section 10.1)
3. Access the 'configuration system' (see section 9)
4. Configure the input signal
 - choose an input signal configuration code (see section 5)
 - introduce the code at the instrument (see section 10.2)
6. Block access to the 'configuration system' (see section 9)
7. Connect the output signals (see section 8)
8. Connect the input signal (see section 8)



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

4. Additional information

Table 1 | Additional information

Document	Link
User's Manual	www.fema.es/docs/5577_I3D_manual_en.pdf
Datasheet	www.fema.es/docs/5579_I3D_datasheet_en.pdf
Quick installation guide	www.fema.es/docs/5581_I3D_installation_en.pdf
CE declaration	www.fema.es/docs/5643_CE-Declaration_I3_en.pdf
Warranty	www.fema.es/docs/4153_Warranty1_en.pdf
Web	www.fema.es/Series_I3

5. Configuration codes

To activate the desired input signal range, activate the range configuration code (see Table 2) into 'configuration mode' (see section 10.2). See connections at section 8.

Table 2 | Input and output signals - Configuration codes

Code	Input signal	Output 1	Output 2
10	4/20 mA	4/20 mA	4/20 mA
11	0/10 Vdc	4/20 mA	4/20 mA
12-14	[no function assigned]		
15	Function 'password'		
16	Reset to default factory parameters		
17	Firmware version		
18	Working mode (see section 10.5)		
19	[no function assigned]		
---	Exit the menu without saving changes		



Codes with 'no function assigned' will display message 'na' indicating the code is 'not available'.



To select the 'active' or 'passive' mA versions at the input and output signals, configure the connection terminals as explained at section 8.



The input loop opens if the instrument is powered off.

6. Typical applications

To measure process signals and provide dual outputs in standard 4/20 mA signals. Inputs and outputs are isolated.

Single and dual signal retransmission to one or two remote acquisition devices (HMI, PLC, Scada, ...). Local and remote verification of process values.

7. Technical specifications

INPUT SIGNAL RANGES

process	4/20 mA, 0/10 Vdc
type of signal	active and passive, the instrument provides excitation voltage to power the transducer.
excitation voltage	+15 Vdc, max. 25 mA, shortcircuit protected
input impedance (mA)	variable impedance, voltage drop on terminals <1.2 Vdc
input impedance (Vdc)	1 MOhm
maximum oversignal*	25 mA for mA 25 Vdc for Vdc

* '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.

ACCURACY AT 25 °C

0.5 % F.S. for mA, 0.3 % F.S. for Vdc
(see section 10.5)

THERMAL DRIFT

<100 ppm/° (F.S.)

STEP RESPONSE

0 to 99 % of signal
<200 mSec. in 'Mode 1', <550 mSec. in 'Mode 2'
(see section 10.5)

OUTPUT SIGNAL 1

active 4/20 mA output	4/20 mA active, max. 20.5 mA, min. 3 mA, maximum load < 400 Ohm
passive 4/20 mA output	4/20 mA passive, max. 30 Vdc on terminals

OUTPUT SIGNAL 2

active 4/20 mA output	4/20 mA active, max. 20.5 mA, min. 3 mA, maximum load < 400 Ohm
passive 4/20 mA output	4/20 mA passive, max. 30 Vdc on terminals

CONFIGURATION

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

POWER SUPPLY

voltage range	24 to 240 Vac/dc $\pm 10\%$, isolated
AC frequency	45 to 65 Hz
consumption	<4.0 W
power wires	1 mm ² to 2.5 mm ² (AWG17 to AWG14)
overvoltage category	2

ISOLATION 4 WAYS

between all circuits	2300 Veff (60 seconds)
except for output 1 - output 2	1500 Vdc (60 seconds)

ENVIRONMENTAL

IP protection	IP30
impact protection	IK06
operation temperature	0 to +50 °C
storage temperature	-20 to +70 °C
'warm-up' time	15 minutes
humidity	0 to 95 % non condensing
altitude	up to 2000 meters

MECHANICAL

size	106 x 108 x 22.5 mm
mounting	standard DIN rail (35 x 7.5 mm)
connections	plug-in screw terminal (pitch 5.08 mm)
housing material	polyamide V0
weight	<150 grams
packaging	120 x 115 x 30 mm, cardboard

8. Connections and dimensions (mm (inch))

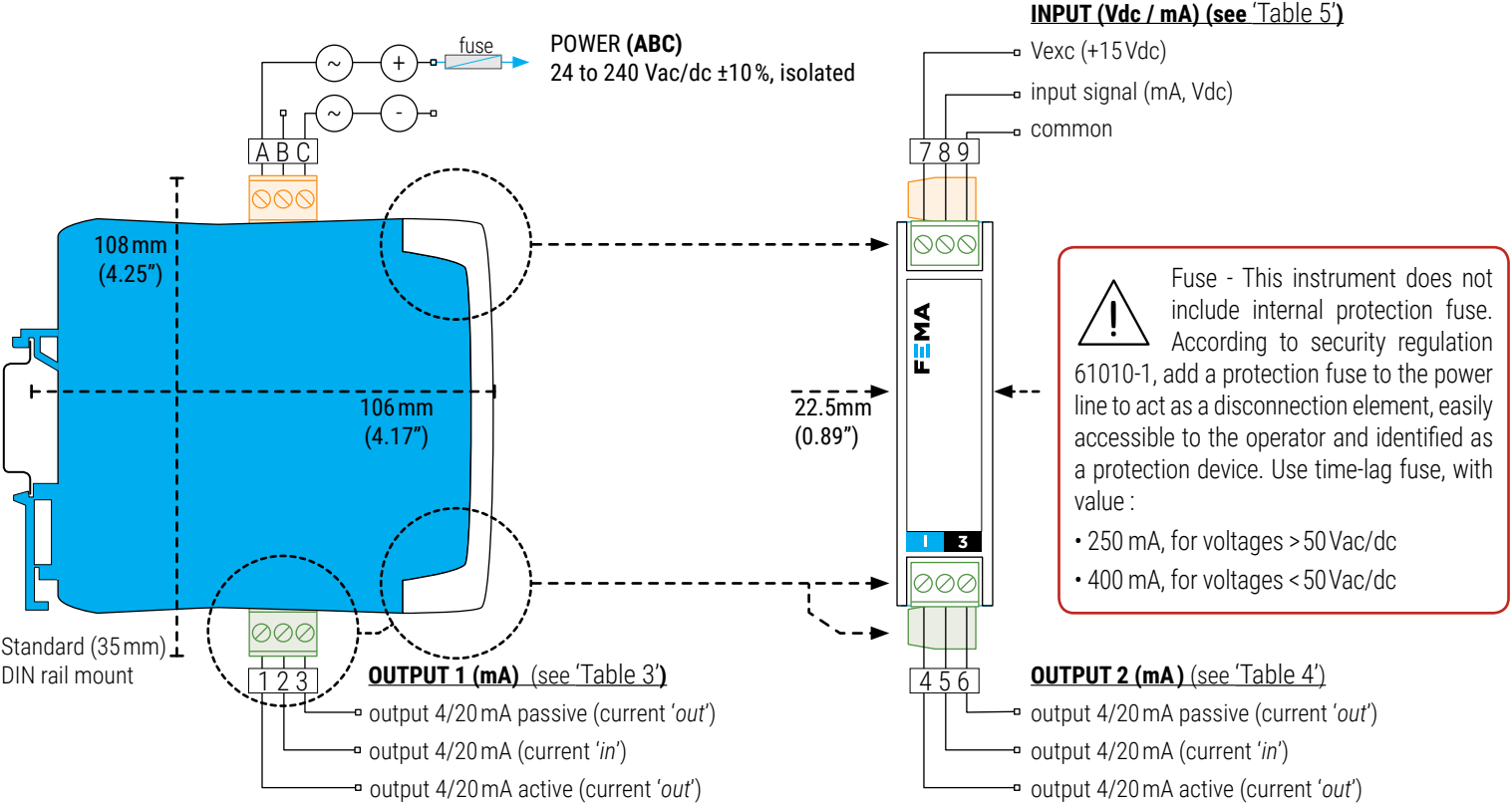


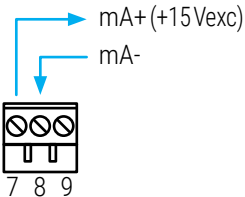
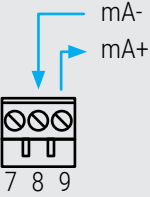
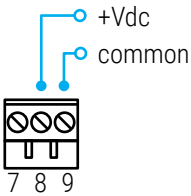
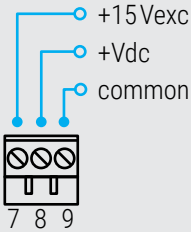
Table 3 | OUTPUT 1 signal connections

OUTPUT 1 signal	Output terminals			Connections
	1	2	3	
4/20 mA active output	Vexc (out)	mA- (in)		
4/20 mA passive output		mA- (in)	mA+ (out)	

Table 4 | OUTPUT 2 signal connections

OUTPUT 2 signal	Output terminals			Connections
	4	5	6	
4/20 mA active output	Vexc (out)	mA- (in)		
4/20 mA passive output		mA- (in)	mA+ (out)	

Table 5 | INPUT signal connections

INPUT signal	Input terminals			Connections
	7	8	9	
4/20mA passive input	Vexc	mA-		
4/20mA active input		mA-	mA+	
0/10 Vdc (2 wires)		+Vdc	common	
0/10 Vdc (3 wires)	Vexc	+Vdc	common	

ACTIVE AND PASSIVE SIGNALS

The instrument can be configured to measure process signals in 4/20 mA (active and passive) and 0/10 Vdc. The instrument has two outputs :

- output 1 is fixed to 4/20 mA (active and passive).
- output 2 is fixed to 4/20 mA (active and passive).

To select the 'active' or 'passive' mA versions at the input and output signals, configure the connection terminals according to your needs.

- active mA inputs are powered by an external element, and the instrument receives an active mA signal.
- passive mA inputs are powered by the instrument, by using the +15Vdc (terminal 7) to power the transducer.
- active mA outputs are powered by the instrument.
- passive mA output are powered by an external element and the instrument only controls the value of the mA, but it does not provide power to the output loop.

9. Access the 'Configuration system'

ACCESS THE 'CONFIGURATION SYSTEM'

Step numbers as referenced at the image below.

1. Remove the input signal terminal
 - make sure that there are no dangerous voltages at the output 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 input signal terminal (if it was placed)
5. Connect the input signal terminal
 - when connected at place, check that the front cover can not be opened
 - if they were removed, connect the two output signal terminals

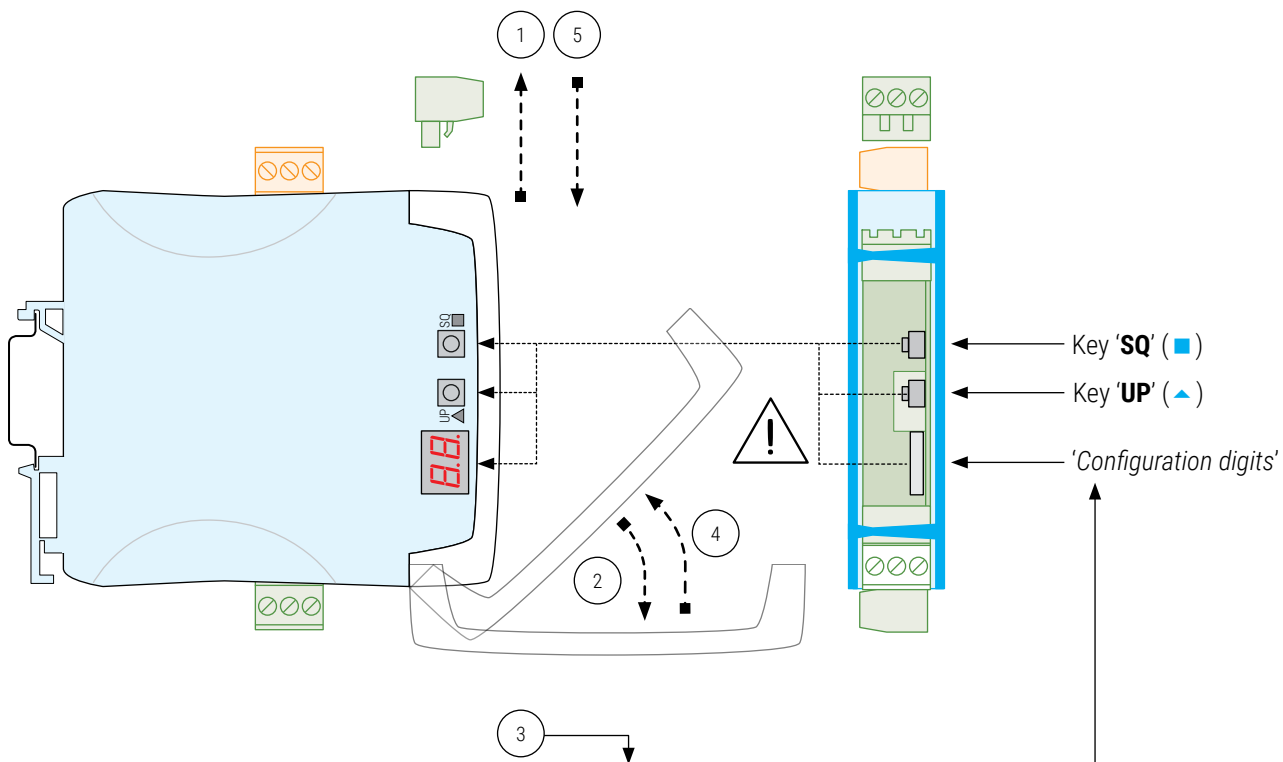


Opening the front cover reduces the security level. While front cover is open :

- the isolation between accessible parts and power supply is reduced from '*reinforced*' to '*basic*'.
- accessible parts are part of the input signal circuit.
- operations must be performed by qualified operators.

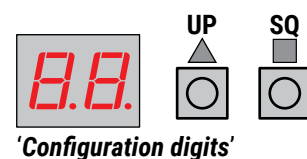


When correctly connected, the input signal terminal prevents the front cover from opening.



'CONFIGURATION SYSTEM'

- the '*configuration digits*' indicate the active input signal range (see section 5)
- keys '**UP**' (▲) and '**SQ**' (■) to configure the instrument (see section 10.2)



10. Operate the configuration system

CONFIGURATION SYSTEM

The **Series I3** of isolated signal converters provide a fast and easy configuration system, based on function codes.

'CONFIGURATION DIGITS'

The instrument provides two numerical leds, to inform about the actual state of the instrument, active input signal range, and error codes (see section 15).

CONFIGURATION KEYPAD

The configuration keypad is located inside the instrument, behind the removable front cover. To access the configuration keypad, remove the input signal terminal, and open the front cover (see section 9). The instrument allows to password lock the keypad functions, by activating an access code ('password' function) (see section 10.4).

10.1. '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 configuration (see section 5)
- 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 10.2)
- to access the '*tools*' menu, press the '**UP**' (▲) key for 1 second (see section 10.3)

'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.

10.2. 'Configuration mode'

HOW TO ACCESS THE 'CONFIGURATION MODE'

With the instrument in '*normal mode*' of operation (see section 10.1), 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 configuration (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 60 seconds, the instrument exits the '*configuration mode*' and returns to '*normal mode*' of operation, discarding changes.

9. Operate the configuration system (cont.)

10.3. 'Tools' menu

HOW TO ACCESS THE 'TOOLS' MENU

With the instrument in '*normal mode*' of operation (see section 10.1), 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 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 60 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

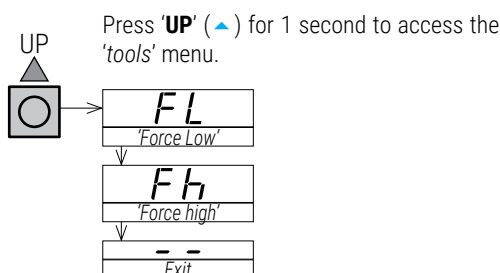
If there is no interaction from the operator for 60 seconds, the instrument exits the '*tools*' menu and returns to '*normal mode*' of operation.

AVAILABLE FUNCTIONS

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

- select '**Force low**' (FL) function to set both output signals to the minimum value of the selected ranges (4mA). 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 both output signal to the maximum value of the selected range (20mA). 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 6 | '*Tools*' menu



10.4. 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 trying to access the '*configuration mode*' or the '*tools*' menu.

To activate a '*password*' select code '**15**' inside the '*configuration mode*'. The step-by-step process is indicated below:

- access the '*configuration mode*' (see section 10.2)
- access code '**15**'
- 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*' (60 seconds) to exit without changes
- the menu returns '*normal mode*' (see section 10.1)

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 '**15**' and select value '**00**'. Press '**SQ**' (■) key to confirm.

10.5. Working mode

The instrument can be configured to work with a slower or faster mode. The slower mode will have an improved accuracy in most of the working range. Configure code '**18**' '*Working mode*' and select the value to '**01**' for a standard response time of 200mSec or select '**02**' for a response time of 550mSec and an improved accuracy in most of the working range.

HOW TO SET THE 'WORKING MODE' PARAMETER

To configure the '*working mode*' value, access code '**18**' inside the '*configuration mode*'. The step-by-step process is indicated below.

- access the '*configuration mode*' (see section 10.2)
- access code '**18**'
- press the '**SQ**' (■) key to select
- the '*configuration digits*' indicate code '**01**' flashing
- press the '**UP**' (▲) key, to select value '**01**' or '**02**'
- 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 10.1)

11. 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 input terminal prevents the front cover from opening.

12. Warranty

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

Extended warranty available at (see section 4).

13. Factory default parameters

Displayed code		[10]
Input signal	4/20 mA	
Output signal 1	4/20 mA	
Output signal 2	4/20 mA	
Password code	disabled	[00]
Working mode	mode 1	[01]

RESET TO DEFAULT FACTORY PARAMETERS

To recover the instrument to default factory parameters, select code '16' and activate value '01'.

- access the 'configuration mode'
- access code '16' 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 alphanumeric code from '00' to 'FF', accessible through configuration code '17'.

14. 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 **I3D**

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 section 4.

Barberà del Vallès, October 2022
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.

15. 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 7 | Error codes

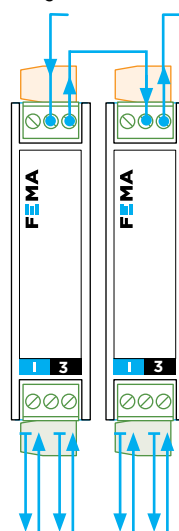
E1	'Password error'. If 'password' function is active, the password code entered is not correct.
E2	'Hardware overrange'. Input signal is above the maximum readable signal (>20.5mA, >10.5Vdc). Output signal is fixed to 20.5mA.
E3	'Hardware underrange'. Input signal is below the minimum readable signal (<3.0mA, <-0.3Vdc). Output signal is fixed to 3mA. Possible shortcircuit at input. Possible open circuit at input.
E4	Overload at the 4/20 mA input. The input signal detected is higher than 90mA. The instrument self protection has opened the circuit. The instrument tries to reconnect every 1 second.

16. FAQ's

16.1. Signal quadrupler - 4 analog outputs

By utilizing two instruments, you can configure a signal quadrupler for a 4–20 mA input signal, producing four independent 4–20 mA output signals equal to the original input signal. This is achieved by connecting the input signal in series to create a single 4–20 mA loop that passes through the input terminals of both instruments. Each instrument subsequently generates two isolated 4–20 mA output signals, resulting in a total of four output signals.

Single 4/20 mA input



four 4/20 mA outputs

In this example, a 4/20 mA active (the loop is generated by an external instrument) is connected to 2x I3D instruments, generating four active output signals. The loop power for the outputs is provided by the I3D instruments.

Refer to the standard guidelines in the manual for input and output terminal connections (see section 8).

Note that the input impedance of each I3D instrument is such that voltage drop on input terminals is <1.2 Vdc. The instrument powering the loop must be able to generate enough power to sustain 20 mA with the <2.4 Vdc total voltage drop.

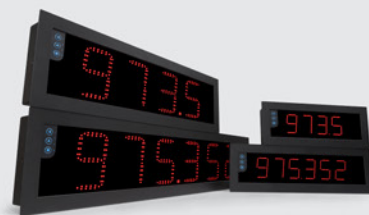
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DIGITAL PANEL METERS
Section Industrial



SIGNAL CONVERTERS
Section Industrial



LARGE DISPLAYS
Section Industrial



PANEL METERS . LOW COST
Section OEM



DUPLICATORS . ISOLATORS
Section OEM



LARGE DISPLAYS
Section Special



SPECIAL INSTRUMENTS
Section Special



DATA ACQUISITION
Section Industrial



'CUSTOMIZED' INSTRUMENTS