Vibro-Meter

TQ 402 & TQ 412 / EA 402 / IQS 450

Proximity System

FEATURES

- Non-contacting measurement system based on eddy current principle
- Certified for use in potentially explosive atmospheres
- TQ 402 conforms to API 670 recommendations
- 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
- Transducer temperature range:
  -40°C 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-contacting 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 (e.g. machine shaft).

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

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be metallic.
The transducer body is available with metric or English thread. The TQ 412 version is intended for reverse-mount applications. The TQ 402/412 has an integral coaxial cable, terminated with an AMP-type connector. Various cable lengths (integral and extension) may be ordered.
The IQS 450 signal conditioner contains an HF 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. Optional junction boxes and housings offer mechanical protection of the integral and extension cable connectors.
The proximity system is powered by associated processor modules 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 - 2.15 mm, corresponding to -1.6 V to -17.6 V output
• *Ordering option B22*	: 0.15 - 2.15 mm, corresponding to 15.5 mA to 20.5 mA output
• *Ordering option B23*	: 0.3 - 4.3 mm, corresponding to -1.6 V to -17.6 V output
• *Ordering option B24*	: 0.3 - 4.3 mm, corresponding to 15.5 mA to 20.5 mA output
Linearity	: See system performance curves on page 4
Frequency response	: DC to 20 kHz (-3 dB)
Interchangeability of elements	: All components in system are interchangeable

ENVIRONMENTAL

Use in explosive atmospheres

• *EC type examination certificate*	: LCIE 02 ATEX 6086 X II 2 G (Zones 1, 2) Ex ib IIC T6 to T3
• *Voluntary type examination certificate*	: LCIE 07 ATEX 6079 X II 3 G (Zone 2) Ex nA IIC T6 to T3

⚠ **For specific parameters of the mode of protection concerned and special conditions for safe use, please refer to the "EC type examination certificate" that is available from Vibro-Meter SA on demand.**

• *CSA standard*	: Certificate 1514309 (LR 62075-5), Class I, Divisions 1 and 2, Groups A, B, C and D Ex ia or Class I, Division 2, Groups A, B, C and D

SPECIFICATIONS *(Continued)*

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. Ø 50 mm / 1 cm thick)

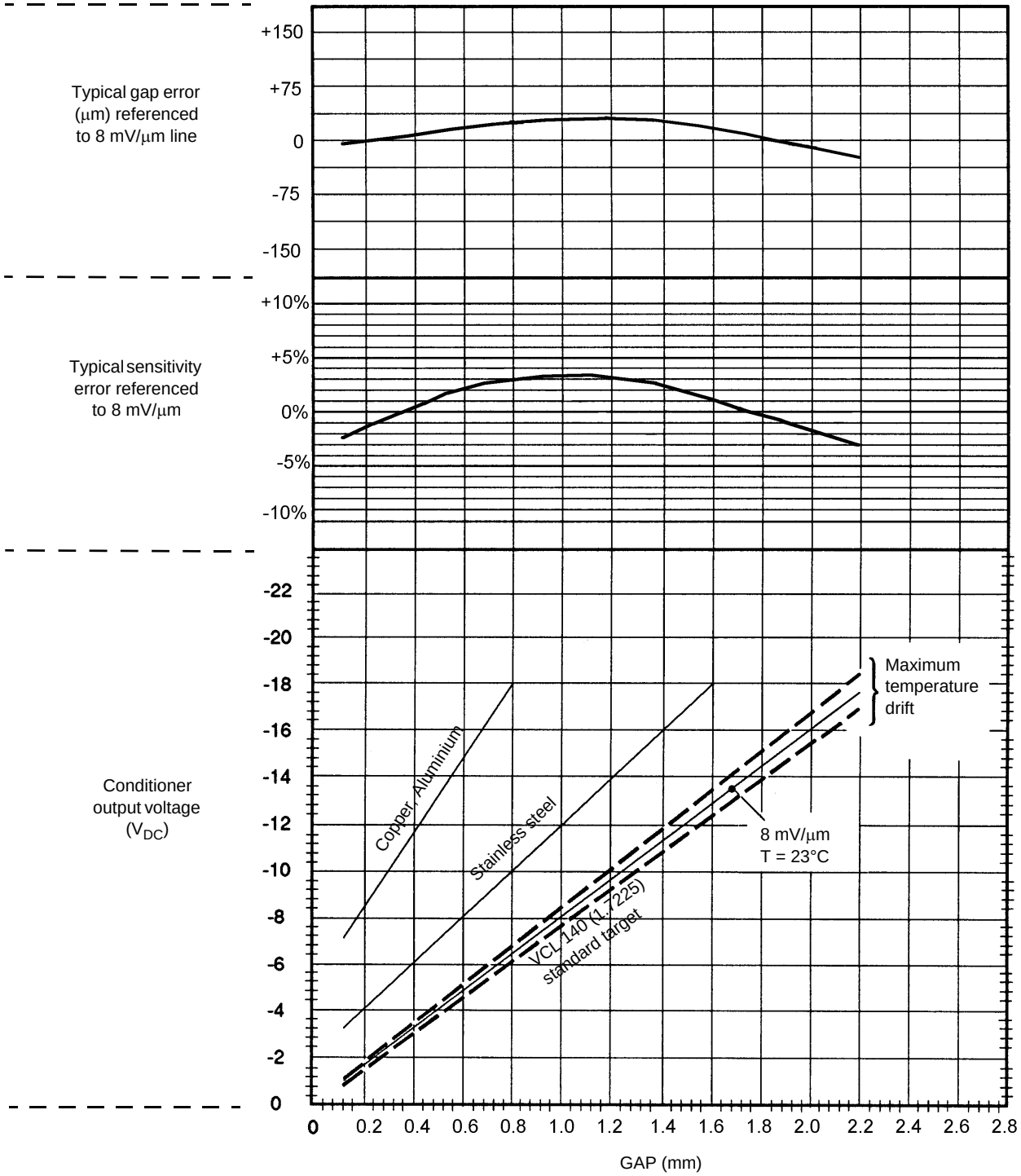
TOTAL SYSTEM LENGTH (TSL)

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)*

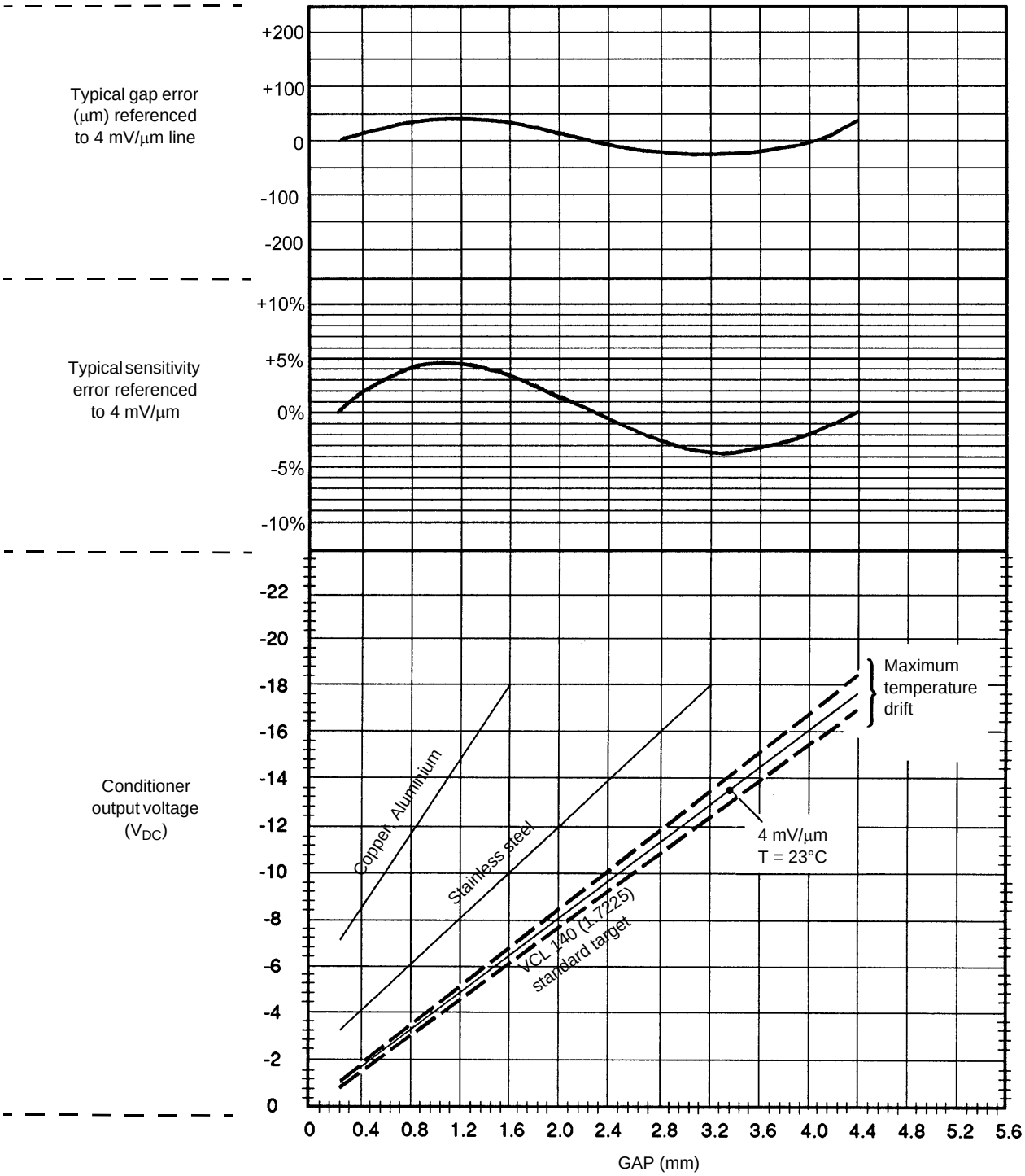
Performance Curves for TQ 402 / 412 Transducer with IQS 450 (ordering options B21 and B22)



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 4137

SPECIFICATIONS *(Continued)*

Performance Curves for TQ 402 / 412 Transducer with IQS 450 (ordering options B23 and B24)



Proximity transducer: TQ 402 / TQ 412
Signal conditioner : IQS 450 (ordering option B23 and B24)
Standard target material: VCL 140 (1.7225)
Equivalent materials: A 37.11 (1.0065), AFNOR 40 CD4, AISI 4137

SPECIFICATIONS *(Continued)*

TQ 402 / TQ 412 Proximity Transducer

GENERAL

Transducer input requirements	: High-frequency power source via matching conditioner type IQS 450

ENVIRONMENTAL

Temperature ranges

• *Transducer*	: -40°C to +180°C with drift < 5% (operation) +180°C to +220°C with drift > 5% (short-term survival)
• *Cable*	: -100°C to +200°C
• *Transducer and cable*	: **-100°C to +195°C if used in Ex zone**
• *Connector*	: -65°C to +85°C
• *Heat shrinkable sleeve (modified Polyolefin)*	: -55°C to +135°C
Protection class (according to IEC 529 and DIN 40050)	: The tip of the transducer is rated IP 67 The connection between the transducer body and its integral cable is rated IP 64
Transducer construction	: Wire coil Ø 8 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, Ø 3.6 mm
• *Option*	: Stainless steel flexible protection tube Note : The flexible protection tube is not leaktight and the heat-shrinkable sleeve is splashproof only
Connector	: Miniature coaxial male connector type AMP 1-330 723-0 N.B.: 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 µH

SUPPLY

Voltage output, 3-wire configuration

- *Voltage* : -20 V to -32 V *
- *Current* : 13 ± 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 µH

ENVIRONMENTAL CHARACTERISTICS

Temperature range

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

Humidity

- *Operation and storage* : Max. 95% non condensing

Vibration

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

Protection class : IP 40

* see section "Thermal Considerations" on page 8

SPECIFICATIONS *(Continued)*

PHYSICAL CHARACTERISTICS

Construction material	: Injection moulded aluminium

ELECTRICAL CONNECTIONS

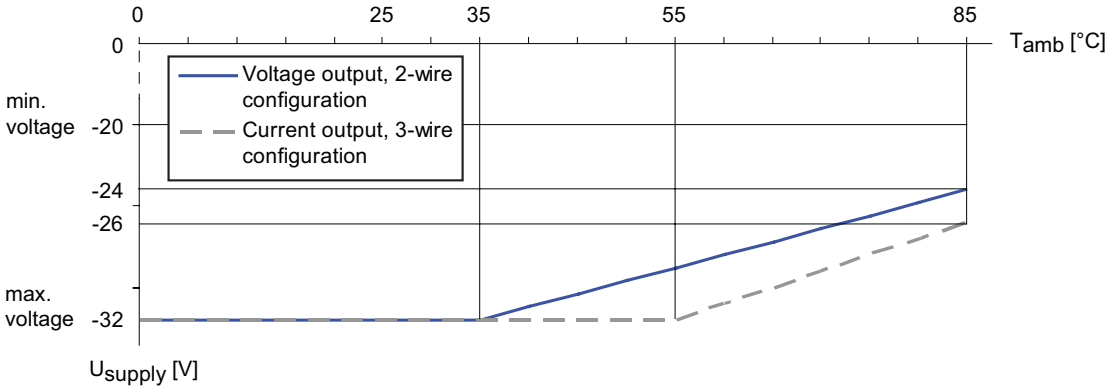
Input	: Stainless steel coaxial female socket
Output and power	: Screw terminal strip

WEIGHT

Standard version	: Approx. 140 g
Exi version	: Approx. 220 g

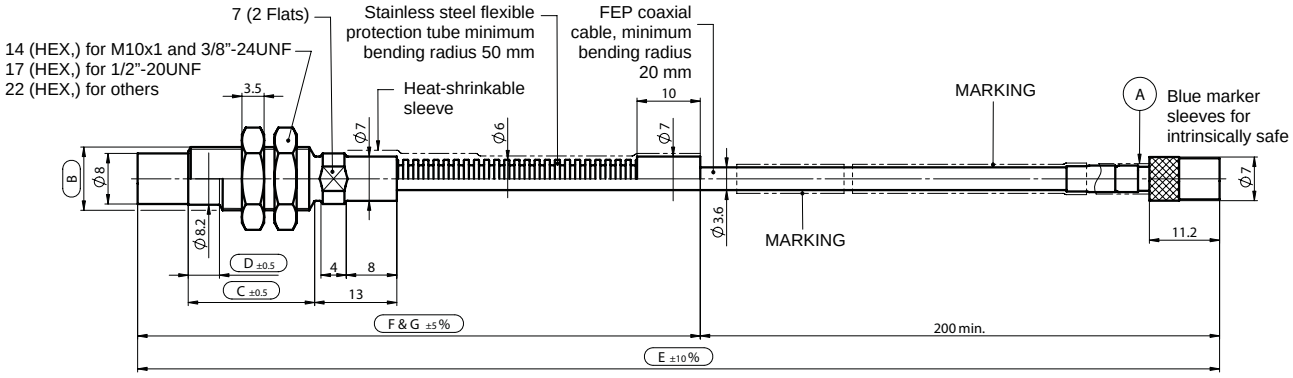
THERMAL CONSIDERATIONS

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

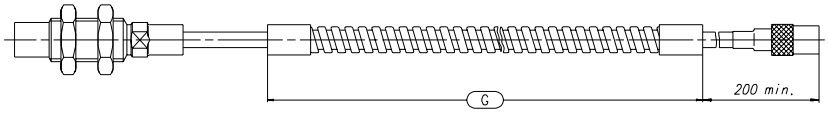


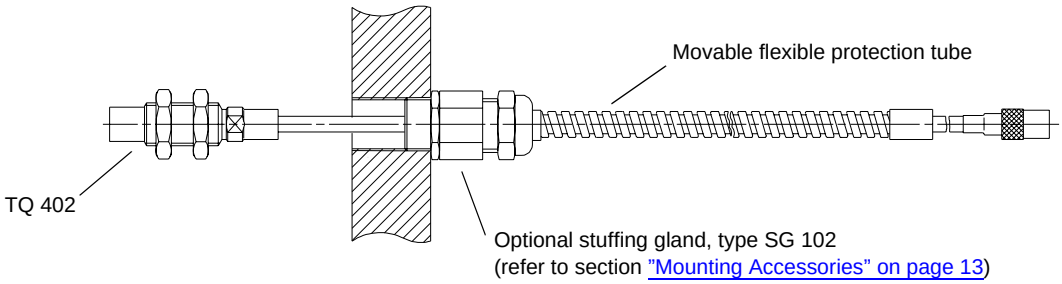
DIMENSIONS AND ORDERING INFORMATION

TQ 402 Proximity Transducer



Movable flexible protection tube for TQ 402





Ordering Number :

111 - 402 - 000 - 012

A	B	C		D			E			F	G			H		

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

Body Thread (B)	
M10x1	1
M14x1.5	2
M16x1.5	3
3/8"-24UNF	6
5/8"-18UNF	7
1/2"-20UNF	8

Body Length (C)	
Each 1 mm, from 20 to 250 mm	
Min. 20 mm	020
Max. 250 mm	250

Unthreaded Length (D)	
Each 1 mm, from 0 to 230 mm	
Min. 0 mm	000
Max. 230 mm	230

Integral Cable (E)	
0.5 m length	005
1 m length	010
1.5 m length	015
2 m length	020
5 m length	050
10 m length	100

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

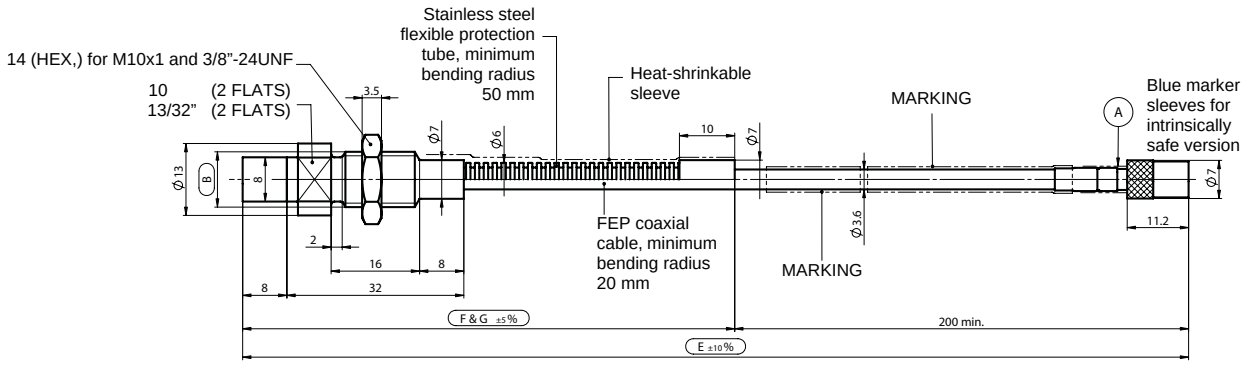
Flexible protection tube Length (G)	
Each 0.1 m, from 0 to 10.0 m	
000	None
001	Min. 0.1 m
100	Max. 10.0 m

Total System Length (H)	
01	1 m length
05	5 m length
10	10 m length

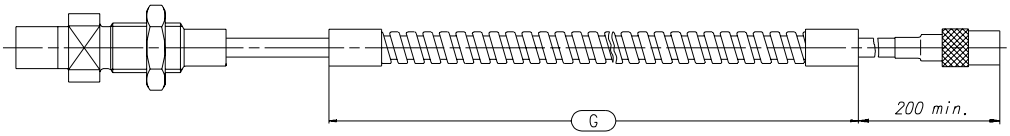
Notes :
(1) All dimensions are in mm.
(2) The total system length (dimension "H") is the sum of the lengths of integral and extension cable.
(3) For details on cable length tolerances, please refer to the section "Total System Length (TSL)" on page 3.

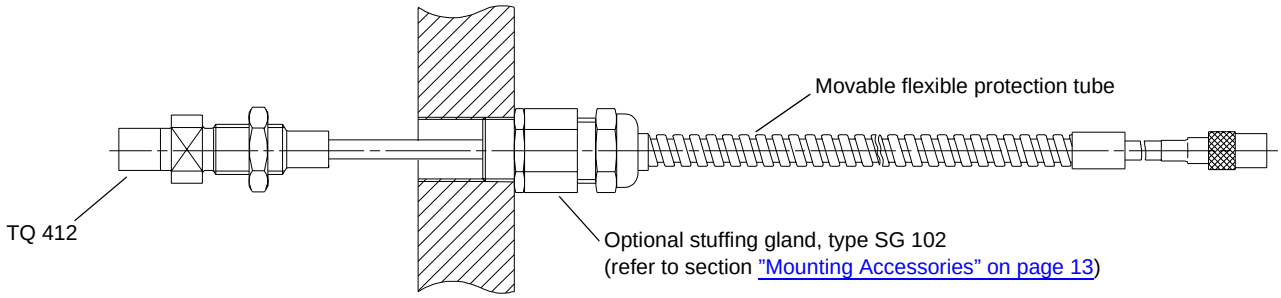
DIMENSIONS AND ORDERING INFORMATION *(Continued)*

TQ 412 Proximity Transducer



Movable flexible protection tube for TQ 412





Ordering Number : 111 - 412 - 000 - 012 — **A** **B** **E** **F** **G** **H**

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

Body Thread (B)	
M10x1	1
3/8"-24UNF	6

Total System Length (H)	
01	1 m length
05	5 m length
10	10 m length

Integral Cable (E)	
0.5 m length	005
1 m length	010
1.5 m length	015
2 m length	020
5 m length	050
10 m length	100

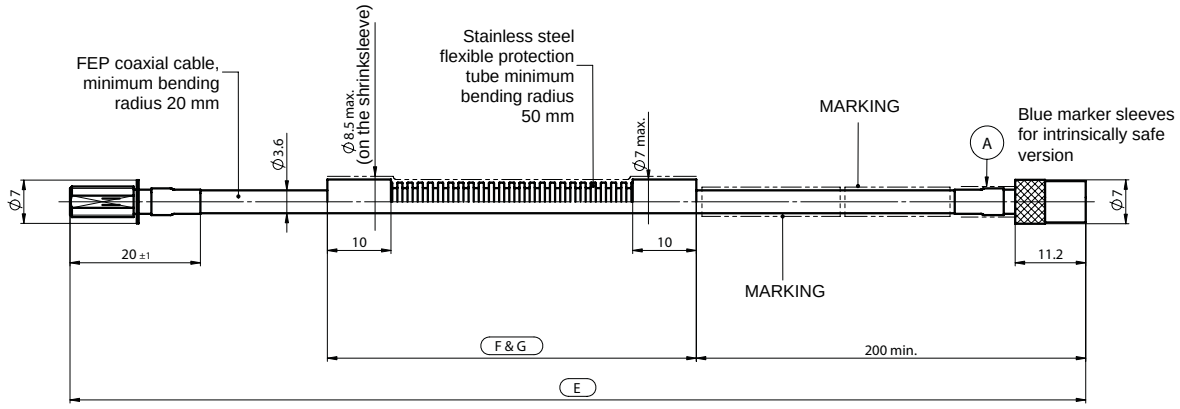
Cable Protection (F)	
None	0
Flexible protection tube	1
Flexible protection tube + sleeve	2
Movable flexible protection tube	3
Movable flexible protection tube + sleeve	4

Flexible protection tube Length (G)	
	Each 0.1 m, from 0 to 10.0 m
000	None
001	Min. 0.1 m
100	Max. 10.0 m

Notes :
(1) All dimensions are in mm.
(2) The total system length (dimension "H") is the sum of the lengths of the integral cable and the extension cable.
(3) For details on cable length tolerances, please refer to the section "Total System Length (TSL)" on page 3.

DIMENSIONS AND ORDERING INFORMATION *(Continued)*

EA 402 Extension Cable



Ordering Number: 913 - 402 - 000 - 012 – **A** | **E** | **F** | **G**

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

Cable Length (E)		
∅ 3.6	3.0 m	030
	3.5 m	035
	4.0 m	040
	4.5 m	045
	5.0 m	050
	8.0 m	080
	8.5 m	085
	9.0 m	090
	9.5 m	095

Cable Protection (F)	
None	0
Flexible protection tube	1
Flexible protection tube + sleeve	2

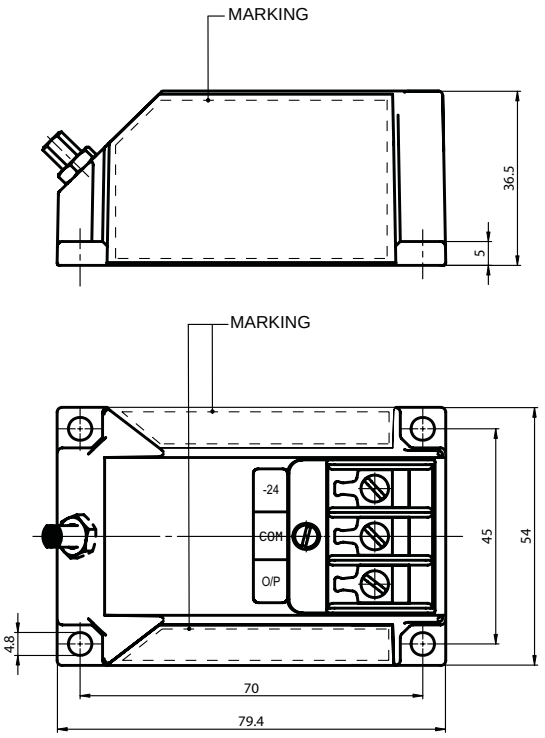
Flexible protection tube Length (G)	Each 0.1 m, from 0 to 10.0 m
000	None
001	Min. 0.1 m
100	Max. 10.0 m

Note:
(1) All dimensions are in mm unless otherwise stated.
(2) For details on cable length tolerances, please refer to the section "Total System Length (TSL)" on page 3.

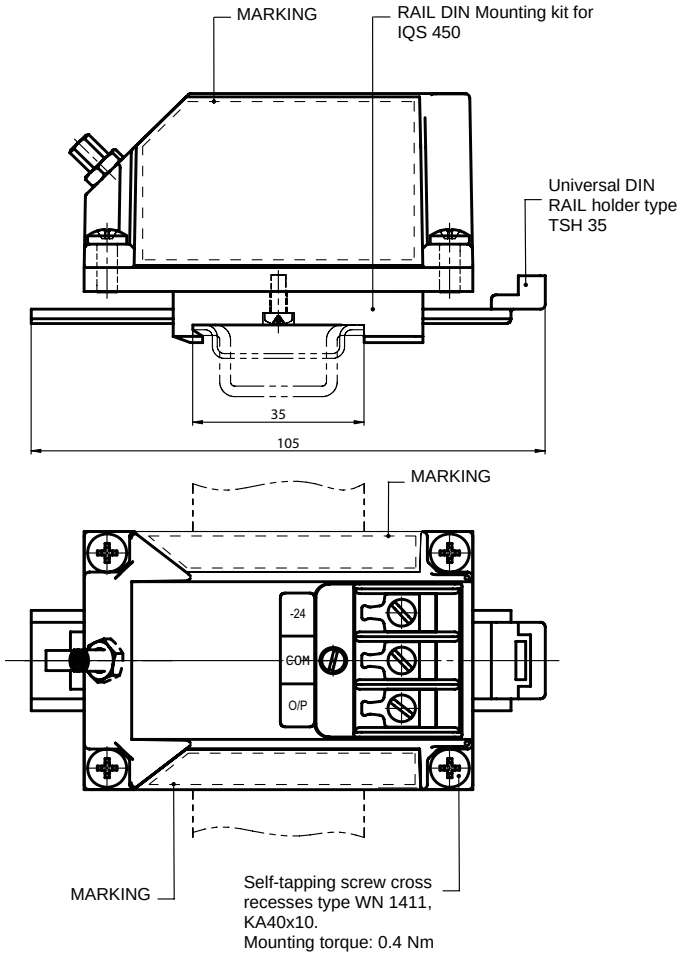
DIMENSIONS AND ORDERING INFORMATION *(Continued)*

IQS 450 Signal Conditioner

Ordering option I0



Ordering option I1



Ordering Number: 204 - 450 - 000 - 001 — **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 mounted on mounting adaptor

Measuring range	Sensitivity (B)	
2 mm	8 mV/µm	21
	2.5 µA/µm	22
4 mm	4 mV/µm	23
	1.25 µA/µm	24

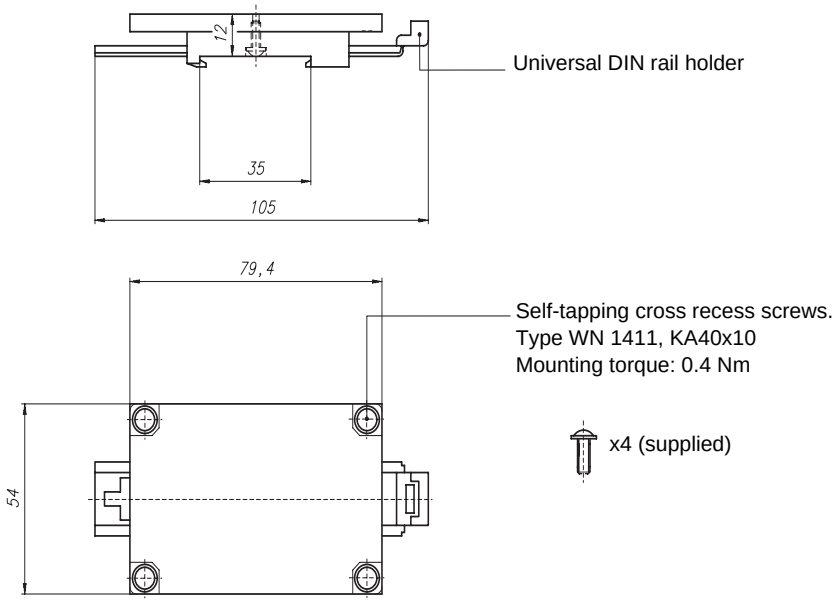
Total System Length (H)	
01	1 m length
05	5 m length
10	10 m length

MOUNTING ACCESSORIES

JB 118	Junction box	: See corresponding data sheet
PA 151	Probe mounting adapter	: See corresponding data sheet
PA 152	Probe mounting adapter	: See corresponding data sheet
PA 153	Probe mounting adapter	: See corresponding data sheet
SG 102	Cable feedthrough	: See corresponding data sheet
ABA 15X	Industrial housing	: See corresponding data sheet
MA 130	Mounting adaptor	: See below

MA 130 mounting adaptor

Mechanical diagram



Ordering number : 809-130-000-011

Sales offices

Vibro-Meter has offices in more than 30 countries. For a complete list, please visit our website.

Your local agent

Head office

Vibro-Meter SA
Rte de Moncor 4
P.O. Box
CH-1701 Fribourg
Switzerland

Tel: +41 26 407 11 11
Fax: +41 26 407 13 01

www.vibro-meter.com

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