

# FEMA

## MODEL · I4P

# PROCESS AND TEMPERATURE



### Signal converter for process and temperature signals, isolated, for DIN rail mount.

Isolated signal converter for process and temperature signals. Configurable to measure a wide range of process signals including 4/20 mA, 0/10 Vdc, potentiometers and resistance measurements, providing excitation voltage to power the transducer when needed. Configurable to measure a wide range of temperature signals, including Pt100, Pt500 and Pt1000 sensors, thermocouples J, K, N, E, T, R, S, C and B, NTC sensors (44004 to 44008 and 44030 to 44034), and a single NTC range with configurable  $R_{25}$  and  $\beta$  parameters. Output signal configurable for 4/20 mA (active and passive) and 0/10 Vdc. Universal power supply from 18 to 265 Vac/dc. 3 way isolation between input, output and power circuits. Plug-in screw terminal connections.

Two configuration modes: <sup>(1)</sup> easy and fast using predefined configuration codes, and <sup>(2)</sup> advanced configuration through the 'configuration menu' to customize input and output signal ranges. Configuration through front push-button keypad and front display. Configurable display information (input signal value, output signal value, configured label, signal percentage and process value). Manual 'force' functions to generate low and high output signals, to validate remote instrumentation during installation. 'Password' function to block non-authorized access to configuration menu. 'SOS' mode to help on critical maintenance and repairs without affecting the manufacturing process. Designed for industrial use, with potential integration into a wide range of applications, excellent quality and optional customization.

## 1. TECHNICAL SPECIFICATIONS

<b>Input signal ranges</b>	
process	4/20 mA, 0/10 Vdc (active and passive) excitation voltage +15Vdc @25mA
thermocouples	J, K, N, E, T, R, S, C and B (according to ITS-90)
'Pt' sensors	Pt100 (2 wires and 3 wires), Pt500, Pt1000 (2 wires)
'NTC' sensors	44004, 44005, 44006, 44007, 44008, 44030, 44031, 44032, 44033, 44034 and NTC with $R_{25}$ and $\beta$
resistances	ranges from 0/1 Kohm up to 0/1 MOhm
potentiometers	nominal value from 250 Ohm to 15KOhm
* for a list of preconfigured signal ranges, see section 7	
<b>Accuracy at 25 °C*</b>	
see section 7 for each type of signal	
*values for 4/20 mA output, for 0/10 Vdc output, add +0.05% to indicated accuracy.	
<b>Thermal stability</b>	
±100 ppm/°C (F.S.) ±0.05 °C/°C (thermocouple cold junction)	
<b>Step response</b>	
Typical response time, according to the configured power filter, to reach 99% of output, in response to a 100% input step (see Table 1)	
<b>Output signal ranges</b>	
active current output	4/20 mA active, max. <22 mA, min. 0 mA, load <400 Ohm
passive current output	4/20 mA passive, max. 30 Vdc on terminals
voltage output	0/10 Vdc, max. <11 Vdc, min. -0.05 Vdc (typ.), load >10 KOhm
* custom input and output ranges through the 'configuration menu' (for example: 4/12 mA, 0/5 Vdc, 20/4 mA, etc)	
<b>Configuration system</b>	
key pad + display	accessible at the front of the instrument
configuration modes	<sup>(1)</sup> through preconfigured codes, <sup>(2)</sup> through 'configuration menu'
<b>Power supply</b>	
voltage range	18 to 265 Vac/dc isolated (20 to 240 Vac/dc ±10%)
AC frequency	45 to 65 Hz
consumption	<3.0 W
power wires	1 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (AWG17 to AWG14)
overvoltage category	2
<b>Isolation</b>	
input - output	3000 Veff (60 seconds)
power - input	3000 Veff (60 seconds)
power - output	3000 Veff (60 seconds)
<b>Environmental</b>	
IP protection	IP30
impact protection	IK06
operation temperature	from 0 to +50 °C
storage temperature	from -20 to +70 °C
'warm-up' time	15 minutes
humidity	0 to 95% non condensing
altitude	up to 2000 meters
<b>Mechanical</b>	
size	106x108x22.5 mm
mounting	standard DIN rail (35x7.5 mm)
connections	plug-in screw terminals (pitch 5.08 mm)
housing material	polyamide V0
weight	<150 grams
packaging	120x115x30 mm, cardboard

## 2. HOW TO ORDER

<b>I4P</b>	Process and temperature signal converter
<b>I4P1442</b>	Process and temperature signal converter with custom features

## 3. DIMENSIONS

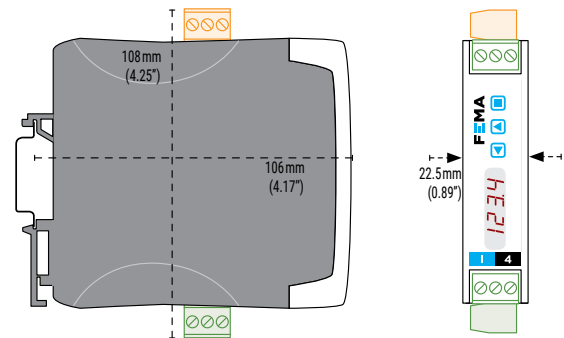


Table 1 | Response times

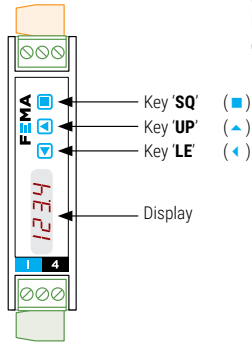
Type of signal	No filter	50 Hz or 60 Hz filter	Both
Process	<60 mSec.	<250 mSec.	<600 mSec.
Pt100	<100 mSec.	<320 mSec.	<2 Sec.
Thermocouple	<100 mSec.	<200 mSec.	<1 Sec.
Resistances*	<100 mSec.	<200 mSec.	<200 mSec.

\*for the 1 MOhm range, applies double response time

## 4. CONFIGURATION SYSTEM

The instrument allows for 2 configuration modes: <sup>(1)</sup> easy and fast using predefined configuration codes, and <sup>(2)</sup> advanced configuration through the 'configuration menu'.

Configuration is applied through the 3 push button keypad and the 4 red digit led display at the front of the instrument.



## 6. CONNECTIONS: INPUT & OUTPUT

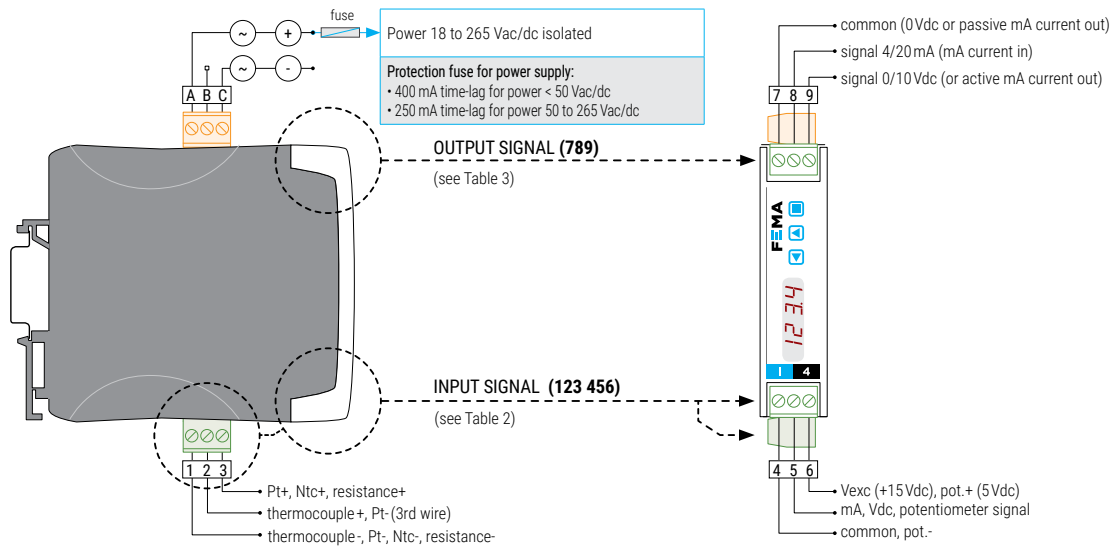


Table 2 | INPUT signal connections

Input signal	Input terminals					
	1	2	3	4	5	6
4/20 mA (passive loop)					mA- (in)	+15Vexc (out)
4/20 mA (active loop)				mA+ (out)	mA- (in)	
0/10 Vdc (2 wires)				common	+Vdc	
0/10 Vdc (3 wires)				common	+Vdc	+15Vexc
Thermocouples	tc-	tc+				
Ntc	ntc-		ntc+			
Pt100 (3 wires)	pt100-	pt100- (3 <sup>rd</sup> wire)	pt100+			
Pt100 (2 wires)	pt100-	short to terminal 1	pt100+			
Pt500, Pt1000	pt-		pt+			
Resistances	res-		res+			
Potentiometer				pot-	signal	pot+ (+5Vexc)
Passive potentiometer				common	signal	Vexc (in)

## 5. FUNCTIONS INCLUDED

- 'Force'** functions . . . . . temporarily forces the signal output to the minimum (**'Force Low'**), to the maximum (**'Force High'**) or to a selectable value (**'Force Set'**), to validate the function of the remote elements connected to the output during installation.
- 'Label'** function . . . . . configure an alphanumerical label to be shown on display, and easily identify each unit.
- 'SOS'** mode . . . . . manually set the output to a fixed value, to apply critical maintenance or repairs to the input signal section without affecting the manufacturing process.
- 'Messages'** function . . . . . configure information to display at your request at front key **'LE'** (◀). See real time values for input signal, output signal, input percentage, process value or configured label.
- 'On error'** function . . . . . configure the output response in case of error at the input.
- 'Password'** function . . . . . prevents access from unauthorized operators to 'configuration menu'.

Table 3 | OUTPUT signal connections

Output signal	Output terminals			Connections
	7	8	9	
4/20 mA active output		mA- (in)	mA+ (out)	
4/20 mA passive output* (*external loop power needed).	mA+ (out)	mA- (in)		
0/10 Vdc	common		+Vdc	

## 7. PRECONFIGURED SIGNAL RANGES AND TYPICAL APPLICATIONS

The instrument has 2 different configuration modes: <sup>(1)</sup>easy and fast using predefined configuration codes, and <sup>(2)</sup>advanced configuration through the 'configuration menu'.

The tables below provide a list of preconfigured input signal ranges, together with technical specifications for each range, and the associated preconfiguration codes. The 'configuration menu' allows to configure custom ranges for both the input and the output ranges. For additional information see the 'User's Manual' (see section 9).

### Typical applications

- pressure transducers that provide 4/20mA signals and can be powered from the instrument excitation voltage.
- direct measurement potentiometer signals or parallel measurements of existing potentiometer signals.

- measurement of resistance values.
- measurement of temperature with direct connection to specific NTC probes or use the range with beta and  $R_{25}$  configurable values.
- measurement of temperature with direct connection to Pt100 probes, 2 and 3 wires, with multiple preconfigured codes for specific ranges, or configure your own temperature range.
- measurement of temperature from Pt500 and Pt1000 probes.
- measurement of temperature with direct connection to a wide range of thermocouple types. Select one of the multiple preconfigured codes for specific ranges, or configure your own temperature range. Cold junction compensation can be disabled to work with electronic thermocouple simulators.



Tables below indicate the preconfigured ranges for input and output signals. Use the 'configuration menu' to configure custom input and output ranges. For additional information see the User's Manual (see section 9).

Table 4 | Input ranges and technical specifications for process signals

Input range	Code for 4/20 mA output	Code for 0/10 Vdc output	Accuracy (% FS)	Max. oversignal	Zin
4/20 mA	010	110	<0.10%	1 Adc	$V^* < 2Vdc$
0/10 Vdc	011	111	<0.10%	50 Vdc	1 MOhm

\* Voltage drop on terminals <2Vdc.

Table 5 | Input ranges and technical specifications for potentiometer signals

Input range	Code for 4/20 mA output	Code for 0/10 Vdc output	Accuracy (% FS)	Max. oversignal	Zin
0/100%	012	112	<0.20%	---	---

Table 6 | Input ranges and technical specifications for 'passive mode' potentiometer signals

Input range	Code for 4/20 mA output	Code for 0/10 Vdc output	Accuracy (% FS)	Max. overvoltage on passive Vexc.
0/100%	013	113	<0.20%	20 Vdc

Table 7 | Input ranges and technical specifications for resistances

Input range	Code for 4/20 mA output	Code for 0/10 Vdc output	Accuracy (% FS)	Current on resistance	Max. overvoltage
0/1 KOhm	014	114	<0.20%	167 uA	3 Vdc
0/10 KOhm	015	115	<0.20%	45 uA	3 Vdc
0/100 KOhm	016	116	<0.20%	4.5 uA	3 Vdc
0/1000 KOhm	017	117	<0.20%	1 uA	3 Vdc

Table 8 | Input ranges and technical specifications for NTC sensors

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Ntc 44004	020	120	-80/120 °C	-112/248 °F	<0.30%
Ntc 44005	021	121	-80/120 °C	-112/248 °F	<0.25%
Ntc 44006	022	122	-80/120 °C	-112/248 °F	<0.10%
Ntc 44007	023	123	-80/120 °C	-112/248 °F	<0.15%
Ntc 44008	024	124	-80/120 °C	-112/248 °F	<0.20%
Ntc 44030	025	125	-80/75 °C	-112/167 °F	<0.10%
Ntc 44031	026	126	-80/75 °C	-112/167 °F	<0.10%
Ntc 44032	027	127	-80/75 °C	-112/167 °F	<0.20%
Ntc 44033	028	128	-80/75 °C	-112/167 °F	<0.10%
Ntc 44034	029	129	-80/75 °C	-112/167 °F	<0.10%
Ntc $R_{25}=10K$ , $\beta=3500$	030	130	-50/90 °C	-58/194 °F	<0.20%

Table 9 | Input ranges and technical specifications for Pt100

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Pt100	070	170	-200/850 °C	-328/1562 °F	<0.25% FS (-2.6°C)
	071	171	0/600 °C	32/1112 °F	<0.25% FS (-1.5°C)
	072	172	0/400 °C	32/752 °F	<0.30% FS (-1.2°C)
	073	173	0/300 °C	32/572 °F	<0.25% FS (-0.8°C)
	074	174	0/200 °C	32/392 °F	<0.30% FS (-0.6°C)
	075	175	0/100 °C	32/212 °F	<0.50% FS (-0.5°C)
	076	176	-50/+50 °C	-58/122 °F	<0.50% FS (-0.5°C)

Table 10 | Input ranges and technical specifications for Pt500 and Pt1000

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Pt500	080	180	-200/850 °C	-328/1562 °F	<0.20% FS
Pt1000	081	181	-200/850 °C	-328/1562 °F	<0.20% FS

## 8. PRECONFIGURED SIGNAL RANGES AND TYPICAL APPLICATIONS (cont.)



Tables below indicate the preconfigured ranges for input and output signals. Use the 'configuration menu' to configure custom input and output ranges. For additional information see the User's Manual (see section 9).

Table 16 | Input ranges and technical specifications for thermocouple J

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. J	031	131	-200/1200 °C	-328/2192 °F	<0.15% FS ±2° C
	032	132	0/700 °C	32/1292 °F	<0.20% FS ±2° C
	033	133	0/400 °C	32/752 °F	<0.10% FS ±2° C
	034	134	0/250 °C	32/482 °F	<0.15% FS ±2° C
	035	135	0/150 °C	32/302 °F	<0.20% FS ±2° C

Table 17 | Input ranges and technical specifications for thermocouple K

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. K	036	136	-200/1372 °C	-328/2501 °F	<0.15% FS ±2° C
	037	137	0/1200 °C	32/2192 °F	<0.15% FS ±2° C
	038	138	0/700 °C	32/1292 °F	<0.20% FS ±2° C
	039	139	0/400 °C	32/752 °F	<0.30% FS ±2° C
	040	140	0/300 °C	32/572 °F	<0.40% FS ±2° C
	041	141	0/250 °C	32/482 °F	<0.40% FS ±2° C
	042	142	0/150 °C	32/302 °F	<0.70% FS ±2° C

Table 18 | Input ranges and technical specifications for thermocouple N

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. N	045	145	-200/1300 °C	-328/2372 °F	<0.15% FS ±2° C
	046	146	0/1200 °C	32/2192 °F	<0.15% FS ±2° C
	047	147	0/1000 °C	32/1832 °F	<0.15% FS ±2° C

Table 19 | Input ranges and technical specifications for thermocouple E

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. E	050	150	-200/1000 °C	-328/1832 °F	<0.15% FS ±2° C
	051	151	0/1000 °C	32/1832 °F	<0.15% FS ±2° C
	052	152	0/800 °C	32/1472 °F	<0.15% FS ±2° C
	053	153	0/500 °C	32/932 °F	<0.15% FS ±2° C
	054	154	0/300 °C	32/572 °F	<0.15% FS ±2° C

Table 11 | Input ranges and technical specifications for thermocouple T

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. T	055	155	-200/400 °C	-328/752 °F	<0.15% FS ±2° C
	056	156	0/400 °C	32/752 °F	<0.15% FS ±2° C
	057	157	0/300 °C	32/572 °F	<0.15% FS ±2° C
	058	158	0/200 °C	32/392 °F	<0.15% FS ±2° C

Table 12 | Input ranges and technical specifications for thermocouple R

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. R	059	159	-50/1768 °C	-58/3214 °F	<0.15% FS ±2° C
	060	160	0/1600 °C	32/2912 °F	<0.15% FS ±2° C
	061	161	0/1000 °C	32/1832 °F	<0.15% FS ±2° C

Table 13 | Input ranges and technical specifications for thermocouple S

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. S	062	062	-50/1768 °C	-58/3214 °F	<0.15% FS ±2° C
	063	063	0/1600 °C	32/2912 °F	<0.15% FS ±2° C

Table 14 | Input ranges and technical specifications for thermocouple C

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. C	064	164	0/2320 °C	32/4208 °F	<0.15% FS ±2° C
	065	165	0/1500 °C	32/2732 °F	<0.15% FS ±2° C

Table 15 | Input ranges and technical specifications for thermocouple B

Sensor	Code for 4/20 mA output	Code for 0/10 Vdc output	Input range (°C)	Input range (°F)	Accuracy (% FS)
Thermoc. B	066	166	250/1820 °C	482/3308 °F	<0.40% FS ±2° C