



**IPC704**

## Signal conditioner

### FEATURES

- » From the Vibro-Meter® product line
- » For CAxxx piezoelectric accelerometers and CPxxx 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



**IPC704**



**IECEx**

**NEPSI KGS**

### DESCRIPTION

The IPC704 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 IPC704 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 IPC704 signal conditioner, including:

- » A polyester enclosure providing environmental protection against dust, oil and water jets.
- » A mounting adaptor allowing the IPC704 signal conditioner to be mounted on a DIN rail.



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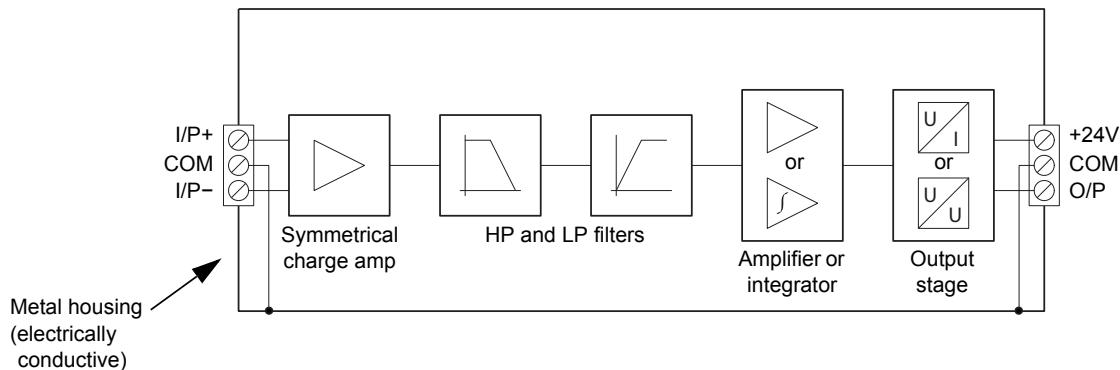
**DESCRIPTION (continued)**

Two versions of the IPC704 signal conditioner are available:

- » An IPC704 for sensors using standard piezoelectric materials, for example, CAxxx, CP10x and CP2xx (ordering number 244-704-000-042- ... ).

- » An IPC704 for sensors using  $\text{GaPO}_4$  piezoelectric material, for example, CP50x (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 (-22 to 185°F)
- *Storage* : -40 to 85°C (-40 to 185°F)

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 : IP66  
(according to IEC 60529)

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

**SPECIFICATIONS (continued)****Explosive atmospheres**

Available in Ex approved versions for use in hazardous locations

Type of protection Ex i: intrinsic safety (ordering option A2)		
Europe	EC type examination certificate	LCIE 02 ATEX 6085 X II 2G (Zones 1, 2) Ex ib IIC T6 ... T4 Gb
North America	CCSAus certificate	CCSAUS 1243981 Class I, Division 1, Groups A, B, C, D Ex ia (T6 to T4)
International	IECEx certificate of conformity	IECEx LCI 06.0009X Ex ib IIC T6 ... 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

Type of protection Ex nA: non-sparking (ordering option A3)		
Europe	Voluntary type examination certificate	LCIE 09 ATEX 1027 X II 3G (Zone 2) Ex nA IIC T6 ... T5 Gc
North America	CCSAus certificate	CCSAUS 1243981 Class I, Division 2, Groups A, B, C, D Ex nA IIC T6 to T5 Gc Class I, Zone 2 AEx nA IIC T6 to T5 Gc
International	IECEx certificate of conformity	IECEx LCIE 13.0053X Ex nA IIC T6 ... T5 Gc

\* Not engraved on the product marking.

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

 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).

 For the most recent information on the Ex certifications that are applicable to this product, refer to the *Ex product register (PL-1511)* document that is available from Meggitt SA.

**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* :  $<10^9 \Omega$  (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, refer to the certificates that are available from Meggitt SA on demand.

 For the most recent information on the Ex certifications that are applicable to this product, refer to the *Ex product register (PL-1511)* document that is available from Meggitt SA.

**SPECIFICATIONS (continued)**

**Power supply to IPC704**

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

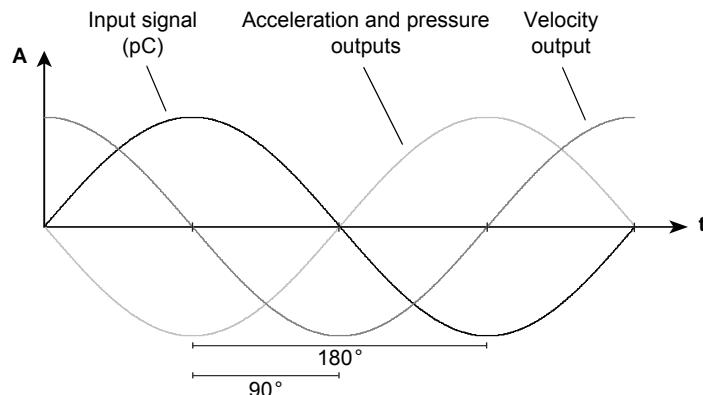
**Transfer characteristics (ordering option B)**

IPC704 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 98100 mV/(pC.s) or 981 to 98100  $\mu$ A/(pC.s)

IPC704 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/°C typical
- Phase : 180° between the input signal and the acceleration output.  
180° between the input signal and the pressure output.  
90° between the acceleration and velocity outputs.  
See the 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

- *Accelerometers* : See **IPC704 for accelerometers (acceleration output) using standard piezoelectric materials on page 6** and **IPC704 for accelerometers (velocity output) using standard piezoelectric materials on page 6**
- *Dynamic pressure transducers* : See **IPC704 for pressure sensors using standard piezoelectric materials on page 7** and **IPC704 for pressure sensors using GaPO<sub>4</sub> piezoelectric material on page 8**

Charge amplifier : Symmetrical

RFI filter : Symmetrical LC network

Resistance :  $\geq 50$  k $\Omega$  (sensor and cable)

Capacitance :  $\leq 10$  nF (sensor and cable)

**SPECIFICATIONS (continued)****Output characteristics (ordering option D)**

RFI filter	: Symmetrical LC network
2-wire current transmission	
• <i>Dynamic signal</i>	: Max. $\pm 5$ mA peak
• <i>Standing current</i>	: $12$ mA $\pm 0.5$ mA
• <i>Electrical connection</i>	: $+24$ V = "+", COM = "-"
• <i>Output sensitivity</i>	: See <b>Ordering information on page 12</b>
• <i>Max. dynamic range</i>	: $5$ mA peak/output sensitivity
3-wire voltage transmission	
• <i>Dynamic signal</i>	: Max. $\pm 5$ V peak
• <i>Standing voltage</i>	: $7.5$ V $\pm 0.2$ V
• <i>Output sensitivity</i>	: See <b>Ordering information on page 12</b>
• <i>Output impedance</i>	: $750 \Omega$ (3-wire configuration)
• <i>Max. dynamic range</i>	: $5$ 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**

• <i>Cutoff frequencies (at <math>-3</math> dB)</i>	: $0.5, 1, 2, 5$ or $10$ Hz (all $\pm 20\%$ )
• <i>Slope</i>	: $24$ 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**

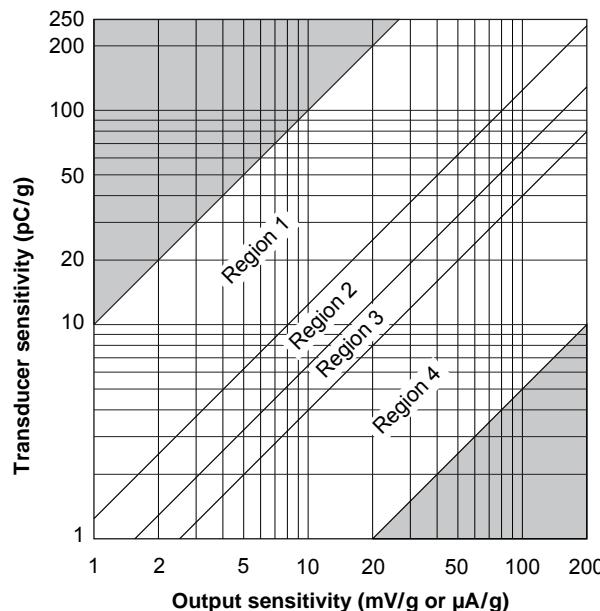
• <i>Cutoff frequencies (at <math>-1</math> dB)</i>	: $200, 500, 1000, 2000, 5000, 10000$ or $20000$ Hz (all $\pm 10\%$ )
• <i>Slope</i>	: $12$ dB/octave (2nd order)

**SPECIFICATIONS (continued)**

**Charge amplifier frequencies versus transfer unit**

**IPC704 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 cutoff frequency of the IPC704's charge amplifier dictates the required high-pass filter settings. (See the **HP FILTER (E)** option in ordering information.)

Region 1: Cutoff frequency is 0.5 Hz → HP filter  $\geq 0.5$  Hz.

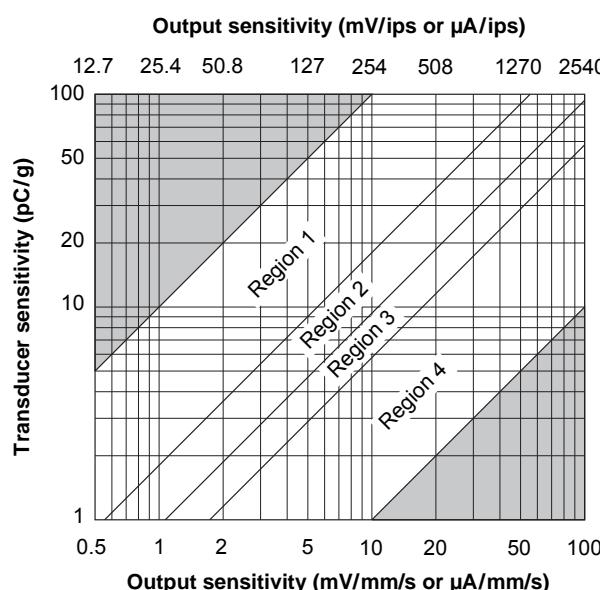
Region 2: Cutoff frequency is 1 Hz → HP filter  $\geq 1$  Hz.

Region 3: Cutoff frequency is 2 Hz → HP filter  $\geq 2$  Hz.

Region 4: Cutoff frequency is 3 Hz → HP filter  $\geq 5$  Hz.

**IPC704 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 cutoff frequency of the IPC704's charge amplifier dictates the required high-pass filter settings. (See the **HP FILTER (E)** option in ordering information.)

Region 1: Cutoff frequency is 0.5 Hz → HP filter  $\geq 0.5$  Hz.

Region 2: Cutoff frequency is 1 Hz → HP filter  $\geq 1$  Hz.

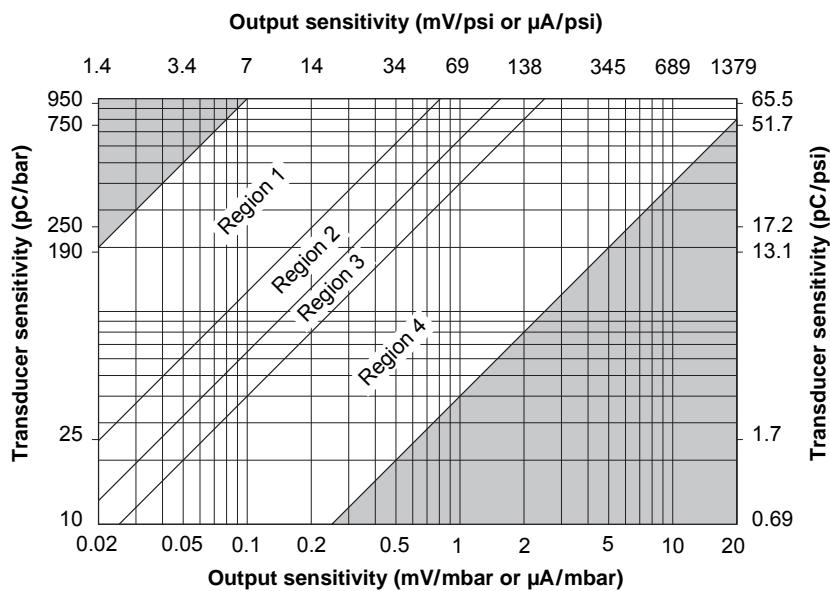
Region 3: Cutoff frequency is 2 Hz → HP filter  $\geq 2$  Hz.

Region 4: Cutoff frequency is 3 Hz → HP filter  $\geq 5$  Hz.

## SPECIFICATIONS (continued)

## IPC704 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 cutoff frequency of the IPC704's charge amplifier dictates the required high-pass filter settings. (See the **HP FILTER (E)** option in ordering information.)

Region 1: Cutoff frequency is 0.5 Hz → HP filter  $\geq 0.5$  Hz.

Region 2: Cutoff frequency is 1 Hz → HP filter  $\geq 1$  Hz.

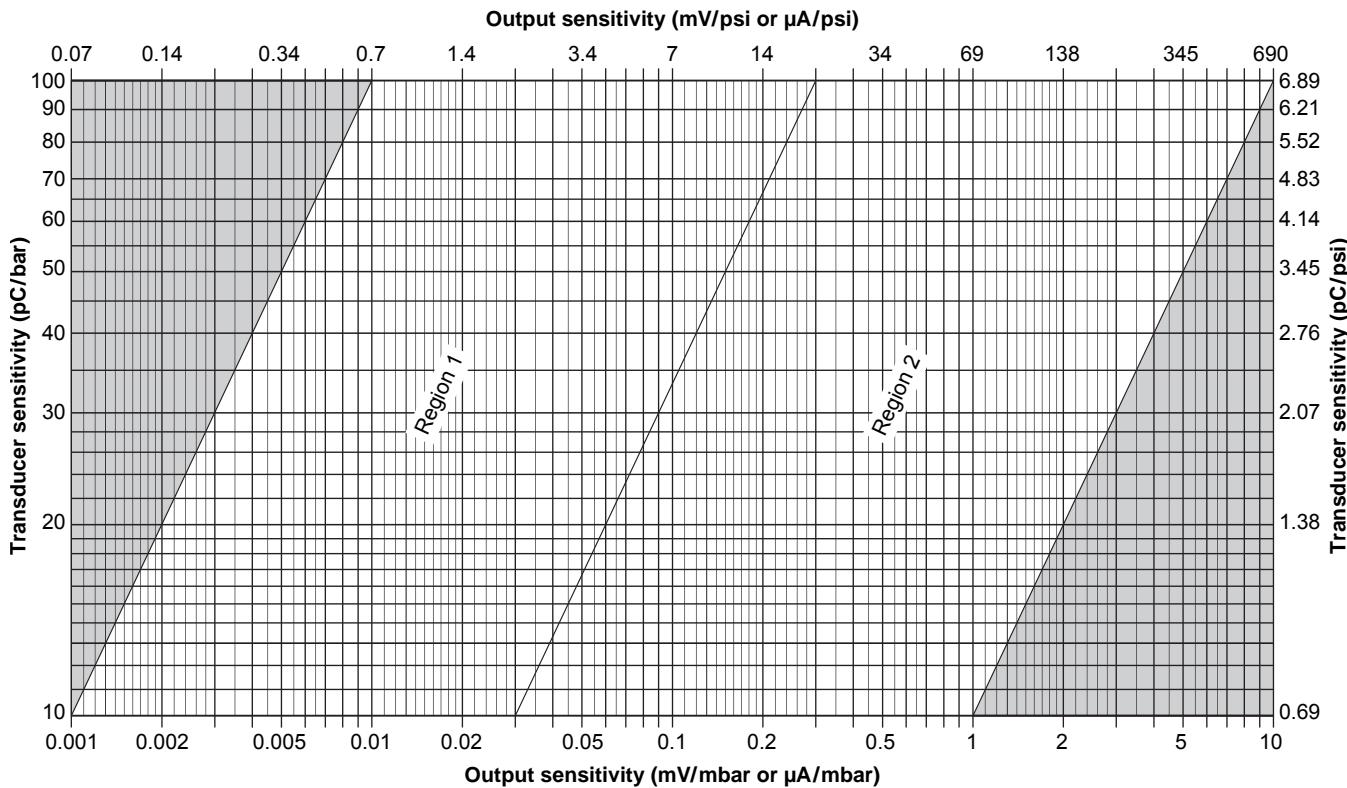
Region 3: Cutoff frequency is 2 Hz → HP filter  $\geq 2$  Hz.

Region 4: Cutoff frequency is 3 Hz → HP filter  $\geq 5$  Hz.

**SPECIFICATIONS (continued)**

**IPC704 for pressure sensors using  $\text{GaPO}_4$  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 cutoff frequency of the IPC704's charge amplifier dictates the required high-pass filter settings. (See the **HP FILTER (E)** option in ordering information.)

Region 1: Cutoff frequency is 0.5 Hz → HP filter  $\geq 0.5$  Hz.

Region 2: Cutoff frequency is 1 Hz → HP filter  $\geq 1$  Hz.

**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 on page 10**
- *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 on page 10**

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

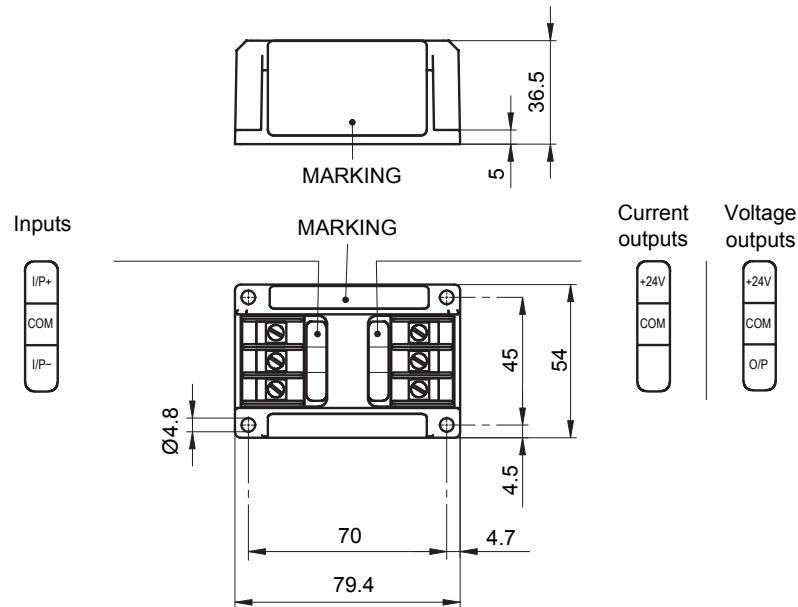
- *Type* : See **Ordering information on page 12**
- *Material* : Nickel-plated brass with Viton® seal

**Signal conditioner with MA130 mounting adaptor (ordering option G2)**

- *Universal DIN rail holder type* : TSH 35
- *DIN rail type* : TH 35-7.5 or TH 35-15  
(according to EN 50022 / IEC 60715)
- *Dimensions* : See **Mechanical drawings on page 10**

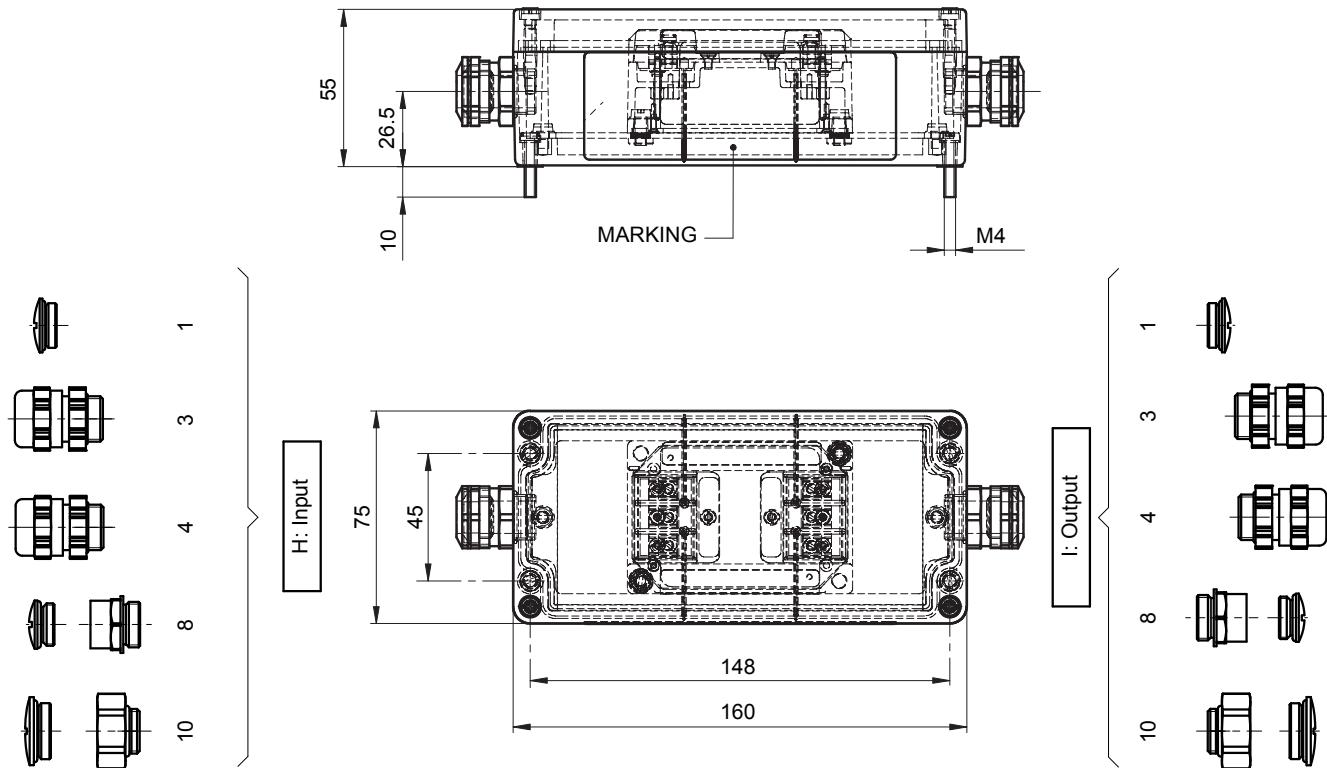
MECHANICAL DRAWINGS

Signal conditioner without industrial housing (ordering option G0)



Note: All dimensions in mm unless otherwise stated.

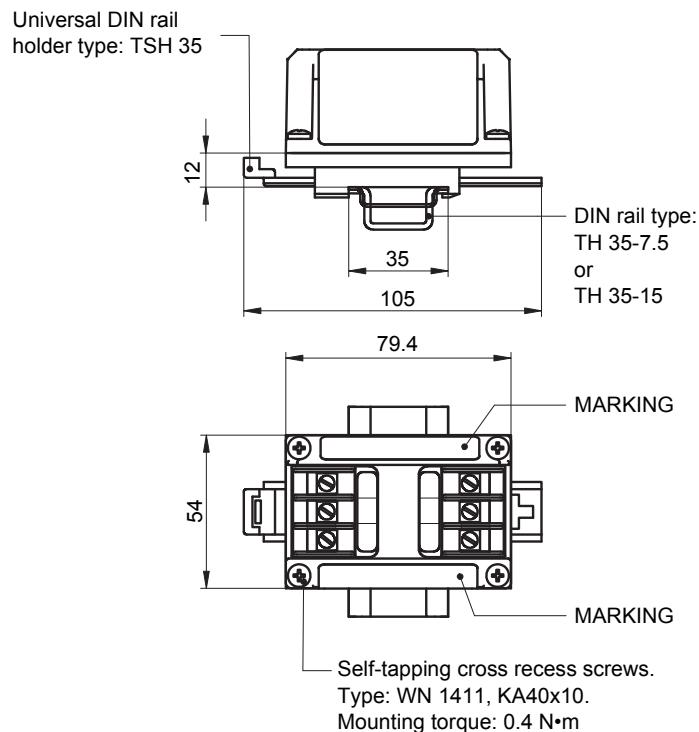
Signal conditioner with industrial housing (ordering option G1)



Note: All dimensions in mm unless otherwise stated.

## MECHANICAL DRAWINGS (continued)

## Signal conditioner with MA130 mounting adaptor (ordering option G2)

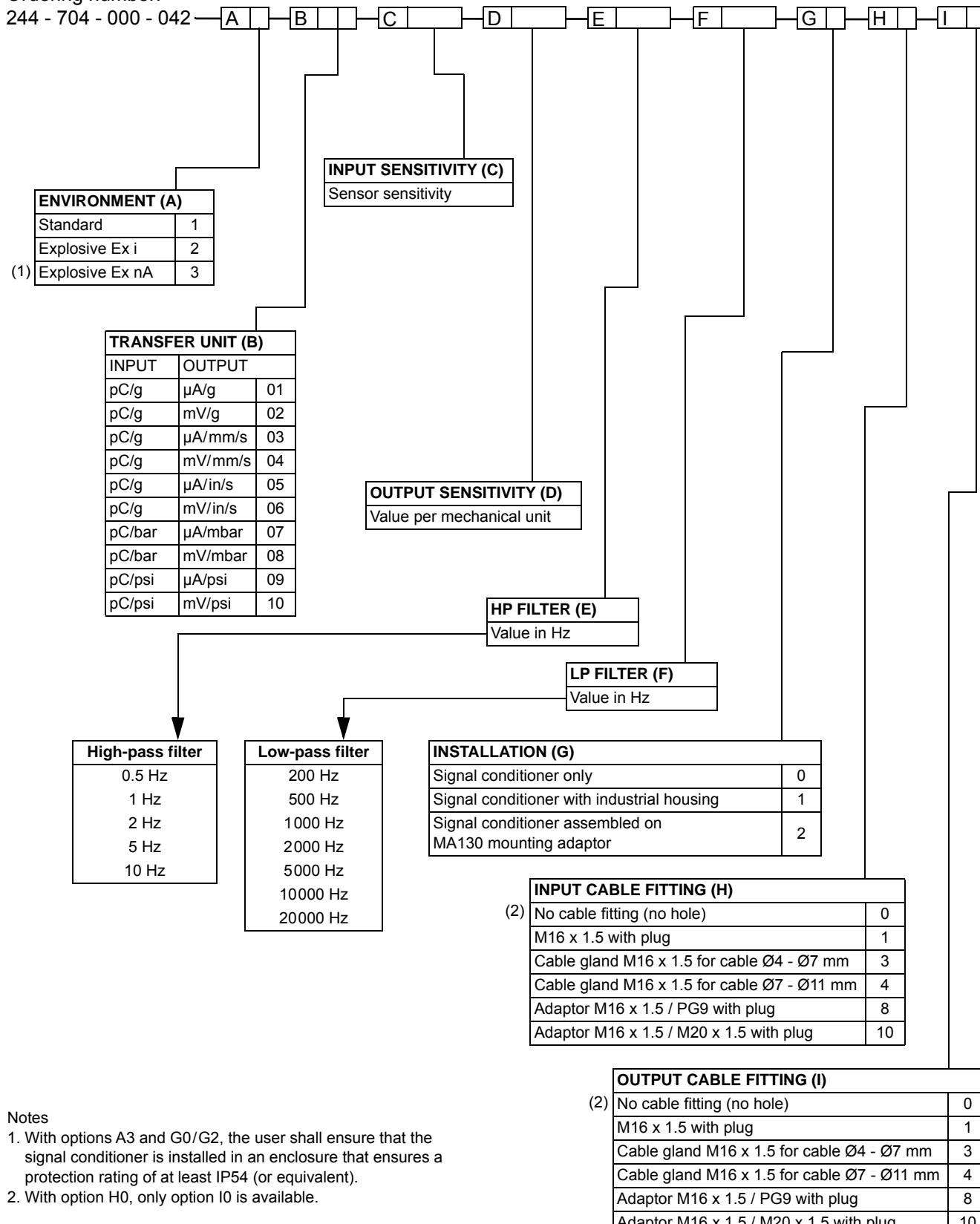


Note: All dimensions in mm unless otherwise stated.

## ORDERING INFORMATION

### IPC704 signal conditioner for sensors using standard piezoelectric materials

Ordering number:



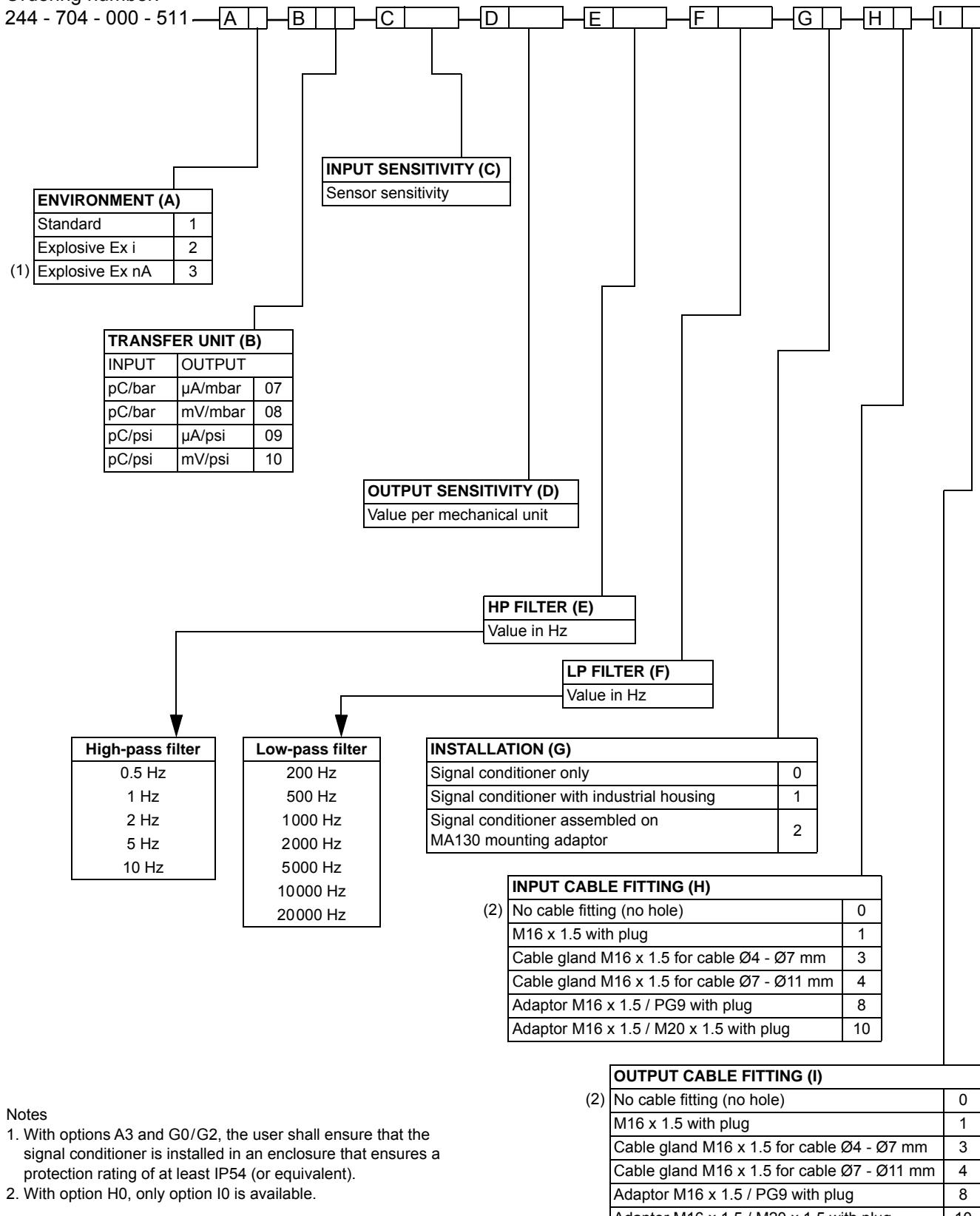
#### Notes

- 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).
- With option H0, only option I0 is available.

## ORDERING INFORMATION (continued)

IPC704 signal conditioner for sensors using  $\text{GaPO}_4$  piezoelectric material

Ordering number:

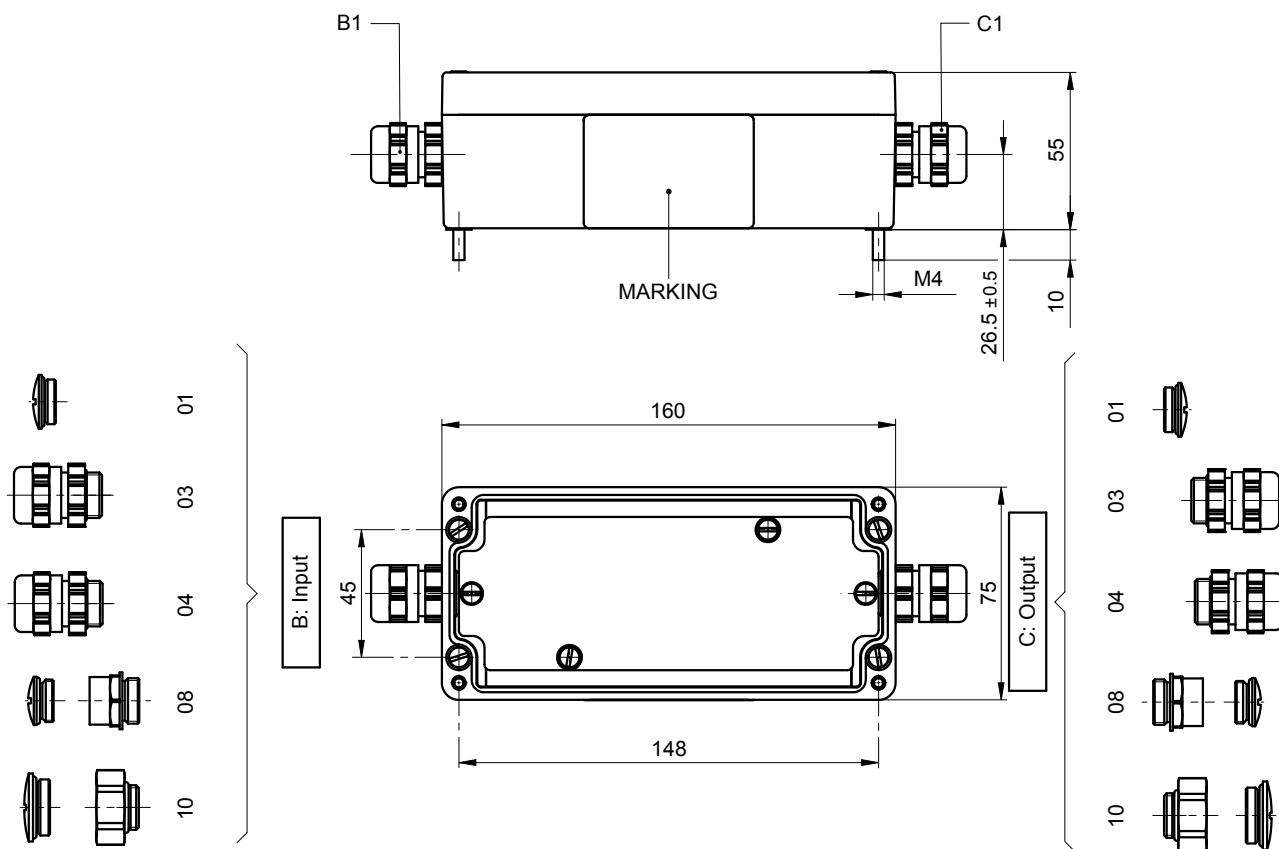


## Notes

- 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).
- With option H0, only option I0 is available.

MOUNTING ACCESSORIES

ABA160 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 OUTPUT (C)	
(2) No cable fitting (no hole)	00
M16 x 1.5 with plug	01
Cable gland M16 x 1.5 for cable Ø4 - Ø7 mm	03
Cable gland M16 x 1.5 for cable Ø7 - 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

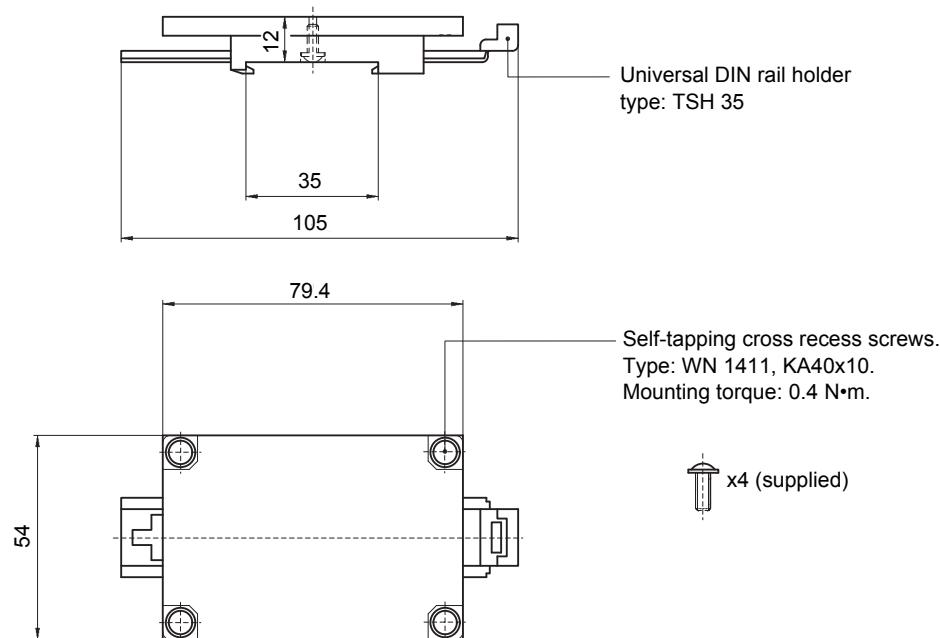
CABLE FITTING INPUT (B)	
(2) No cable fitting (no hole)	00
M16 x 1.5 with plug	01
Cable gland M16 x 1.5 for cable Ø4 - Ø7 mm	03
Cable gland M16 x 1.5 for cable Ø7 - Ø11 mm	04
Adaptor M16 x 1.5 / PG9 with plug	08
Adaptor M16 x 1.5 / M20 x 1.5 with plug (cable Ø12 mm max.)	10

Notes

1. 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.
2. With option B00, only option C00 is available.

## MOUNTING ACCESSORIES (continued)

## MA130 mounting adaptor

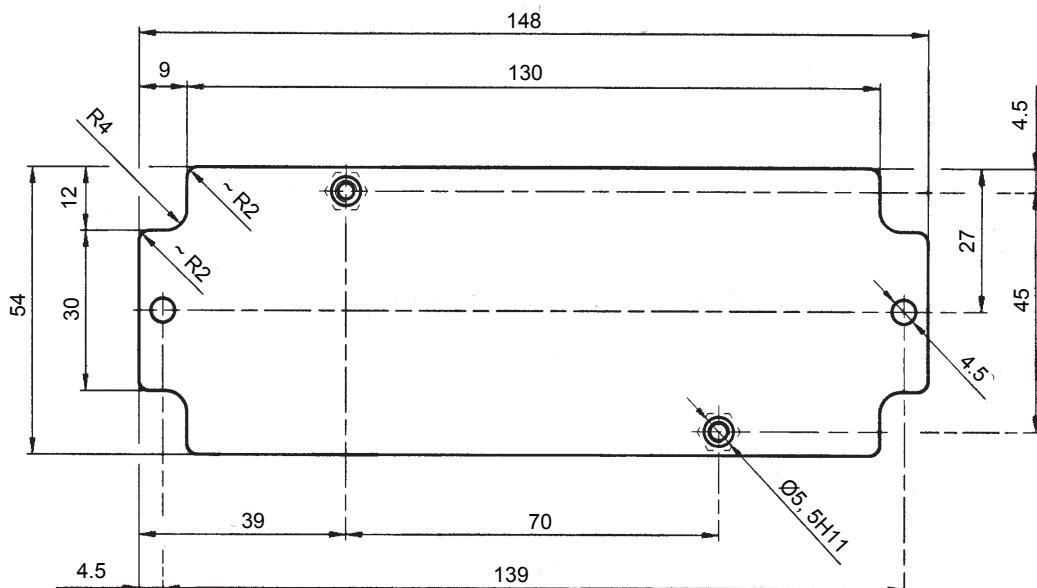


Note: All dimensions in mm unless otherwise stated.

Ordering number: 809-130-000-011

## Base plate for IPC704 signal conditioner

This aluminium base plate can be used when an old IPC620 unit is replaced by an IPC704 signal conditioner. The housing of the IPC620 can be reused and the IPC704 mounted on it.



Note: All dimensions in mm unless otherwise stated.

Ordering number: 244-620-002S034

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 and Vibro-Meter. 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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