



TQ 402 and TQ 412 / EA 402 / IQS 450

Proximity measuring system

FEATURES

- » From the Vibro-Meter® product line
- » TQ 402 conforms to API 670 recommendations
- » Non-contact measurement system based on eddy current principle
- » Certified for use in potentially explosive atmospheres
- » 1 m, 5 m and 10 m systems
- » Temperature compensated system
- » Voltage or current output with protection against short circuits
- » Frequency response:
DC to 20 kHz (-3 dB)
- » Measuring range:
2 mm or 4 mm
- » Temperature range:
-40 to +180°C

TQ 402



TQ 412



IQS 450



DESCRIPTION

This proximity system allows contactless measurement of the relative displacement of moving machine elements. It is particularly suitable for measuring the relative vibration and axial position of rotating machine shafts, such as those found in steam, gas and hydraulic turbines, as well as in alternators, turbo-compressors and pumps.

The system is based around a TQ 402 or TQ 412 non-contact transducer and an IQS 450 signal conditioner. Together, these form a calibrated proximity system in which each component is interchangeable. The system outputs a voltage or current proportional to the distance between the transducer tip and the target, such as a machine shaft.



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DESCRIPTION *(continued)*

The active part of the transducer is a coil of wire that is moulded inside the tip of the device, made of Torlon® (polyamide-imide). The transducer body is made of stainless steel. The target material must, in all cases, be metallic.

The transducer body is available with metric or imperial thread. The TQ 412 version is intended for reverse-mount applications. The TQ 402/412 has an integral coaxial cable, terminated with a self-locking miniature coaxial connector. Various cable lengths (integral and extension) may be ordered.

The IQS 450 signal conditioner contains a high-frequency modulator/demodulator that supplies a driving signal to the transducer. This generates the

necessary electromagnetic field used to measure the gap. The conditioner circuitry is made of high-quality components and is mounted in an aluminium extrusion.

The TQ 402/412 transducer can be matched with a single EA 402 extension cable to effectively lengthen the front-end. Optional junction boxes, housings and connector protectors are available for the environmental and mechanical protection of the connection between the integral and extension cables.

The proximity system can be powered by associated signal processing modules (for example, VM600 cards) or a rack power supply.

SPECIFICATIONS

Overall proximity system

Operation

Sensitivity

- *Ordering option B21* : 8 mV/μm (200 mV/mil)
- *Ordering option B22* : 2.5 μA/μm (62.5 μA/mil)
- *Ordering option B23* : 4 mV/μm (100 mV/mil)
- *Ordering option B24* : 1.25 μA/μm (31.2 μA/mil)

Linear measuring range (typical)

- *Ordering option B21* : 0.15 to 2.15 mm, corresponding to -1.6 to -17.6 V output
- *Ordering option B22* : 0.15 to 2.15 mm, corresponding to 15.5 to 20.5 mA output
- *Ordering option B23* : 0.3 to 4.3 mm, corresponding to -1.6 to -17.6 V output
- *Ordering option B24* : 0.3 to 4.3 mm, corresponding to 15.5 to 20.5 mA output

Linearity : See Performance curves on pages 4 and 5

Frequency response : DC to 20 kHz (-3 dB)

Interchangeability of elements : All components in system are interchangeable

:

Environmental – explosive atmospheres

Available in Ex approved versions for use in hazardous locations

Type of protection Ex i: intrinsic safety		
Europe	EC type examination certificate	LCIE 11 ATEX 3091 X II 1G (Zones 0, 1, 2) Ex ia IIC T6 to T3 Ga
International	IECEx certificate of conformity	IECEx LCI 11.0061X Ex ia IIC T6 to T3 Ga
North America	CSA certificate of compliance	Pending

SPECIFICATIONS (continued)

Type of protection Ex nA: non-sparking apparatus		
Europe	Voluntary type examination certificate	LCIE 11 ATEX 1010 X II 3G (Zone 2) Ex nA II T6 to T3 Gc
International	IECEX certificate of conformity	IECEX LCI 11.0063X Ex nA II T6 to T3 Gc

 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.

System calibration

Calibration temperature : +23°C ± 5°C
Target material : VCL 140 steel (1.7225)

Note: If special calibration is required, please define the alloy precisely or supply a sample of alloy (min. Ø50 mm / 1 cm thick) according to Meggitt Sensing Systems' drawing number PZ 7009/1.

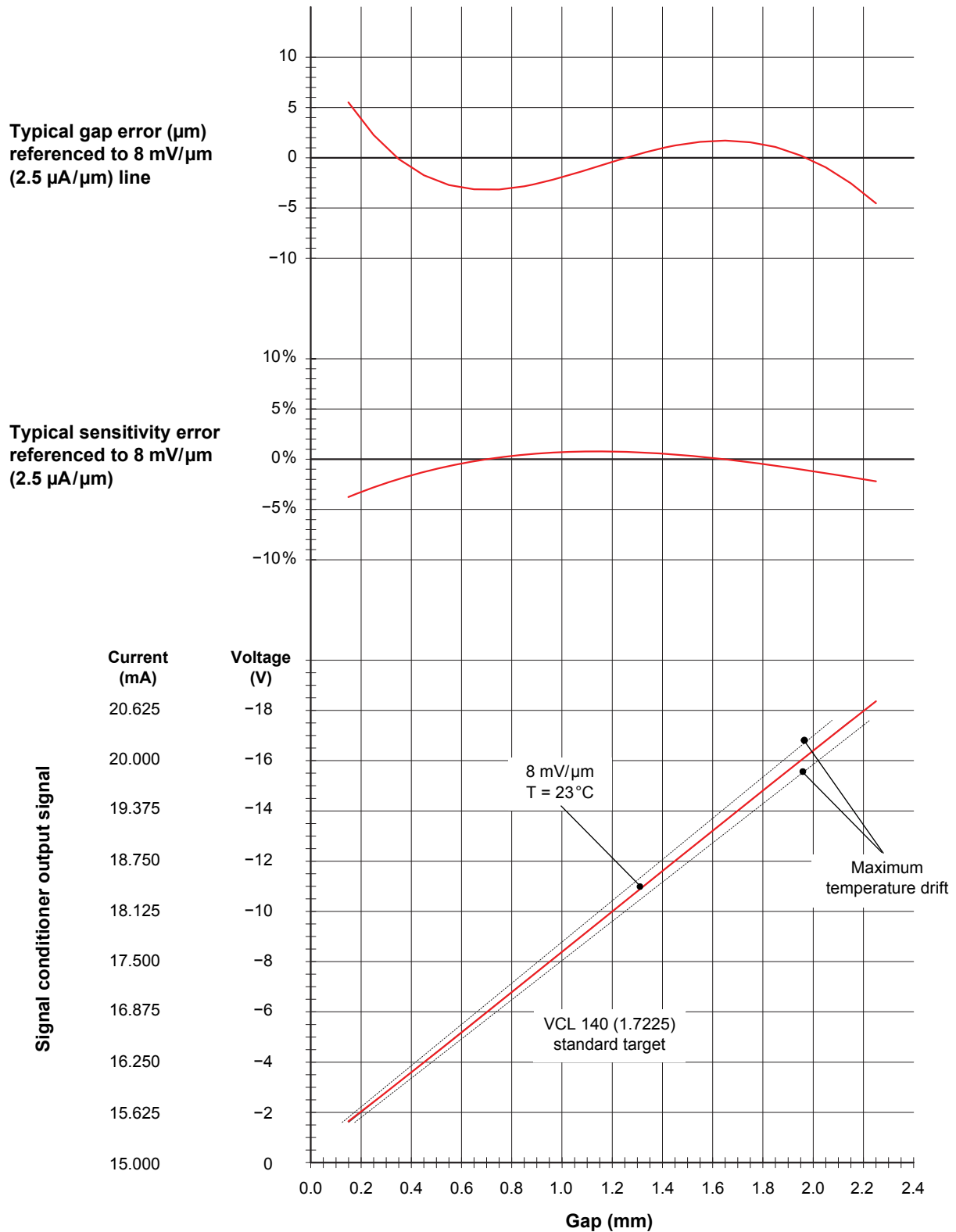
Total system length (TSL)

Due to the characteristics of the coaxial cable, an "electrical trimming" of the nominal length of the integral and extension cables is necessary to optimize the system performance and the transducer interchangeability.

TSL for a 1 m chain : 0.9 m minimum
TSL for a 5 m chain : 4.4 m minimum
TSL for a 10 m chain : 8.8 m minimum

SPECIFICATIONS (continued)

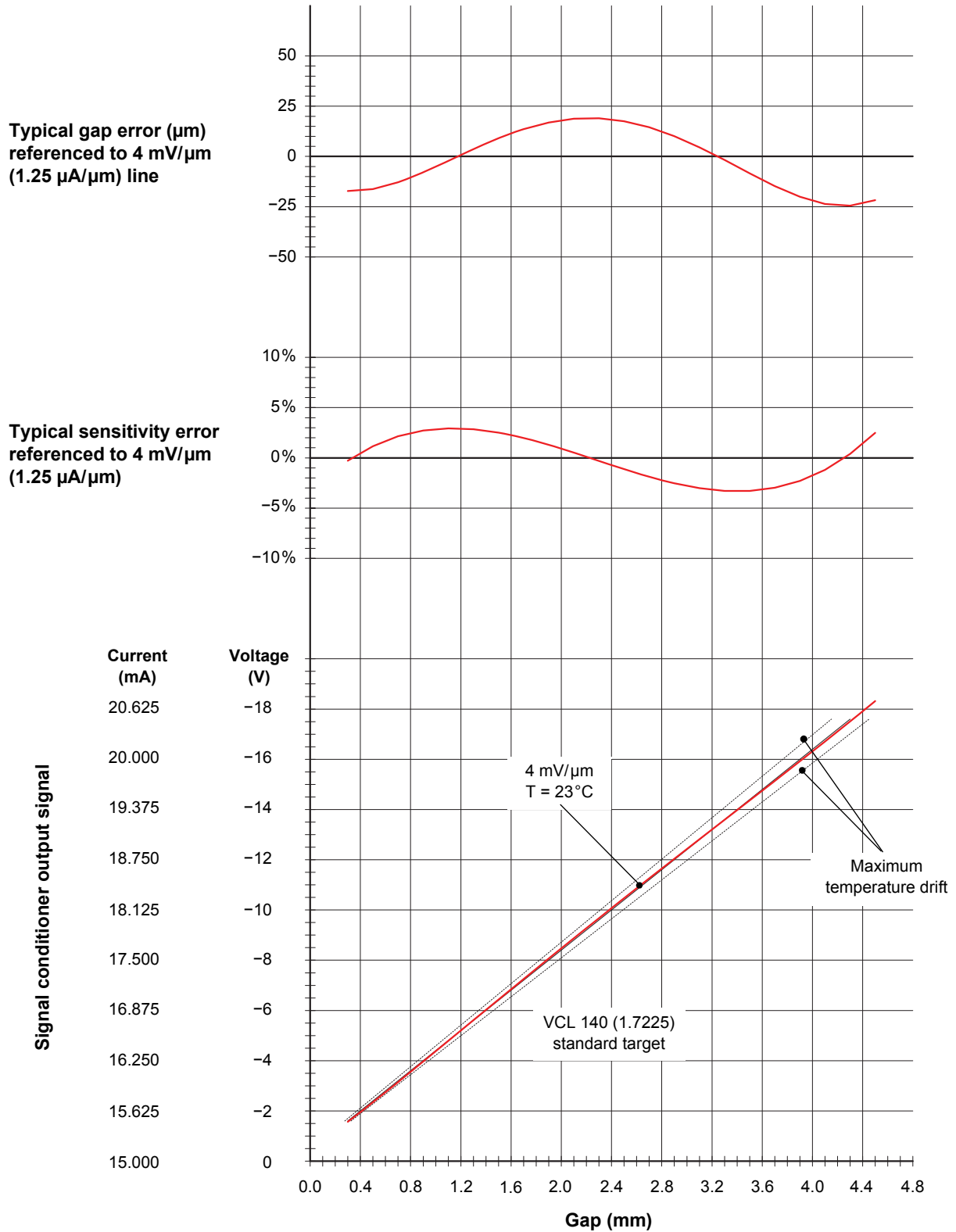
Performance curves for TQ 402 and TQ 412 with IQS 450 (ordering options B21 and B22)



Proximity transducer: TQ 402 / TQ 412
 Signal conditioner: IQS 450 (ordering option B21 and B22)
 Standard target material: VCL 140 (1.7225)
 Equivalent materials: A 37.11 (1.0065), AFNOR 40 CD4, AISI 4140

SPECIFICATIONS (continued)

Performance curves for TQ 402 and TQ 412 with IQS 450 (ordering options B23 and B24)



Proximity transducer: TQ 402 / TQ 412
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SPECIFICATIONS *(continued)*

TQ 402 and TQ 412 proximity transducers

General

Transducer input requirements : High-frequency power source from an IQS 450 signal conditioner

Environmental

Temperature ranges

- *Transducer* : -40 to +180°C with drift < 5% (operation).
+180 to +220°C with drift > 5% (short-term survival).
- *Cable* : -100 to +200°C
- *Transducer and cable* : **-100 to +195°C if used in an Ex zone**
- *Connector* : -65 to +180°C
- *Heat shrinkable sleeve
(modified Polyolefin)* : -55 to +135°C

Protection rating (according to IEC 60529 and DIN 40050) : The entire transducer assembly is rated IP68 (transducer tip, integral cable and self-locking miniature coaxial connector, including all joins)

Transducer construction : Wire coil Ø8 mm, Torlon (polyamide-imide) tip, encapsulated in stainless steel body (AISI 316L) with high-temperature epoxy glue

Integral cable : FEP covered 70 Ω coaxial cable, Ø3.6 mm

- *Option* : Flexible stainless steel protection tube.
Note: The protection tube is not leak-tight and the heat-shrinkable sleeve is splash-proof only.

Connector : Self-locking miniature coaxial connector.
Note: This should be hand-tightened only when connecting.

SPECIFICATIONS (continued)

IQS 450 signal conditioner**Output characteristics**

Voltage output, 3-wire configuration

- *Voltage at min. GAP* : -1.6 V
- *Voltage at max. GAP* : -17.6 V
- *Dynamic range* : 16 V
- *Output impedance* : 500 Ω
- *Short-circuit current* : 45 mA

Current output, 2-wire configuration

- *Current at min. GAP* : 15.5 mA
- *Current at max. GAP* : 20.5 mA
- *Dynamic range* : 5 mA

Output capacitance : 1 nF

Output inductance : 100 μ H**Supply**

Voltage output, 3-wire configuration

- *Voltage* : -20 V to -32 V*
- *Current* : 13 \pm 1 mA (25 mA max.)

Current output, 2-wire configuration

- *Voltage* : -20 V to -32 V*
- *Current* : 15.5 to 20.5 mA

Supply input capacitance : 1 nF

Supply input inductance : 100 μ H**Environmental characteristics**

Temperature range

- *Operation* : -35 to +85°C*.
0 to +70°C if used in an Ex zone.
- *Storage* : -40 to +85°C

Humidity

- *Operation and storage* : Max. 95% non condensing.
100% condensing (not submerged).

Vibration

- *Operation and storage* : 2 g peak between 10 and 500 Hz

Protection rating : IP40

Physical characteristics

Construction material : Injection moulded aluminium

*See Thermal considerations on page 8

SPECIFICATIONS *(continued)*

Electrical connections

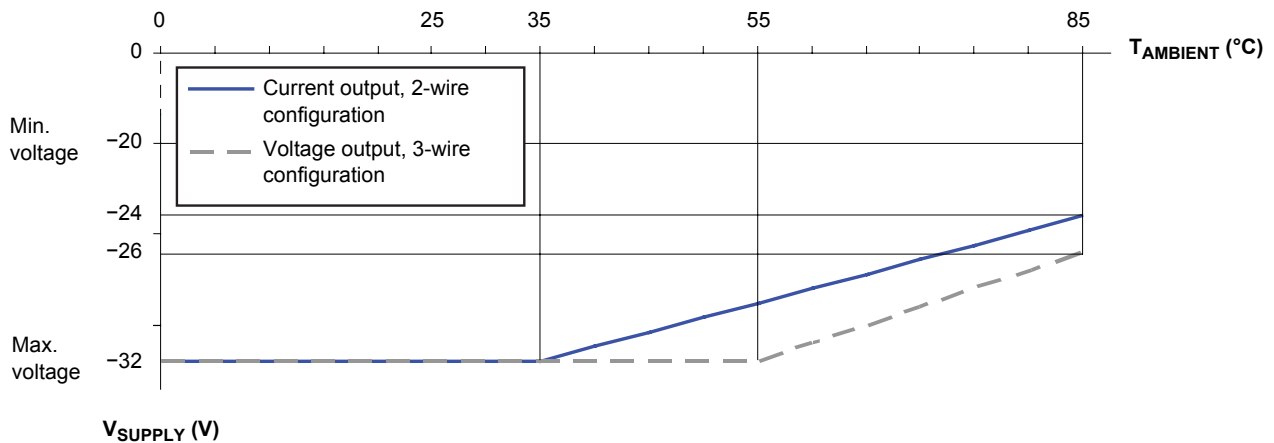
Input : Self-locking miniature coaxial connector
Output and power : Screw terminal strip

Weight

Standard version : 140 g (approximately)
Ex version : 220 g (approximately)

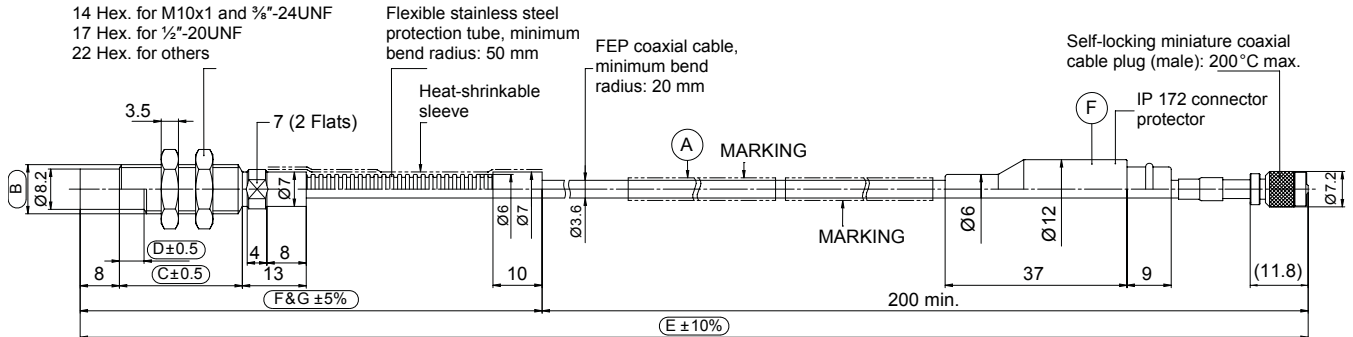
Thermal considerations

The IQS 450 signal conditioner will operate at ambient temperatures as high as 85°C, but to do so, it requires derating of the maximum input voltage. The IQS 450 must operate between the minimum supply voltage and the maximum supply voltage, as shown on the following graph.



MECHANICAL DRAWINGS AND ORDERING INFORMATION

TQ 402 proximity transducer



Ordering number:

111 - 402 - 000 - 013 - A B C D E F G H

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

Body thread (B)	
M10 x 1	1
M14 x 1.5	2
M16 x 1.5	3
3/8"-24UNF	6
5/8"-18UNF	7
1/2"-20UNF	8

Body length (C)	
Each 1 mm, from 20 to 250 mm	
20 mm min.	020
250 mm max.	250

Unthreaded length (D)	
Each 1 mm, from 0 to 230 mm	
0 mm min.	000
230 mm max.	230

Integral cable (E)	
0.5 m	005
1.0 m	010
1.5 m	015
2.0 m	020
5.0 m	050
10 m	100

Total system length (H)	
01	1 m
05	5 m
10	10 m

Flexible protection tube (G)	
Each 0.1 m, from 0 to 9.8 m	
000	None
001	0.1 m min.
098	9.8 m max.

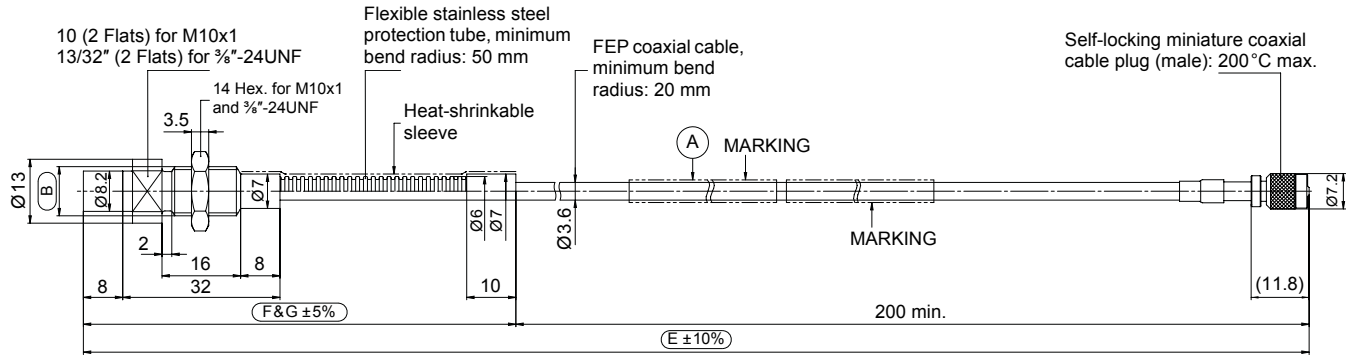
Cable protection (F)		
	Cable	Connector
0	None	None
1	Flexible protection tube	None
2	Flexible protection tube with sleeve	None
3	Movable flexible protection tube	None
4	Movable flexible protection tube with sleeve	None
5	None	IP 172
6	Flexible protection tube	IP 172
7	Flexible protection tube with sleeve	IP 172
8	Movable flexible protection tube	IP 172
9	Movable flexible protection tube with sleeve	IP 172

Notes

All dimensions are in mm unless otherwise stated.
The total system length (dimension "H") is the sum of the lengths of integral and extension cable.
For details on cable length tolerances, see Total system length (TSL) on page 3.

MECHANICAL DRAWINGS AND ORDERING INFORMATION (continued)

TQ 412 proximity transducer



Ordering number: 111 - 412 - 000 - 013 - **A** - **B** - **E** - **F** - **G** - **H**

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

Body thread (B)	
M10 x 1	1
3/8"-24UNF	6

Integral cable (E)	
0.5 m	005
1.0 m	010
1.5 m	015
2.0 m	020
5.0 m	050
10.0 m	100

Cable protection (F)	
None	0
Flexible protection tube	1
Flexible protection tube with sleeve	2
Movable flexible protection tube	3
Movable flexible protection tube with sleeve	4

Total system length (H)	
01	1 m
05	5 m
10	10 m

Flexible protection tube (G)	
Each 0.1 m, from 0 to 9.8 m	
000	None
001	0.1 m min.
098	9.8 m max.

Notes

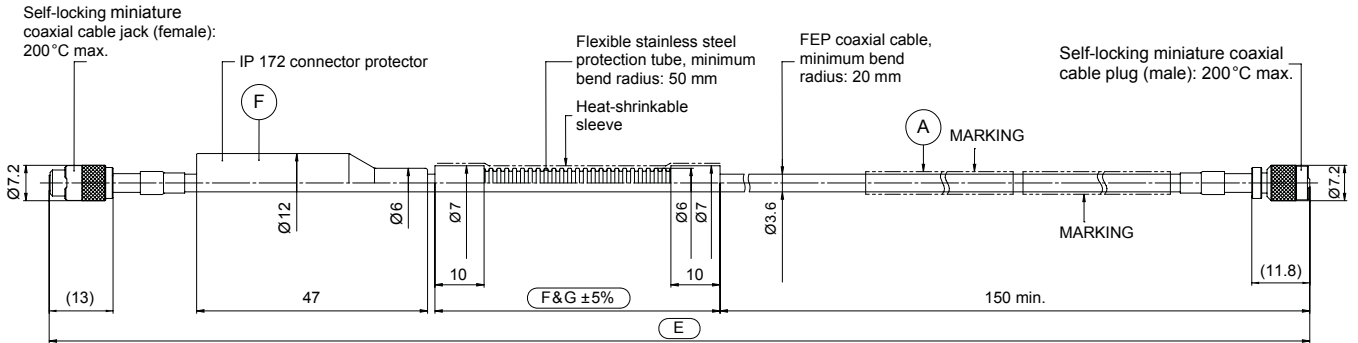
All dimensions are in mm unless otherwise stated.

The total system length (dimension "H") is the sum of the lengths of the integral cable and the extension cable.

For details on cable length tolerances, see Total system length (TSL) on page 3.

MECHANICAL DRAWINGS AND ORDERING INFORMATION (continued)

EA 402 extension cable



Ordering number: 913 - 402 - 000 - 013 - A - E - F - G

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

Integral cable (E)	
3.0 m ±150 mm	030
3.5 m ±150 mm	035
4.0 m ±150 mm	040
4.5 m ±150 mm	045
5.0 m ±200 mm	050
8.0 m ±300 mm	080
8.5 m ±300 mm	085
9.0 m ±350 mm	090
9.5 m ±350 mm	095

Cable protection (F)		
Cable	Connector	
None	None	0
Flexible protection tube	None	3
Flexible protection tube with sleeve	None	4
None	IP 172	5
Flexible protection tube	IP 172	8
Flexible protection tube with sleeve	IP 172	9

Flexible protection tube (G)	
Each 0.1 m, from 0 to 9.3 m	
000	None
001	0.1 m min.
093	10.0 m max.

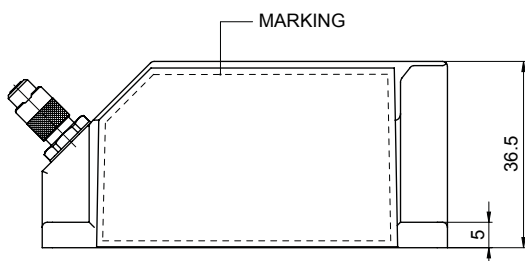
Notes

All dimensions are in mm unless otherwise stated.
For details on cable length tolerances, see Total system length (TSL) on page 3.

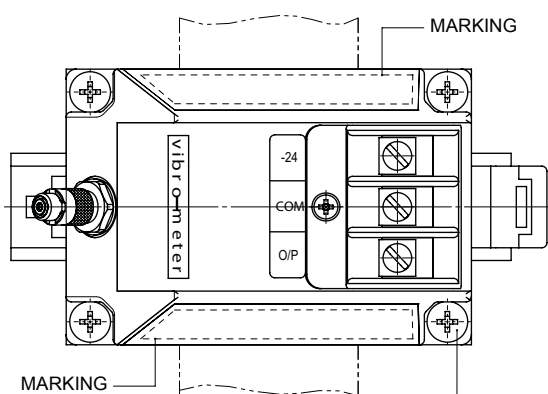
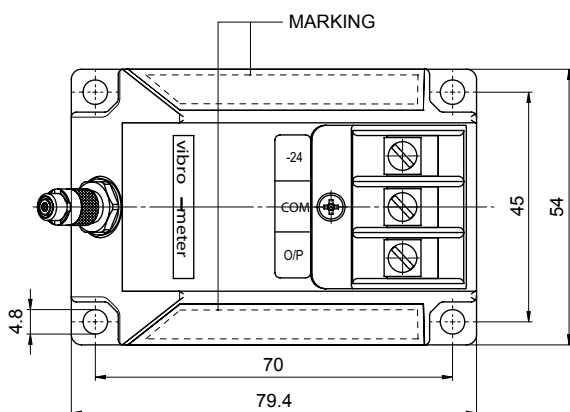
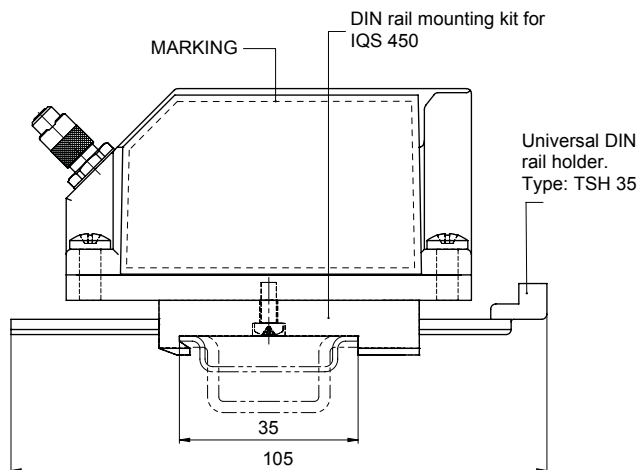
MECHANICAL DRAWINGS AND ORDERING INFORMATION (continued)

IQS 450 signal conditioner

Ordering option I0



Ordering option I1



Note: All dimensions are in mm unless otherwise stated.

Self-tapping cross-recess screws.
Type: WN 1411, KA40 x 10.
Mounting torque: 0.4 N·m.

Ordering number: 204 - 450 - 000 - 002 - A - B - H - I

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

Installation (I)	
0	Signal conditioner only
1	Signal conditioner assembled on mounting adaptor

Measuring range	Sensitivity (B)	
	2 mm	8 mV/μm
	2.5 μA/μm	22
4 mm	4 mV/μm	23
	1.25 μA/μm	24

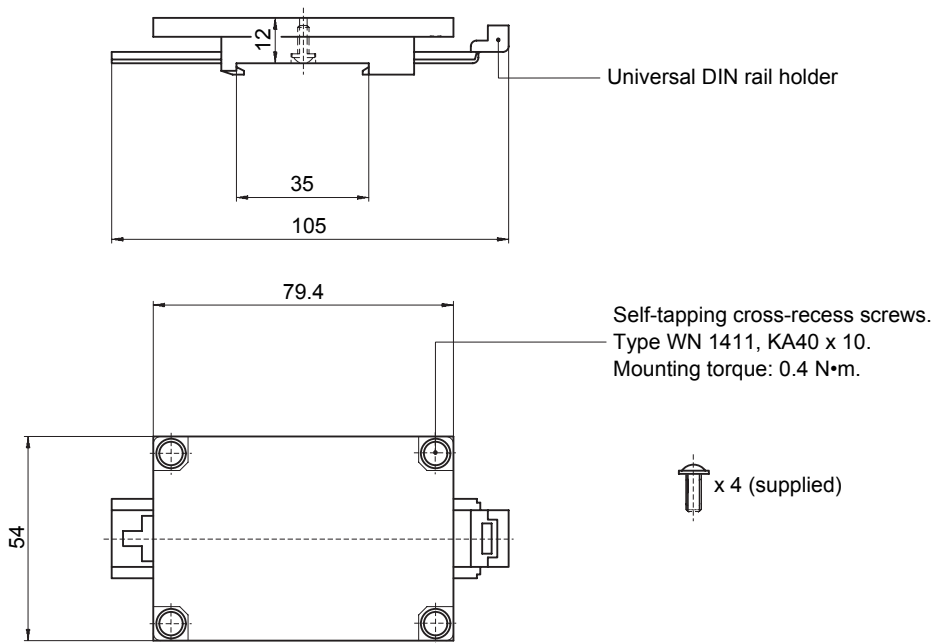
Total system length (H)	
01	1 m
05	5 m
10	10 m

MOUNTING ACCESSORIES

ABA 15x	Industrial housing	: Refer to corresponding data sheet
IP 172 KIT	Connector protector kit	: Refer to corresponding data sheet (pending)
JB 118	Junction box	: Refer to corresponding data sheet
KS 107	Flexible conduit	: Refer to corresponding data sheet
PA 151	Probe mounting adaptor	: Refer to corresponding data sheet
PA 152	Probe mounting adaptor	: Refer to corresponding data sheet
PA 153	Probe mounting adaptor	: Refer to corresponding data sheet
MA 130	Mounting adaptor	: See below
SG 102	Cable feedthrough	: Refer to corresponding data sheet
SG 164	Cable feedthrough	: Refer to corresponding data sheet

MA 130 mounting adaptor

Mechanical drawing



Note: All dimensions are in mm unless otherwise stated.

Ordering number : 809-130-000-011

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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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