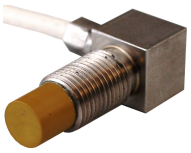
DATA SHEET

vibro-meter®

TQ442, EA402 and IQS450 proximity measurement system



TQ442

IQS450

KEY FEATURES AND BENEFITS

- From the vibro-meter® product line
- Non-contact measurement system based on eddy-current principle
- Ex certified versions for use in hazardous areas (potentially explosive atmospheres)
- Right-angle (90°) mount sensor
- 1, 5 and 10 m systems
- Temperature-compensated design
- Voltage or current output with protection against short circuits
- Frequency response:
  DC to 20 kHz (−3 dB)
- Measurement range:
  2 or 4 mm
- Temperature range:
  −40 to +180 °C

APPLICATIONS

- Shaft relative vibration and gap/position measurement chains for machinery protection and/or condition monitoring
- Ideal for use with VM600^{Mk2}/VM600 and VibroSmart® machinery monitoring systems
- For applications in confined spaces / difficult-to-access areas

DESCRIPTION

The TQ442, EA402 and IQS450 form a proximity measurement system from, Meggitt's vibro-meter® product line. This proximity measurement system allows contactless measurement of the relative displacement of moving machine elements.

TQ4xx-based proximity measurement systems are 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.

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DESCRIPTION *(continued)*

The system is based around a TQ442 non-contact sensor and an IQS450 signal conditioner. Together, these form a calibrated proximity measurement 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.

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 TQ442 is mounted at 90° degrees to the mounting surface (right-angle mount sensor). It has an integral coaxial cable, terminated with a self-locking miniature coaxial connector. Various cable lengths (integral and extension) can be ordered.

The IQS450 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 TQ442 transducer can be matched with a single EA402 extension cable to effectively lengthen the front-end. Optional housings, junction boxes and interconnection protectors are available for the mechanical and environmental protection of the connection between the integral and extension cables.

TQ4xx-based proximity measurement systems can be powered by associated machinery monitoring systems such as VM600^{Mk2}/VM600 modules (cards) or VibroSmart® modules, or by another power supply.

For specific applications, contact your local Meggitt representative.

SPECIFICATIONS

Overall proximity measurement 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 measurement range (typical)	
• Ordering option B21	: 0.15 to 2.15 mm, corresponding to a −1.6 to −17.6 V output
• Ordering option B22	: 0.15 to 2.15 mm, corresponding to a −15.5 to −20.5 mA output
• Ordering option B23	: 0.3 to 4.3 mm, corresponding to a −1.6 to −17.6 V output
• Ordering option B24	: 0.3 to 4.3 mm, corresponding to a −15.5 to −20.5 mA output
Linearity	: See **Performance curves on page 5 and on page 6**
Frequency response	: DC to 20 kHz (−3 dB)
Interchangeability of elements	: All components in system are interchangeable

SPECIFICATIONS *(continued)*

Environmental

Potentially 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 11 ATEX 3091 X II 1G (Zones 0, 1, 2) Ex ia IIC T6…T3 Ga
International	IECEx certificate of conformity	IECEx LCI 11.0061X Ex ia IIC T6…T3 Ga
North America	cCSAus certificate of compliance	cCSAus 1514309 Class I, Divisions 1 and 2, Groups A, B, C, D Ex ia
South Korea	KGS certificate of conformity	KGS 15-GA4BO-0664X Ex ia IIC T6 to T3
Russian Federation	EAЭC RU certificate of conformity	EAЭC RU C-CH.AД07.B.03003/21 0Ex ia IIC T6…T3 Ga X

Type of protection Ex nA: non-sparking (**ordering option A3**)		
Europe	Voluntary type examination certificate	LCIE 11 ATEX 1010 X II 3G (Zone 2) Ex nA II T6…T3 Gc
International	IECEx certificate of conformity	IECEx LCI 11.0063X Ex nA II T6…T3 Gc
North America	cCSAus certificate of compliance	cCSAus 1514309 Class I, Division 2, Groups A, B, C, D
Russian Federation	EAЭC RU certificate of conformity**	EAЭC RU C-CH.AД07.B.03003/21 2Ex nA II T6…T3 Gc X

*Not engraved/marked on the products.
**Not engraved/marked on all products.

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

⚠ **When using protection mode "Ex nA" (non-sparking), the user must ensure that the signal conditioner is installed in an industrial housing or 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.**

SPECIFICATIONS *(continued)*

Approvals

Conformity	: CE marking, European Union (EU) declaration of conformity. EAC marking, Eurasian Customs Union (EACU) certificate/ declaration of conformity.
Electromagnetic compatibility	: EN 61000-6-2:2005. EN 61000-6-4:2007 + A1:2011. TR CU 020/2011.
Electrical safety	: EN 61010-1:2010
Environmental management	: RoHS compliant (2011/65/EU)
Hazardous areas	: Ex approved versions (see **Potentially explosive atmospheres on page 3**)
Russian federal agency for technical regulation and metrology (Rosstandart)	: Pattern approval certificate No 60859-15

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 (minimum: Ø50 mm / 1 cm thick) according to Meggitt SA drawing number PZ 7009/1.

Total system length

The total system length (TSL) is the sum of the length of the TQ4xx transducer's integral cable and the length of the EA40x extension cable. The supported TSLs can be obtained from different combinations of cables.

Total system lengths

• 1 m	: 1.0 m integral cable with no extension cable
• 5 m	: 0.5 m integral cable + 4.5 m extension cable. 1.0 m integral cable + 4.0 m extension cable. 1.5 m integral cable + 3.5 m extension cable. 2.0 m integral cable + 3.0 m extension cable. 5.0 m integral cable with no extension cable.
• 10 m	: 0.5 m integral cable + 9.5 m extension cable. 1.0 m integral cable + 9.0 m extension cable. 1.5 m integral cable + 8.5 m extension cable. 2.0 m integral cable + 8.0 m extension cable. 5.0 m integral cable + 5.0 m extension cable. 10.0 m integral cable with no extension cable.

Note: The combination of cables selected for a particular total system length depends on the application. For example, to obtain the optimum location for the separation between the integral and extension cables or to eliminate the requirement for an extension cable.

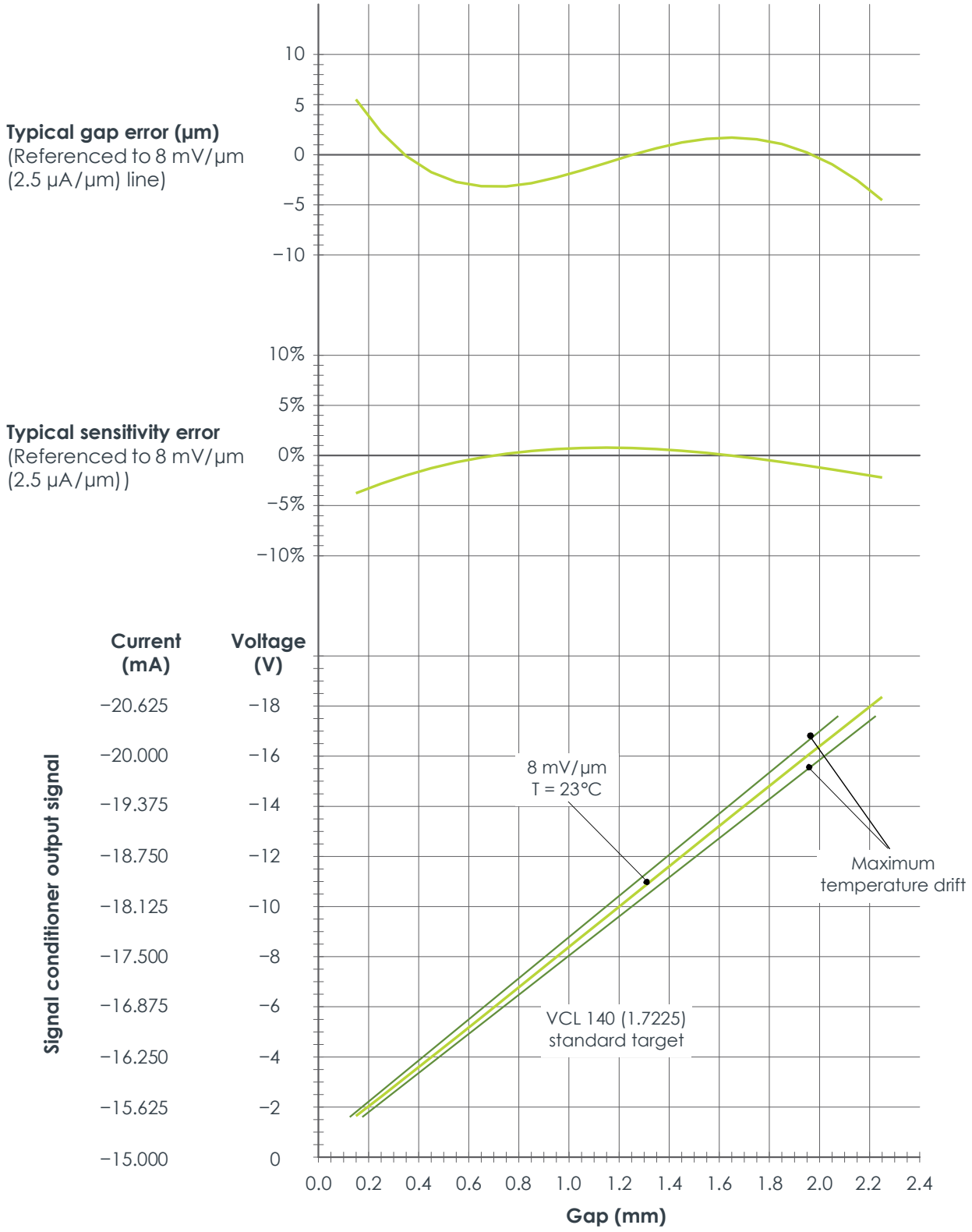
Total system length trimming

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

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

SPECIFICATIONS *(continued)*

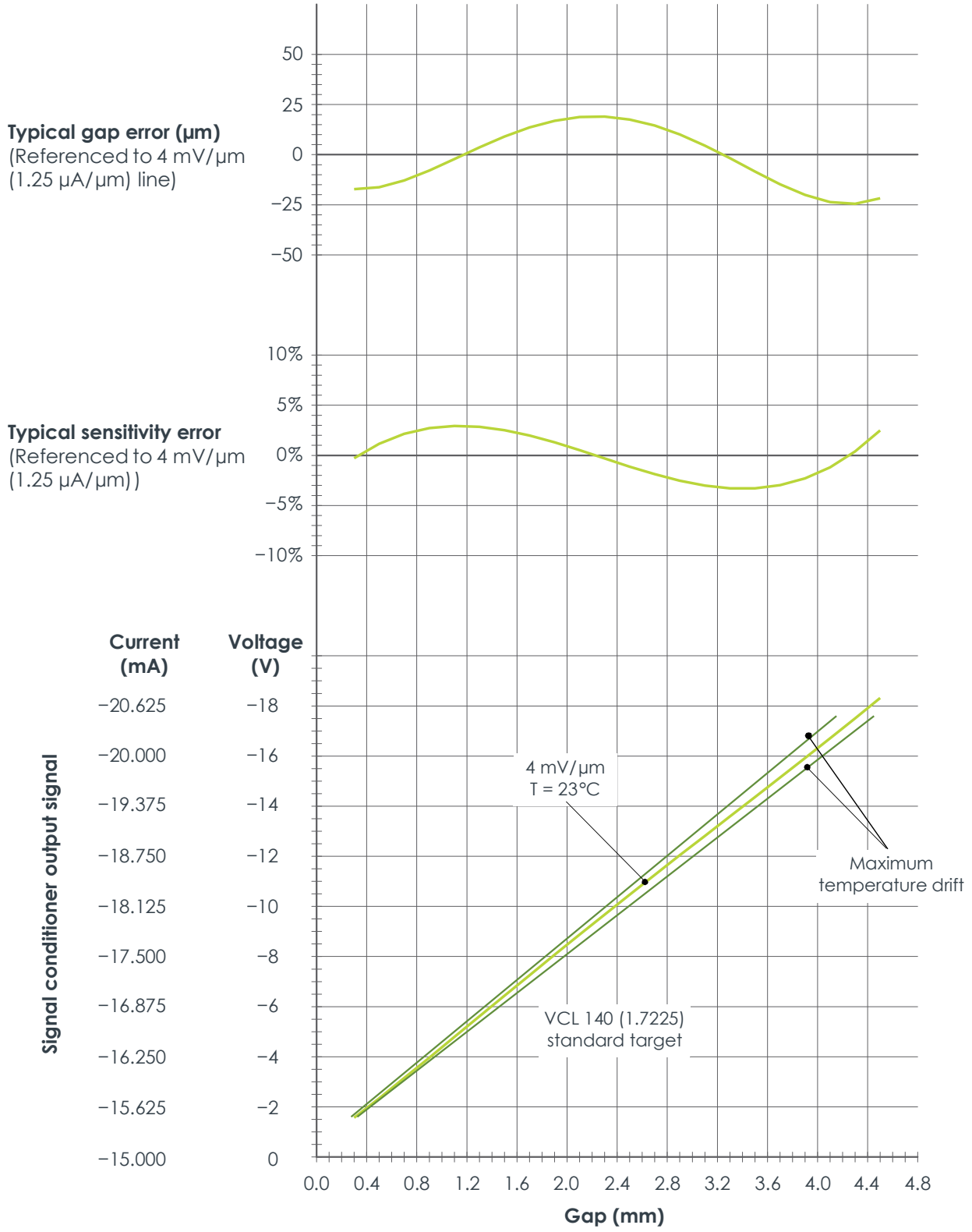
Performance curves for TQ442 with IQS450 (ordering options B21 and B22)



Proximity transducer: TQ442
Signal conditioner: IQS450 (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 TQ442 with IQS450 (ordering options B23 and B24)



Proximity transducer: TQ442
Signal conditioner: IQS450 (ordering option B23 and B24)
Standard target material: VCL 140 (1.7225)
Equivalent materials: A 37.11 (1.0065), AFNOR 40 CD4, AISI 4140

SPECIFICATIONS *(continued)*

TQ442 proximity transducer and EA402 extension cable

General

Transducer input requirements	: High-frequency power source from an IQS450 signal conditioner

Environmental

Temperature ranges	
• Transducer	: −40 to +180°C with drift <5% (operating). +180 to +220°C with drift >5% (short-term survival).
• Transducer and cable	: **−40 to +195°C if used in an Ex Zone**
• Cable, connector and optional protection	: −40 to +200°C
Protection rating (according to IEC 60529)	: The head of the proximity transducer (transducer tip and integral cable) is rated IP68
Vibration (according to IEC 60068-2-26)	: 5 g peak between 10 and 500 Hz
Shock acceleration (according to IEC 60068-2-27)	: 15 g peak (half sine-wave, 11 ms duration)

Physical characteristics

Transducer construction	: Wire coil Ø8 mm, Torlon (polyamide-imide) tip, encapsulated in stainless steel body (AISI 316L) with high-temperature epoxy glue
Integral and extension cables	: FEP covered 70 Ω coaxial cable, Ø3.6 mm
Connectors	: Self-locking miniature coaxial connectors. Note: When connecting, these should be hand-tightened until locked.
Optional protection	
• Flexible stainless steel hose (protection tube)	: The stainless steel hose provides additional mechanical protection but is not leak-tight
• FEP sheath (extruded fluorinated ethylene propylene)	: The FEP sheath provides resistance to almost all chemicals and low permeability to liquids, gases and moisture. It is also flexible, low friction and mechanically tough.

SPECIFICATIONS *(continued)*

IQS450 signal conditioner

Output

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 to −32 V*
• Current	: −13 mA ±1 mA (−25 mA max.)
Current output, 2-wire configuration	
• Voltage	: −20 to −32 V*
• Current	: −15.5 to −20.5 mA
Supply input capacitance	: 1 nF
Supply input inductance	: 100 µH

Environmental

Temperature ranges	
• Operating	: −35 to +85°C*
• Storage	: −40 to +85°C
Humidity	: 95% max. non-condensing. 100% condensing (not submerged).
Protection rating (according to IEC 60529)	: IP40
Vibration (according to IEC 60068-2-26)	: 2 g peak between 10 and 55 Hz
Shock acceleration (according to IEC 60068-2-27)	: 15 g peak (half sine-wave, 11 ms duration)

Physical characteristics

Construction material	: Injection-moulded aluminium
Mounting	: Two or four M4 screws
Dimensions	: See **Mechanical drawings and ordering information on page 12**

*See **Thermal considerations on page 9**.

SPECIFICATIONS *(continued)*

Electrical connections

Input	: Self-locking miniature coaxial connector (female). Note: When connecting, this should be hand-tightened, until locked.
Output and power supply	: Three screw terminals – wire section 2.5 mm^2 max.

Weight

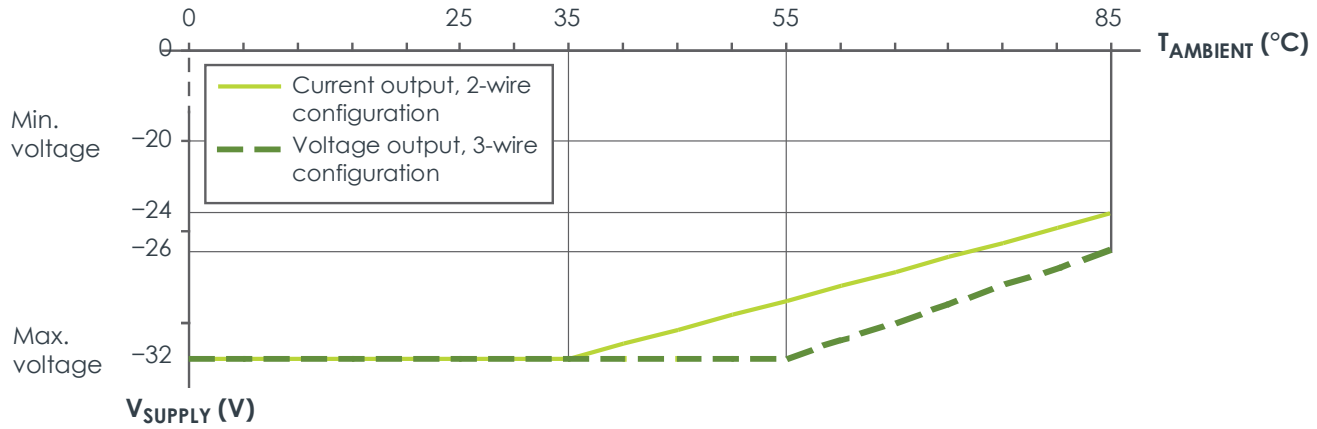
Standard version	: 140 g approx.
Ex version	: 220 g approx.

Signal conditioner with MA130 mounting adaptor (ordering option I1)

Universal DIN rail holder type	: TSH 35
DIN rail type (according to EN 50022 / IEC 60715)	: TH 35-7.5 and TH 35-15
Dimensions	: See **Accessories on page 13**

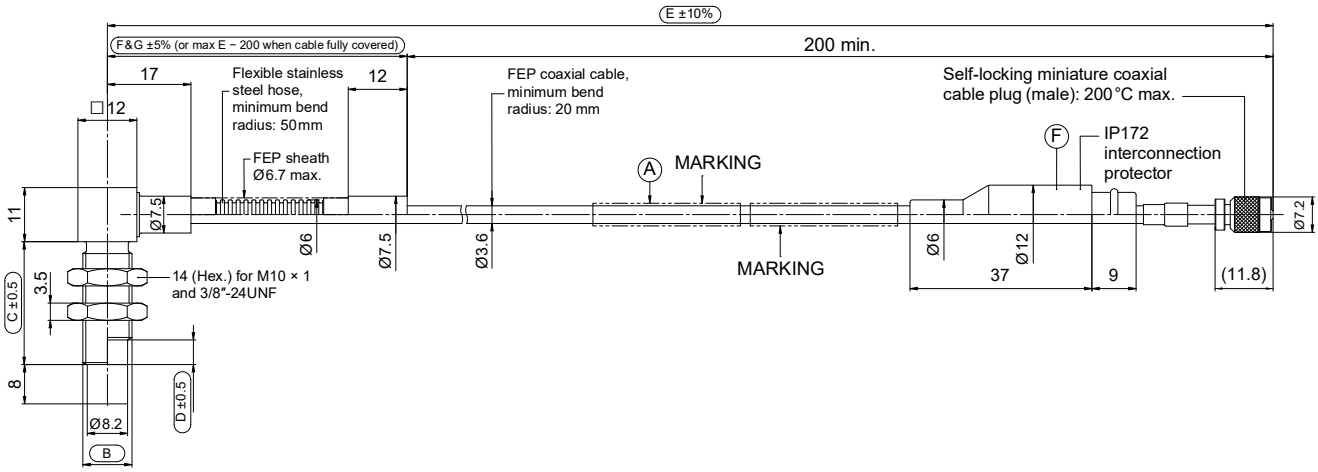
Thermal considerations

The IQS450 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 IQS450 must operate between the minimum supply voltage and the maximum supply voltage, as shown on the following graph.



MECHANICAL DRAWINGS AND ORDERING INFORMATION

TQ442 proximity transducer



Ordering number:

111 - 442 - 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 × 1	1
3/8"-24UNF	6

Body length (C)	
Each 1 mm, from 18 to 62 mm	
18 mm min.	018
62 mm max.	062

Unthreaded length (D)	
Each 1 mm, from 0 to 47 mm	
0 mm min.	000
47 mm max.	047

Integral cable length (E)	
0.5 m ±50 mm	005
1.0 m ±100 mm	010
1.5 m ±150 mm	015
2.0 m ±200 mm	020
5.0 m ±500 mm	050
10 m ±1000 mm	100

Optional protection (F) See note 1		
	Cable	Connector
0	None	None
1	Flexible hose	None
2	Flexible hose with FEP sheath	None
3	Movable flexible hose	None
4	Movable flexible hose with FEP sheath	None
5	None	IP172
6	Flexible hose	IP172
7	Flexible hose with FEP sheath	IP172
8	Movable flexible hose	IP172
9	Movable flexible hose with FEP sheath	IP172

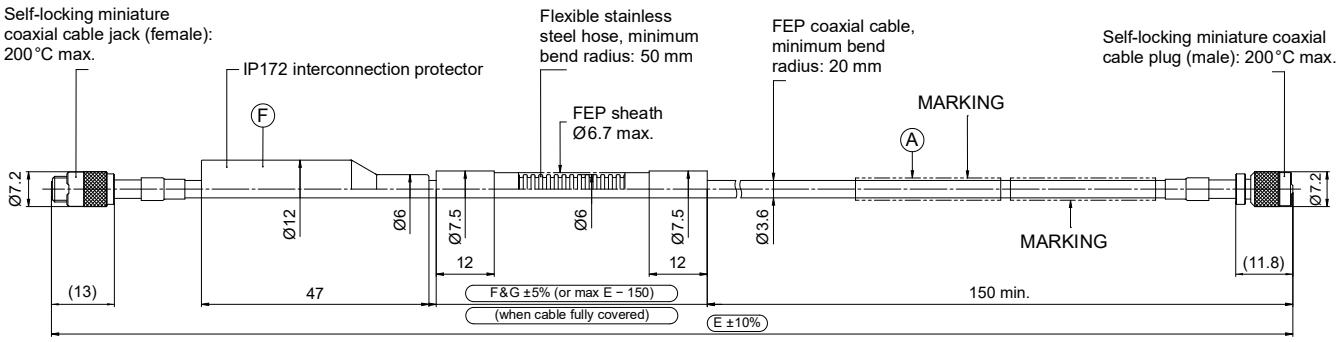
Flexible hose length (G) See note 1	
	Each 0.1 m, from 0 to 9.8 m
000	None
001	0.1 m min.
098	9.8 m max.

Total system length (H) See note 2	
1 m	01
5 m	05
10 m	10

Notes
All dimensions are in mm unless otherwise stated.
1. When optional protection such as a flexible stainless steel hose with or without an FEP sheath is ordered:
   Flexible hose length (G) max. = TQ442 integral cable length (E) − 200 mm, for an integral cable that is protected to the maximum extent possible ("cable fully covered").
2. The Total system length (H) = TQ442 integral cable length (E) + EA402 extension cable length.
   For information on combining integral and extension cables to obtain a particular total system length, see **Total system length on page 4**.
   For information on cable length tolerances, see **Total system length trimming on page 4**.

MECHANICAL DRAWINGS AND ORDERING INFORMATION *(continued)*

EA402 extension cable



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

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

Flexible hose length (G)	
	Each 0.1 m, from 0 to 9.3 m
000	None
001	0.1 m min.
093	9.3 m max.

Extension cable length (E) See note 1	
3.0 m ±300 mm	030
3.5 m ±350 mm	035
4.0 m ±400 mm	040
4.5 m ±450 mm	045
5.0 m ±500 mm	050
8.0 m ±800 mm	080
8.5 m ±850 mm	085
9.0 m ±900 mm	090
9.5 m ±950 mm	095

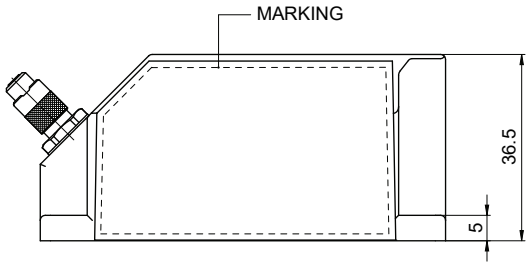
Optional protection (F) See note 2		
Cable	**Connector**	
None	None	0
Flexible hose	None	1
Flexible hose with FEP sheath	None	2
None	IP172	5
Flexible hose	IP172	6
Flexible hose with FEP sheath	IP172	7

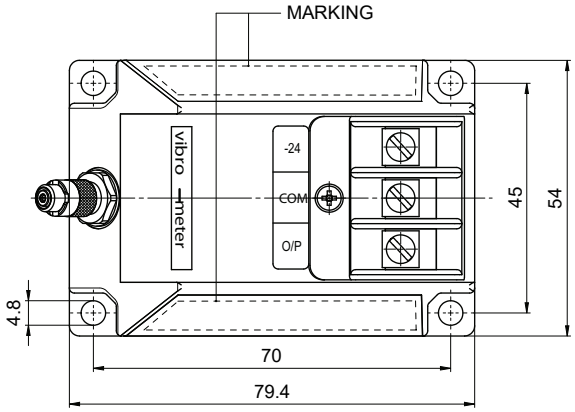
Notes
All dimensions are in mm unless otherwise stated.
1. The total system length = TQ442 integral cable length + EA402 extension cable length (E).
   For information on combining integral and extension cables to obtain a particular total system length, see **Total system length on page 4**. For information on cable length tolerances, see **Total system length trimming on page 4**.
2. When optional protection such as a flexible stainless steel hose with or without an FEP sheath is ordered:
   Flexible hose length (G) max. = EA402 extension cable length (E) − 150 mm, for an extension cable that is protected to the maximum extent possible ("cable fully covered").

MECHANICAL DRAWINGS AND ORDERING INFORMATION *(continued)*

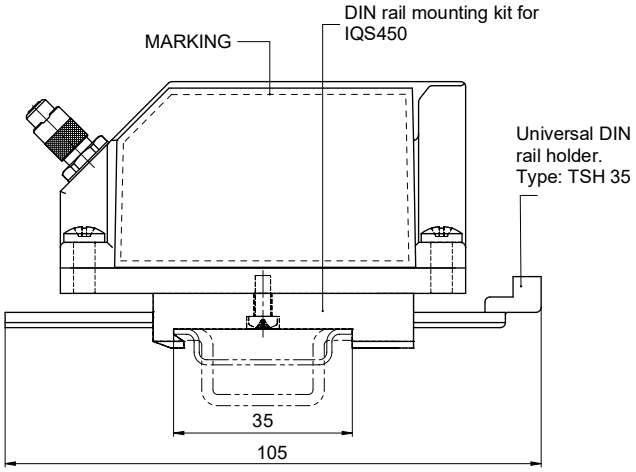
IQS450 signal conditioner

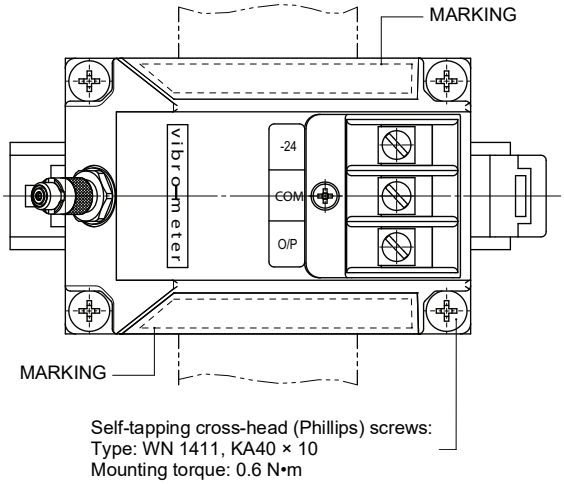
Signal conditioner only (ordering option I0)





Signal conditioner with MA130 mounting adaptor (ordering option I1)





Note: All dimensions are in mm unless otherwise stated.

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 MA130 mounting adaptor

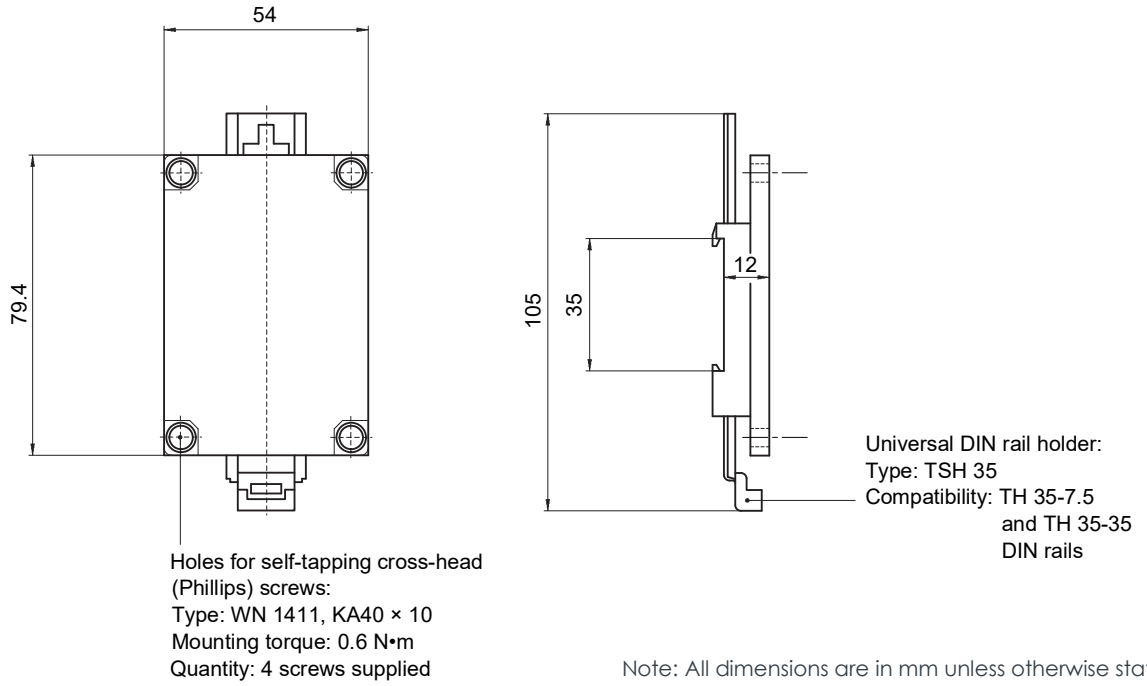
Measurement range	Sensitivity (B)	
2 mm	8 mV/µm	21
	2.5 µA/µm	22
4 mm	4 mV/µm	23
	1.25 µA/µm	24

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

ACCESSORIES

ABA17x	Industrial housings	: Refer to corresponding data sheets
IP172	Interconnection protection	: Refer to corresponding data sheet
JB118	Junction box	: Refer to corresponding data sheet
KS107	Flexible conduit	: Refer to corresponding data sheet
MA130	Mounting adaptor	: See below
SG1xx	Cable feedthroughs	: Refer to corresponding data sheets

MA130 mounting adaptor (for IQS450)



Note: All dimensions are in mm unless otherwise stated.

Ordering number (PNR): 809-130-000-011

RELATED PRODUCTS

TQ942, EA902 and IQS900	Proximity measurement chain (2 or 4 mm measurement range, right-angle (90°) mount)	: Refer to corresponding data sheet
TQ401, EA401 and IQS450	Proximity measurement system (2 mm measurement range)	: Refer to corresponding data sheet
TQ402/TQ412, EA402 and IQS450	Proximity measurement system (2 or 4 mm measurement range)	: Refer to corresponding data sheet
TQ403, EA403 and IQS450	Proximity measurement system (12 mm measurement range)	: Refer to corresponding data sheet
TQ422/TQ432, EA402 and IQS450	Proximity measurement system (2 or 4 mm measurement range, high-pressure applications)	: Refer to corresponding data sheet
TQ423, EA403 and IQS450	Proximity measurement system (12 mm measurement range, high-pressure applications)	: Refer to corresponding data sheet

Meggitt (Meggitt PLC) is a leading international engineering company, headquartered in England, that designs and delivers high-performance components and subsystems for aerospace, defence and selected energy markets. Meggitt comprises four customer-aligned divisions: Airframe Systems, Engine Systems, Energy & Equipment and Services & Support.

The Energy & Equipment division includes the Energy Sensing and Controls product group that specialises in sensing and monitoring solutions for a broad range of energy infrastructure, and control valves for industrial gas turbines, primarily for the Power Generation, Oil & Gas and Services markets. Energy & Equipment is headquartered in Switzerland (Meggitt SA) and incorporates the vibro-meter® product line, which has over 65 years of sensor and systems expertise and is trusted by original equipment manufacturers (OEMs) globally.

In this publication, a dot (.) is used as the decimal separator and thousands are separated by thin spaces. Example: 12345.67890.

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