



**MEGGITT**  
smart engineering for  
extreme environments

## IPC 704

# Signal conditioner

### FEATURES

- » From the Vibro-Meter® product line
- » For CA xxx piezoelectric accelerometers and CP xxx dynamic pressure sensors
- » Configurable high-pass and low-pass filters
- » Frequency range: 0.5 Hz to 20 kHz
- » Optional integrator to produce a velocity output
- » Optional 2-wire current or 3-wire voltage transmission
- » Certified for use in potentially explosive atmospheres
- » A range of installation options are available



CE Ex SP US  
IECEx NEPSI

### DESCRIPTION

The IPC 704 signal conditioner converts the charge-based signal from a piezoelectric-based transducer into a current or a voltage signal. This current or voltage signal is transmitted to the processing electronics via a standard 2-wire or 3-wire transmission cable.

The current modulation technique allows transmission over a distance of up to 1 km. A GSI galvanic separation unit is required for this configuration.

The electronic circuitry of the IPC 704 signal conditioner is incorporated into a moulded aluminium enclosure. The signal conditioner has configurable

high-pass and low-pass filters and an optional integrator to give a velocity output. Furthermore, RFI filters protect the input and output against radio-frequency interference and other electromagnetic influences.

A range of installation options are available for the IPC 704 signal conditioner, including:

- » A polyester enclosure providing environmental protection against dust, oil and water jets.
- » A mounting adaptor allowing the IPC 704 signal conditioner to be mounted on a DIN rail.



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## Signal conditioner IPC 704

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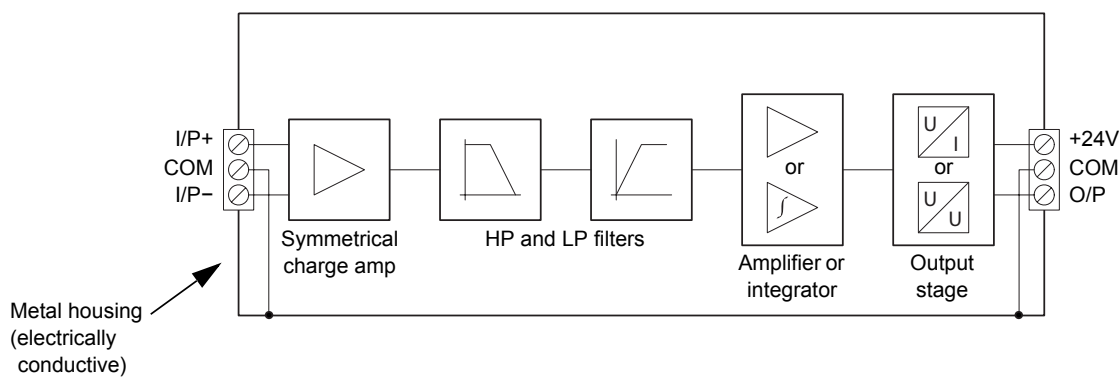
### DESCRIPTION *(continued)*

Two versions of the IPC 704 signal conditioner are available:

» An IPC 704 for sensors using standard piezoelectric materials, for example, CA xxx, CP 10x and CP 2xx (ordering number 244-704-000-042-...).

» An IPC 704 for sensors using GaPO<sub>4</sub> piezoelectric material, for example, CP 50x (ordering number 244-704-000-511-...).

### BLOCK DIAGRAM



### SPECIFICATIONS

#### Environmental characteristics

(Specifications according to IEC 60068-2 recommendations)

#### General

Temperature

- *Operation* : -30 to +85°C
- *Storage* : -40 to +85°C

Humidity

- : Max. 95% non-condensing.
- Note: For operation in a humid environment, ordering option A3 (potted version) should be considered.

Protection rating

- (according to IEC 60529) : IP40

Vibration

- (according to IEC 60068-2-26) : 2 g peak between 10 and 500 Hz

Shock acceleration

- (according to IEC 60068-2-27) : 15 g peak (half-sine, 11 ms duration)

#### Industrial housing (ordering option G1)

Protection rating

- (according to IEC 60529) : IP66

Impact resistance

- : >4 mJ/mm<sup>2</sup> (DIN 53453)

Chemical resistance

- : Good resistance to seawater, acids, alkaline solutions, gasoline and oils

Flammability

- : UL94V-0 self-extinguishing


**MEGGITT****Signal conditioner  
IPC 704****SPECIFICATIONS** *(continued)***Explosive atmospheres**

Available in Ex approved versions for use in hazardous locations

Type of protection Ex i: intrinsic safety ( <b>ordering option A2</b> )		
Europe	EC type examination certificate	LCIE 02 ATEX 6085 X II 2G (Zones 1, 2) Ex ib IIC T6 to T4 Gb
North America	cCSAus certificate	cCSAus 1243981 Class I, Div. 1, Groups A, B, C, D Ex ia (T6 to T4)
International	IECEx certificate of conformity	LCI 06.0009X Ex ib IIC T6 to T4 Gb
China	NEPSI certificate of conformity	GYJ12.1450X Ex ib IIC T6 to T4 Gb
Korea	KGS certificate of conformity	12-GA4BO-0396X Ex ib IIC T6 to T4

 **For specific parameters of the mode of protection concerned and special conditions for safe use, please refer to the certificates that are available from Meggitt SA on demand.**

Type of protection Ex nA: non-sparking apparatus ( <b>ordering option A3</b> )		
Europe	Voluntary type examination certificate	LCIE 09 ATEX 1027 X II 3G (Zone 2) Ex nA IIC T6 to T5 Gc

 **When using protection mode 'nA' (non-sparking apparatus), the user shall ensure that the signal conditioner is installed in an enclosure that ensures a protection rating of at least IP54 (or equivalent).**

**Industrial housing (ordering option G1)**

Available in Ex approved versions for use in hazardous locations

- *Environment* : II 2 G (Zones 1, 2) Ex e II
- *Surface resistivity for Ex version* : <math> < 10^9 \Omega </math> (DIN 53482)

**Stuffing glands**

Available in Ex approved versions for use in hazardous locations

- *Environment* : II 2 G/D (Zones 1, 2) Ex e II

 **For specific parameters of the mode of protection concerned and special conditions for safe use, please refer to the certificates that are available from Meggitt SA on demand.**

**Power supply to IPC 704**

- Voltage : 18 to 30 V<sub>DC</sub>
- Current : 25 mA (max.)

## Signal conditioner IPC 704

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### SPECIFICATIONS (continued)

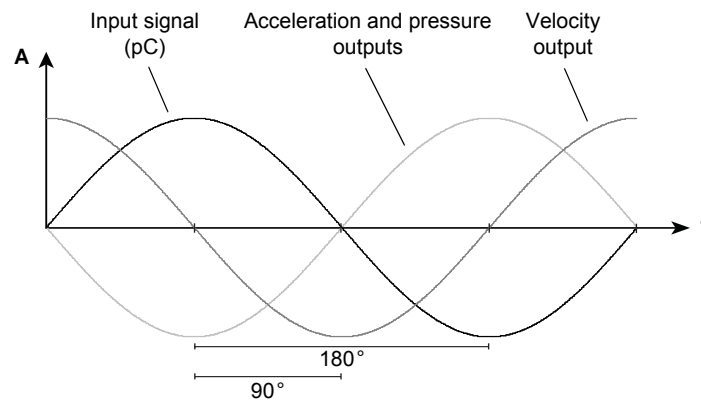
#### Transfer characteristics (ordering option B)

IPC 704 for sensors using standard piezoelectric materials (244-704-000-042-...)

- *Transfer without integrator* : 0.1 to 10 mV/pC or 0.1 to 10  $\mu$ A/pC
- *Transfer with integrator* : 981 to 98 100 mV/(pC.s) or 981 to 98 100  $\mu$ A/(pC.s)

IPC 704 for sensors using GaPO<sub>4</sub> piezoelectric material (244-704-000-511-...)

- *Transfer* : 0.1 to 50 mV/pC or 0.1 to 50  $\mu$ A/pC
- Linearity error :  $\leq 0.2\%$
- Temperature stability : 100 ppm/ $^{\circ}$ C typical
- Phase : 180 $^{\circ}$  between the input signal and the acceleration output.  
180 $^{\circ}$  between the input signal and the pressure output.  
90 $^{\circ}$  between the acceleration and velocity outputs.  
(See graph below.)



#### Input characteristics (ordering option C)

- Compatible sensors : Any piezoelectric-based transducer, symmetrical or non-symmetrical, case grounded or insulated
- Dynamic range : 100000 pC peak
- Input sensitivity : Accelerometer: 10 to 200 pC/g.  
Dynamic pressure transducer: 10 to 1000 pC/bar.
- Charge amplifier : Symmetrical
- RFI filter : Symmetrical LC network
- Resistance :  $\geq 50$  k $\Omega$  (sensor and cable)
- Capacitance :  $\leq 10$  nF (sensor and cable)

#### Output characteristics (ordering option D)

- RFI filter : Symmetrical LC network
- 2-wire current transmission : Symmetrical LC network
- *Dynamic signal* : Max.  $\pm 5$  mA peak
- *Standing current* : 12 mA  $\pm 0.5$  mA
- *Electrical connection* : +24 V = "+", COM = "-"
- *Output sensitivity* : See ordering information
- *Max. dynamic range* : 5 mA peak/output sensitivity



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**SPECIFICATIONS** *(continued)*

3-wire voltage transmission

- *Dynamic signal* : Max.  $\pm 5$  V peak
- *Standing voltage* :  $7.5$  V  $\pm 0.2$  V
- *Output sensitivity* : See ordering information
- *Output impedance* :  $750$   $\Omega$  (3-wire configuration)
- *Max. dynamic range* : 5 V peak/output sensitivity

**⚠ The 3-wire voltage output without galvanic separation unit should only be used with piezoelectric-based transducers which are insensitive to frame voltage. Dynamic pressure transducers should always be used with a GSI galvanic separation unit.**

**Filter characteristics (ordering options E and F)**

**High-pass filter**

- *Cut-off frequencies (at -3 dB)* : 0.5, 1, 2, 5 or 10 Hz (all  $\pm 20\%$ )
- *Slope* : 24 dB/octave (4th order)

**⚠ When selecting a high-pass filter, be careful to select an appropriate frequency for the charge amplifier. See the charge amplifier frequencies versus transfer unit graphs on the following pages.**

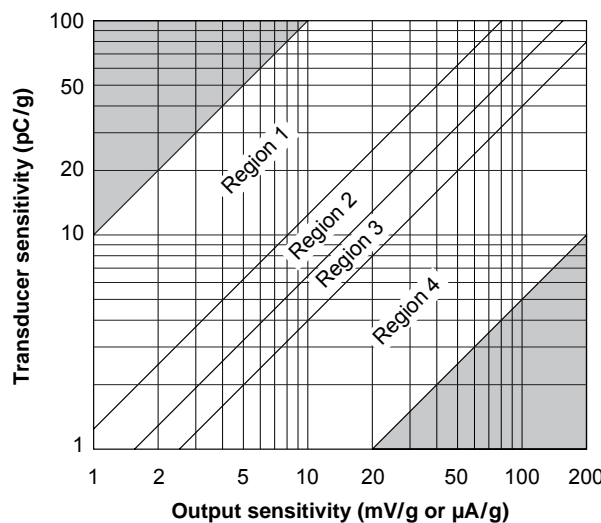
**Low-pass filter**

- *Cut-off frequencies (at -1 dB)* : 200, 500, 1000, 2000, 5000, 10000 or 20000 Hz (all  $\pm 10\%$ )
- *Slope* : 12 dB/octave (2nd order)

**Charge amplifier frequencies versus transfer unit**

**IPC 704 for accelerometers (acceleration output) using standard piezoelectric materials**

Ordering number 244-704-000-042-... with ordering options B01 and B02



**Notes**

For operation in different regions of the chart, the cut-off frequency of the IPC 704's charge amplifier dictates the required high-pass filter settings. (See the HP FILTER (E) option in ordering information.)

Region 1: Cut-off frequency is 0.5 Hz → HP filter  $\geq 0.5$  Hz.

Region 2: Cut-off frequency is 1 Hz → HP filter  $\geq 1$  Hz.

Region 3: Cut-off frequency is 2 Hz → HP filter  $\geq 2$  Hz.

Region 4: Cut-off frequency is 3 Hz → HP filter  $\geq 5$  Hz.

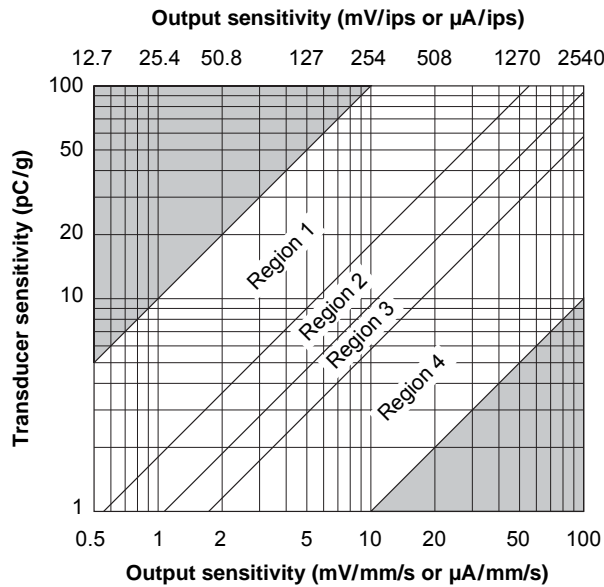
**Signal conditioner  
IPC 704**



**SPECIFICATIONS (continued)**

**IPC 704 for accelerometers (velocity output) using standard piezoelectric materials**

Ordering number 244-704-000-042-... with ordering options B03, B04, B05 and B06



**Notes**

For operation in different regions of the chart, the cut-off frequency of the IPC 704's charge amplifier dictates the required high-pass filter settings. (See the HP FILTER (E) option in ordering information.)

Region 1: Cut-off frequency is 0.5 Hz → HP filter ≥ 0.5 Hz.

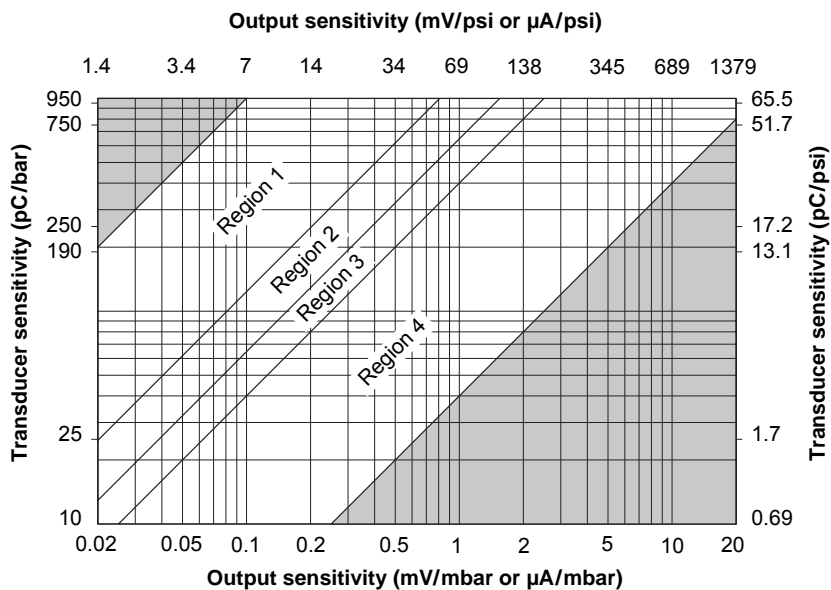
Region 2: Cut-off frequency is 1 Hz → HP filter ≥ 1 Hz.

Region 3: Cut-off frequency is 2 Hz → HP filter ≥ 2 Hz.

Region 4: Cut-off frequency is 3 Hz → HP filter ≥ 5 Hz.

**IPC 704 for pressure sensors using standard piezoelectric materials**

Ordering number 244-704-000-042-... with ordering options B07, B08, B09 and B10



**Notes**

For operation in different regions of the chart, the cut-off frequency of the IPC 704's charge amplifier dictates the required high-pass filter settings. (See the HP FILTER (E) option in ordering information.)

Region 1: Cut-off frequency is 0.5 Hz → HP filter ≥ 0.5 Hz.

Region 2: Cut-off frequency is 1 Hz → HP filter ≥ 1 Hz.

Region 3: Cut-off frequency is 2 Hz → HP filter ≥ 2 Hz.

Region 4: Cut-off frequency is 3 Hz → HP filter ≥ 5 Hz.

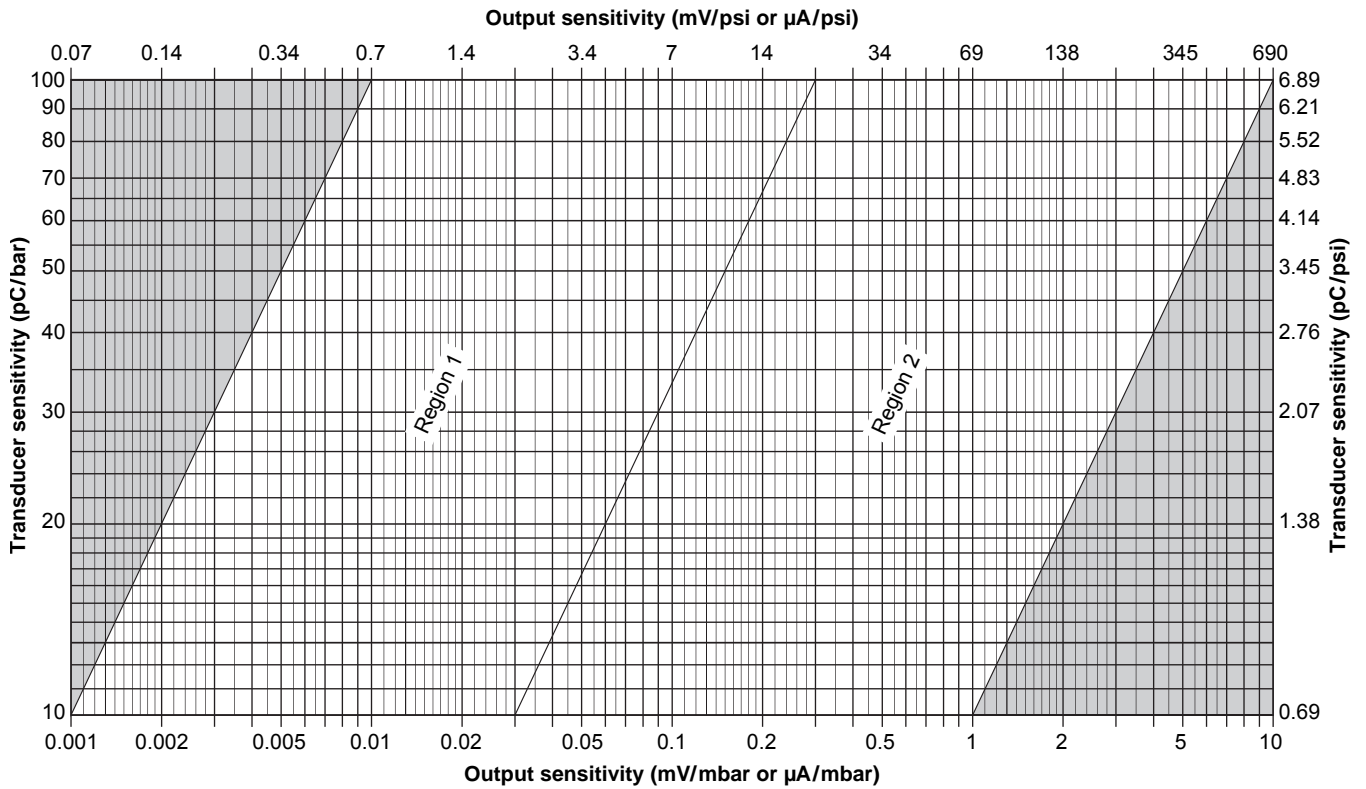


Signal conditioner  
IPC 704

**SPECIFICATIONS** *(continued)*

**IPC 704 for pressure sensors using GaPO<sub>4</sub> piezoelectric material**

Ordering number 244-704-000-511-... with ordering options B07, B08, B09 and B10



**Notes**

For operation in different regions of the chart, the cut-off frequency of the IPC 704's charge amplifier dictates the required high-pass filter settings. (See the HP FILTER (E) option in ordering information.)

Region 1: Cut-off frequency is 0.5 Hz → HP filter ≥ 0.5 Hz.

Region 2: Cut-off frequency is 1 Hz → HP filter ≥ 1 Hz.

**Signal conditioner  
IPC 704****MEGGITT****SPECIFICATIONS** *(continued)*

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**Physical characteristics****Signal conditioner without industrial housing (ordering option G0)**

- *Enclosure* : Injection moulded aluminium, anodized
- *Mounting* : Two or four M4 screws
- *Weight* : Standard version: 170 g  
Ex version: 250 g (the signal conditioner is moulded into silicon)
- *Dimensions* : See mechanical drawings
- *Electrical connection (input)* : Three screw terminals – wire section 2.5 mm<sup>2</sup> (max.)
- *Electrical connection (output)* : Three screw terminals – wire section 2.5 mm<sup>2</sup> (max.)

**Signal conditioner with industrial housing (ordering option G1)**

- *Enclosure* : Polyester reinforced with glass fibre
- *Cover seal* : Silicone gasket
- *Mounting* : M6 x 30 mm Allen screws
- *Dimensions* : See mechanical drawings

**Input/output stuffing glands (ordering options H and I)**

- *Type* : See ordering information
- *Material* : Nickel-plated brass with Viton® seal

**Signal conditioner with mounting adaptor (ordering option G2)**

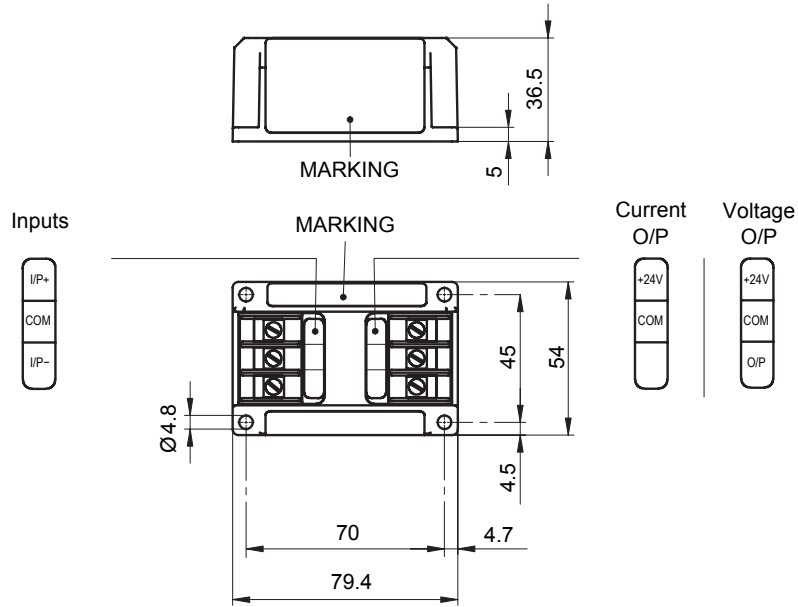
- Universal DIN rail holder type : TSH35
- DIN rail type : EN 50022-35 x 7.5 or EN 50022-35 x 15



Signal conditioner  
IPC 704

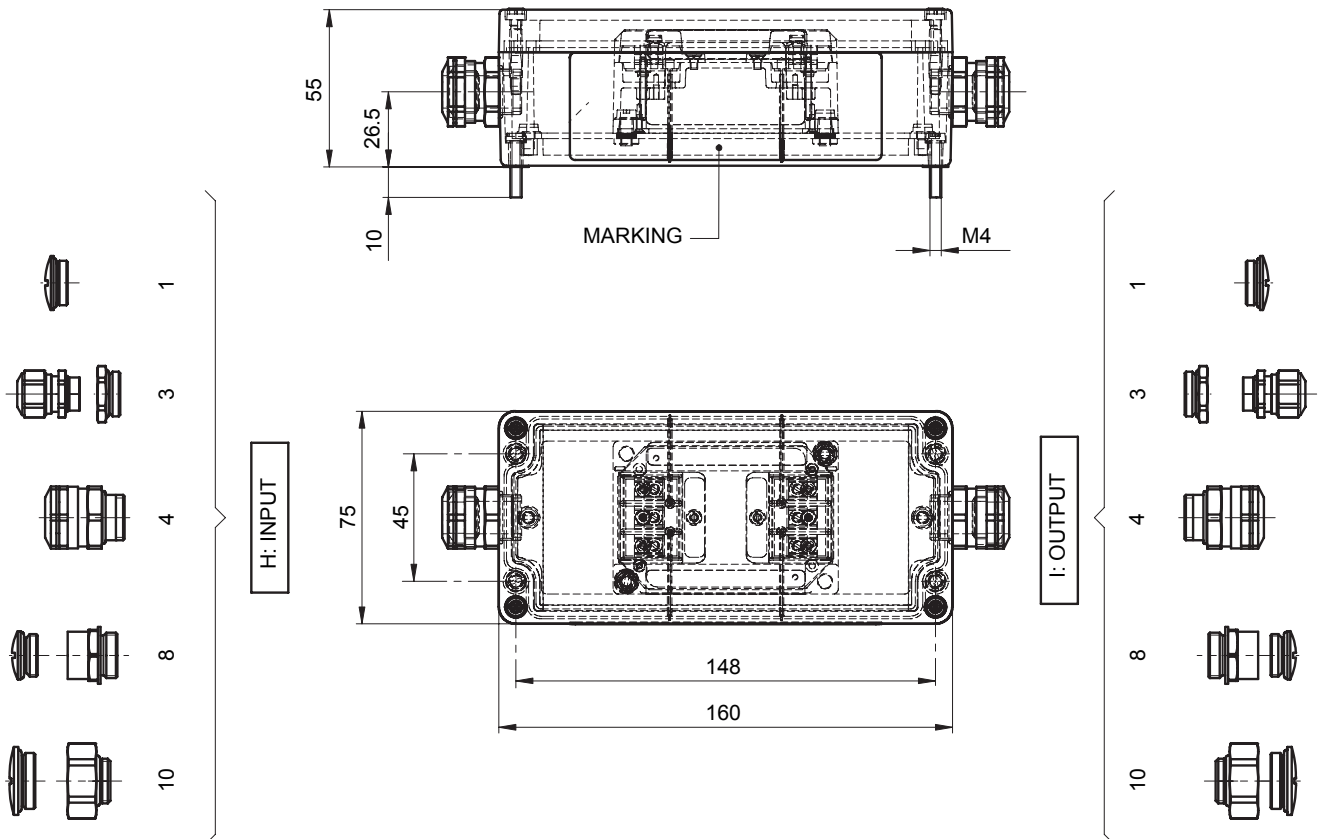
MECHANICAL DRAWINGS

Signal conditioner without industrial housing (ordering option G0)



Note: All dimensions in mm unless otherwise stated.

Signal conditioner with industrial housing (ordering option G1)



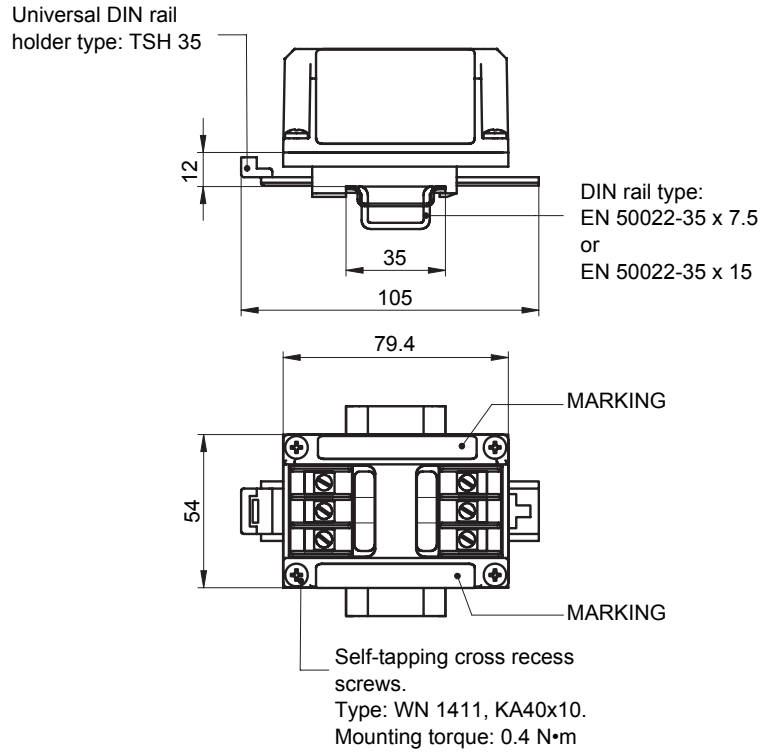
Note: All dimensions in mm unless otherwise stated.

**Signal conditioner  
IPC 704**



**MECHANICAL DRAWINGS** *(continued)*

**Signal conditioner with mounting adaptor (ordering option G2)**



Note: All dimensions in mm unless otherwise stated.



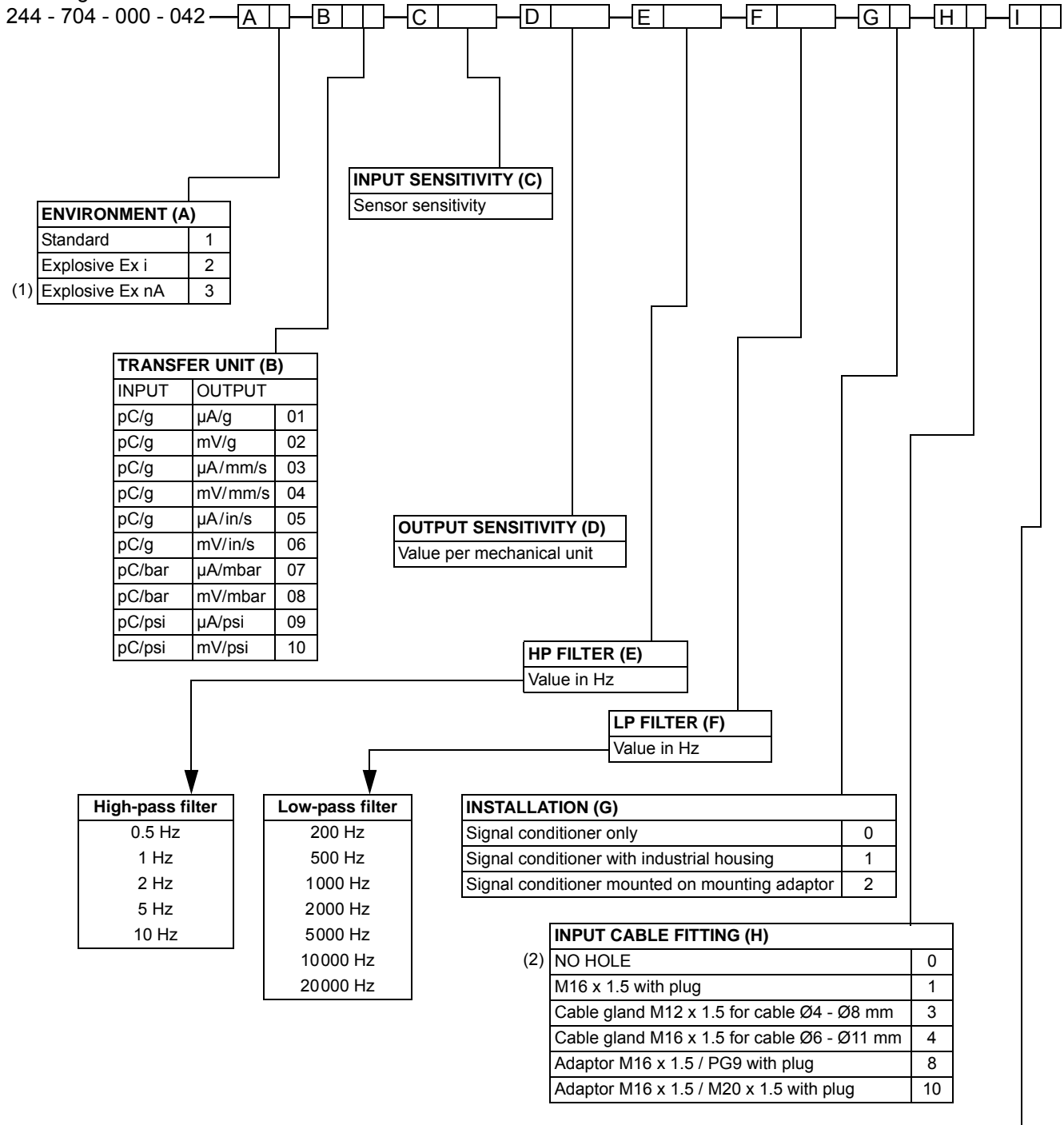
Signal conditioner  
IPC 704

ORDERING INFORMATION

IPC 704 signal conditioner for sensors using standard piezoelectric materials

Ordering number:

244 - 704 - 000 - 042



ENVIRONMENT (A)	
Standard	1
Explosive Ex i	2
(1) Explosive Ex nA	3

TRANSFER UNIT (B)		
INPUT	OUTPUT	
pC/g	µA/g	01
pC/g	mV/g	02
pC/g	µA/mm/s	03
pC/g	mV/mm/s	04
pC/g	µA/in/s	05
pC/g	mV/in/s	06
pC/bar	µA/mbar	07
pC/bar	mV/mbar	08
pC/psi	µA/psi	09
pC/psi	mV/psi	10

INPUT SENSITIVITY (C)
Sensor sensitivity

OUTPUT SENSITIVITY (D)
Value per mechanical unit

HP FILTER (E)
Value in Hz

LP FILTER (F)
Value in Hz

High-pass filter
0.5 Hz
1 Hz
2 Hz
5 Hz
10 Hz

Low-pass filter
200 Hz
500 Hz
1000 Hz
2000 Hz
5000 Hz
10000 Hz
20000 Hz

INSTALLATION (G)	
Signal conditioner only	0
Signal conditioner with industrial housing	1
Signal conditioner mounted on mounting adaptor	2

INPUT CABLE FITTING (H)	
(2) NO HOLE	0
M16 x 1.5 with plug	1
Cable gland M12 x 1.5 for cable Ø4 - Ø8 mm	3
Cable gland M16 x 1.5 for cable Ø6 - Ø11 mm	4
Adaptor M16 x 1.5 / PG9 with plug	8
Adaptor M16 x 1.5 / M20 x 1.5 with plug	10

OUTPUT CABLE FITTING (I)	
(2) NO HOLE	0
M16 x 1.5 with plug	1
Cable gland M12 x 1.5 for cable Ø4 - Ø8 mm	3
Cable gland M16 x 1.5 for cable Ø6 - Ø11 mm	4
Adaptor M16 x 1.5 / PG9 with plug	8
Adaptor M16 x 1.5 / M20 x 1.5 with plug	10

Notes

1. With options A3 and G0/G2, the user shall ensure that the signal conditioner is installed in an enclosure that ensures a protection rating of at least IP54 (or equivalent).
2. With option H0, only option I0 is available.

**Signal conditioner  
IPC 704**

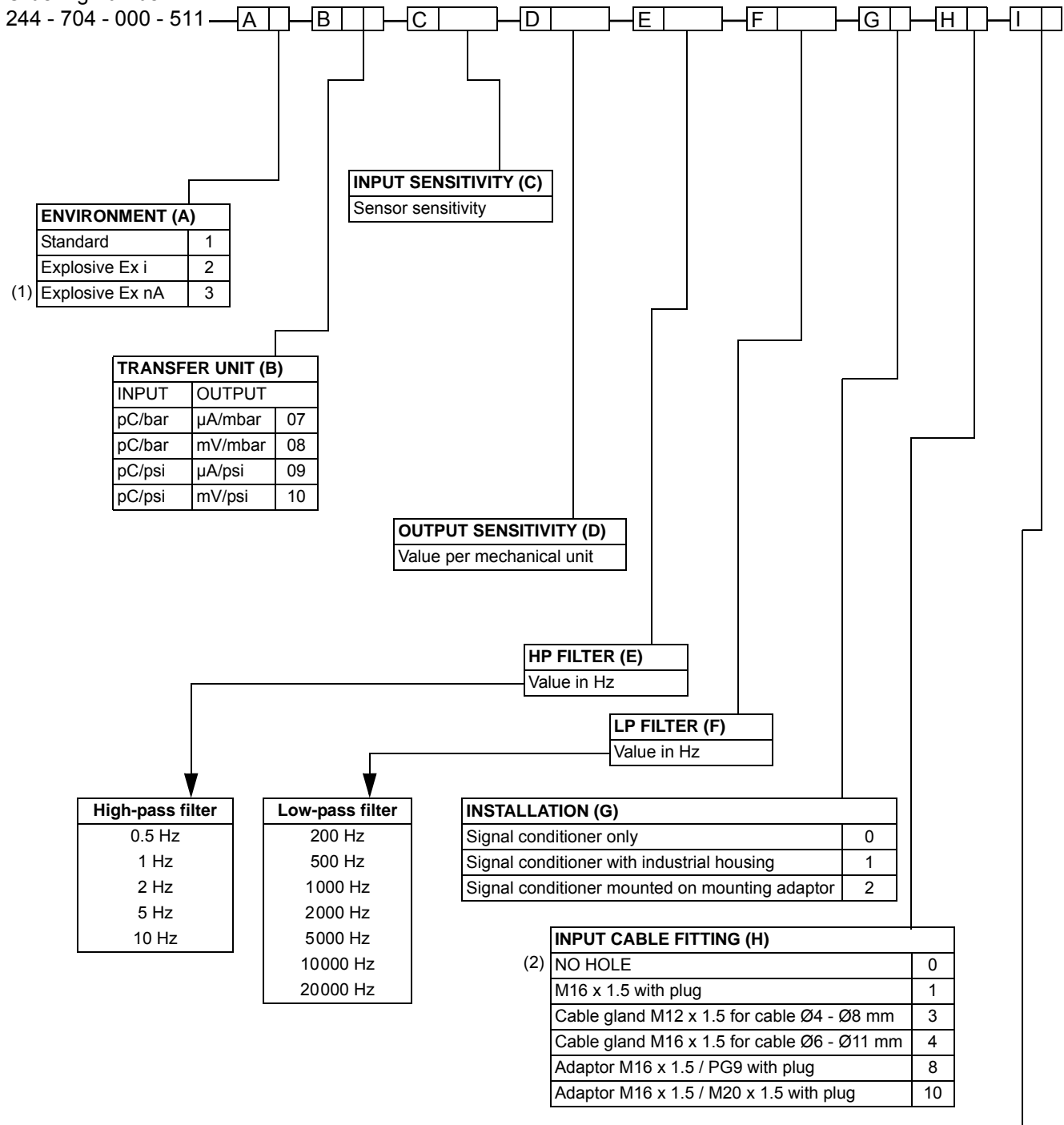


**ORDERING INFORMATION** (continued)

**IPC 704 signal conditioner for sensors using GaPO<sub>4</sub> piezoelectric material**

Ordering number:

244 - 704 - 000 - 511



- Notes
1. With options A3 and G0/G2, the user shall ensure that the signal conditioner is installed in an enclosure that ensures a protection rating of at least IP54 (or equivalent).
  2. With option H0, only option I0 is available.

**ENVIRONMENT (A)**

Standard	1
Explosive Ex i	2
(1) Explosive Ex nA	3

**TRANSFER UNIT (B)**

INPUT	OUTPUT	
pC/bar	µA/mbar	07
pC/bar	mV/mbar	08
pC/psi	µA/psi	09
pC/psi	mV/psi	10

**INPUT SENSITIVITY (C)**

Sensor sensitivity
--------------------

**OUTPUT SENSITIVITY (D)**

Value per mechanical unit
---------------------------

**HP FILTER (E)**

Value in Hz
-------------

**LP FILTER (F)**

Value in Hz
-------------

**High-pass filter**

0.5 Hz
1 Hz
2 Hz
5 Hz
10 Hz

**Low-pass filter**

200 Hz
500 Hz
1000 Hz
2000 Hz
5000 Hz
10000 Hz
20000 Hz

**INSTALLATION (G)**

Signal conditioner only	0
Signal conditioner with industrial housing	1
Signal conditioner mounted on mounting adaptor	2

**INPUT CABLE FITTING (H)**

(2) NO HOLE	0
M16 x 1.5 with plug	1
Cable gland M12 x 1.5 for cable Ø4 - Ø8 mm	3
Cable gland M16 x 1.5 for cable Ø6 - Ø11 mm	4
Adaptor M16 x 1.5 / PG9 with plug	8
Adaptor M16 x 1.5 / M20 x 1.5 with plug	10

**OUTPUT CABLE FITTING (I)**

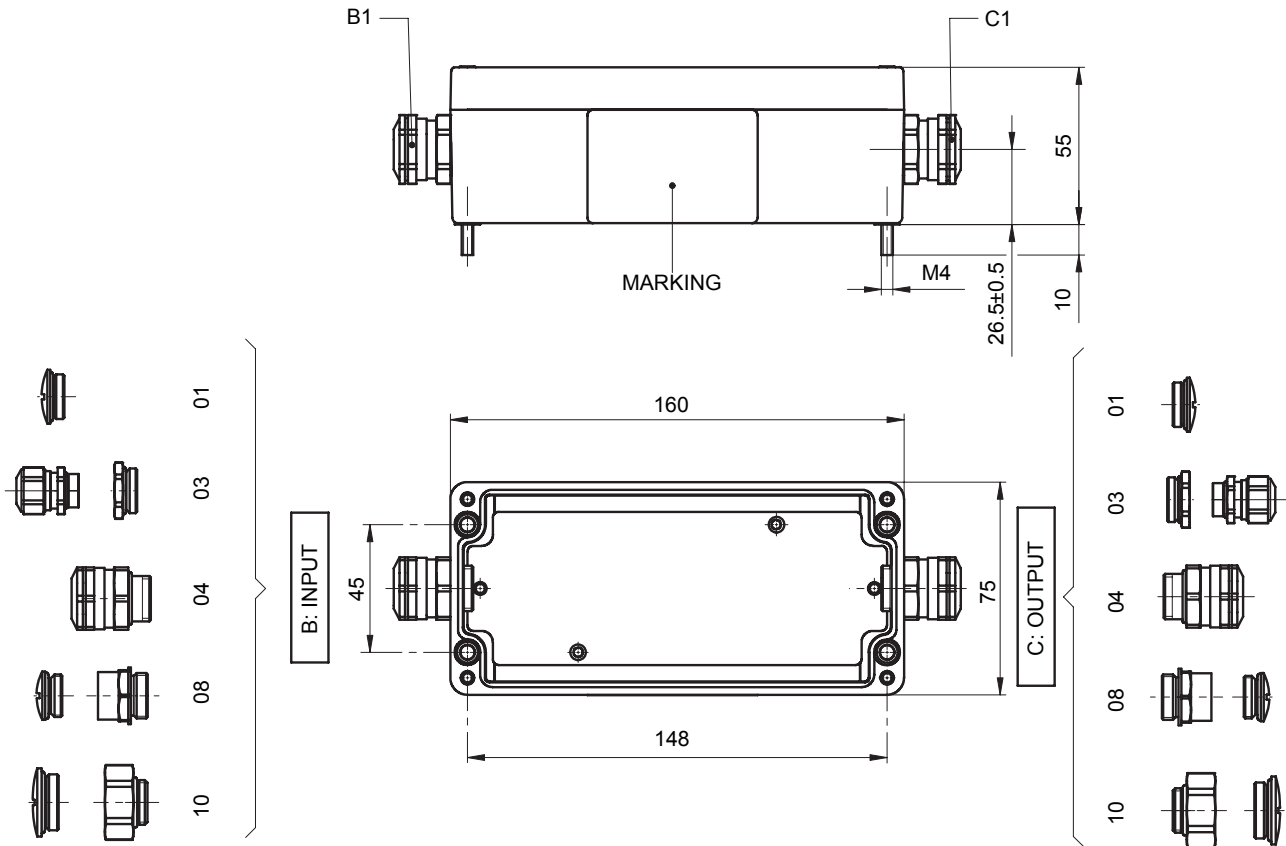
(2) NO HOLE	0
M16 x 1.5 with plug	1
Cable gland M12 x 1.5 for cable Ø4 - Ø8 mm	3
Cable gland M16 x 1.5 for cable Ø6 - Ø11 mm	4
Adaptor M16 x 1.5 / PG9 with plug	8
Adaptor M16 x 1.5 / M20 x 1.5 with plug	10



Signal conditioner  
IPC 704

MOUNTING ACCESSORIES

ABA 160 industrial housing



Note: All dimensions in mm unless otherwise stated.

Ordering number: 830 - 160 - 000 - 111 - A - B1 - C1

ENVIRONMENT (A)	
Standard polyester	1
(1) Explosive Ex i	2

CABLE FITTING INPUT (B)	
(2) NO HOLE	00
M16 x 1.5 with plug	01
Cable gland M12 x 1.5 for cable Ø4 - Ø8 mm	03
Cable gland M16 x 1.5 for cable Ø6 - Ø11 mm	04
Adaptor M16 x 1.5 / PG9 with plug	08
Adaptor M16 x 1.5 / M20 x 1.5 with plug (cable Ø12 mm max.)	10

CABLE FITTING OUTPUT (C)	
(2) NO HOLE	00
M16 x 1.5 with plug	01
Cable gland M12 x 1.5 for sensor cable Ø4 - Ø8 mm	03
Cable gland M16 x 1.5 for sensor cable Ø6 - Ø11 mm	04
Adaptor M16 x 1.5 / PG9 with plug	08
Adaptor M16 x 1.5 / M20 x 1.5 with plug (cable Ø12 mm max.)	10

Notes

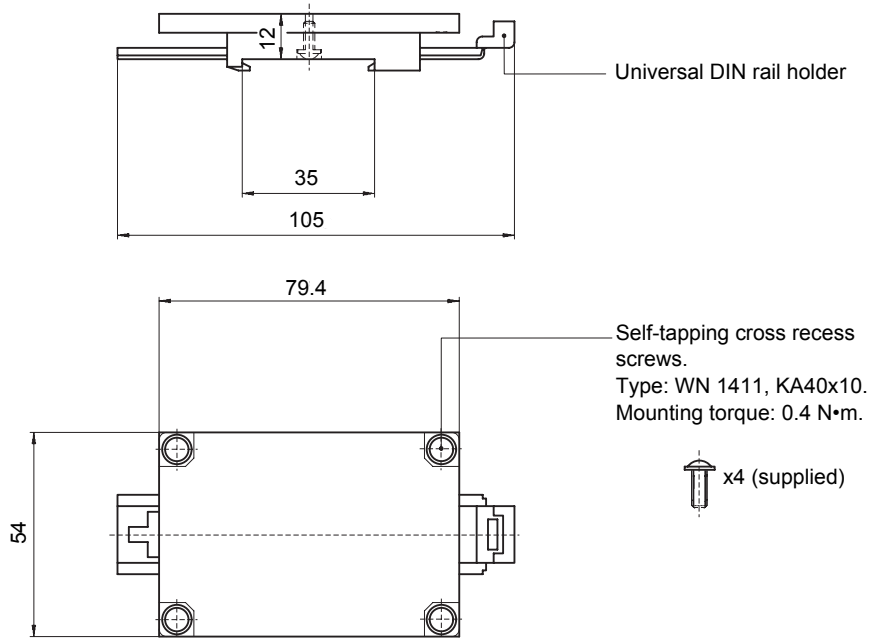
- Suitable for potentially explosive atmospheres only when used with Ex i certified products from Meggitt Sensing Systems' Vibro-Meter product line. All machining on the industrial housing must comply with the operational manual of the housing manufacturer.
- With option B00, only option C00 is available.

**Signal conditioner  
IPC 704**



**MOUNTING ACCESSORIES (continued)**

**MA 130 mounting adaptor**

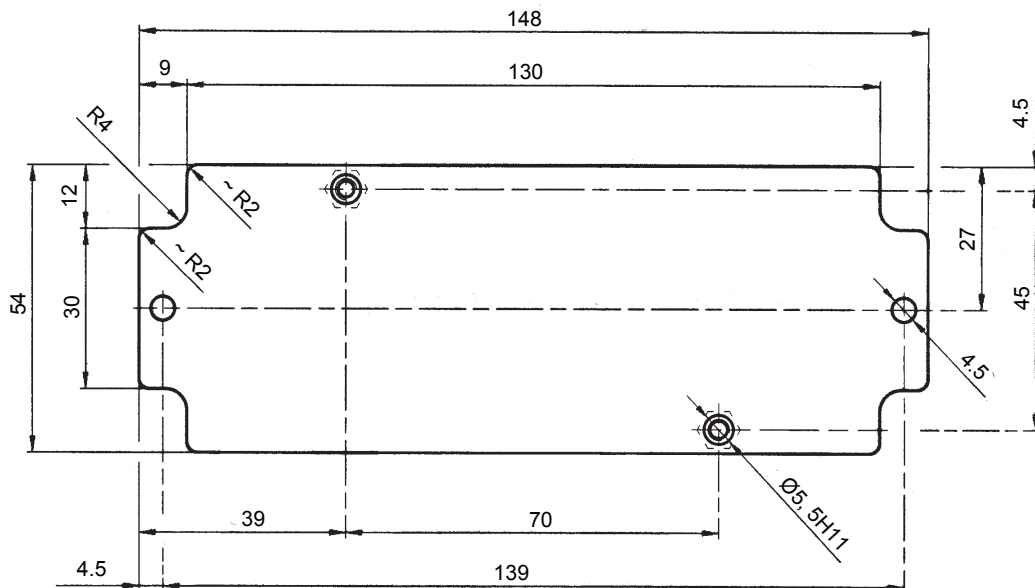


Note: All dimensions in mm unless otherwise stated.

Ordering number: 809-130-000-011

**Base plate for IPC 704 signal conditioner**

This aluminium base plate can be used when an old IPC 620 unit is replaced by an IPC 704 signal conditioner. The housing of the IPC 620 can be reused and the IPC 704 mounted on it.



Note: All dimensions in mm unless otherwise stated.

Ordering number: 244-620-002S034

**MEGGITT****Signal conditioner  
IPC 704**

Headquartered in the UK, Meggitt PLC is a global engineering group specializing in extreme environment components and smart sub-systems for aerospace, defence and energy markets.

Meggitt Sensing Systems is the operating division of Meggitt specializing in sensing and monitoring systems, which has operated through its antecedents since 1927 under the names of ECET, Endevco, Ferroperm Piezoceramics, Lodge Ignition, Sensorex, Vibro-Meter and Wilcoxon Research. Today, these operations are integrated under one strategic business unit called Meggitt Sensing Systems, headquartered in Switzerland and providing complete systems, using these renowned brands, from a single supply base.

The Meggitt Sensing Systems facility in Fribourg, Switzerland was formerly known as Vibro-Meter SA, but is now Meggitt SA. This site produces a wide range of vibration and dynamic pressure sensors capable of operation in extreme environments, leading-edge microwave sensors, electronics monitoring systems and innovative software for aerospace and land-based turbo-machinery.



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