

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.



Information contained in this document may be subject to export control regulations of the European Union, USA or other countries. Each recipient of this document is responsible for ensuring that transfer or use of any information contained in this document complies with all relevant export control regulations. ECN N/A.

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.AΔ07.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.AΔ07.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

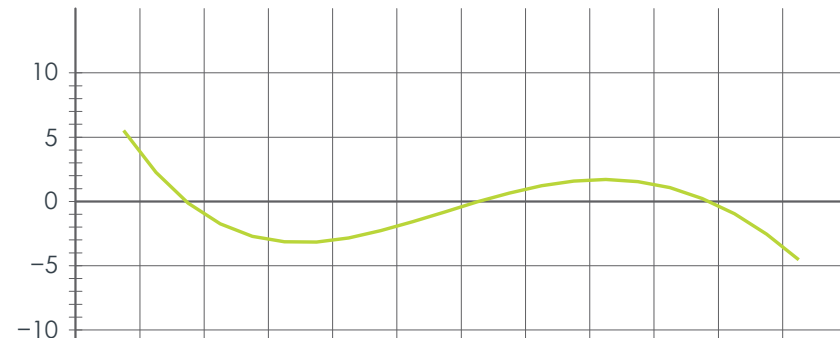
Due to the characteristics of the coaxial cable, an "electrical trimming" of the nominal length of extension cables is necessary to optimize the system performance and the transducer interchangeability.

| | |
|----------------------------------|-----------------|
| 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 |

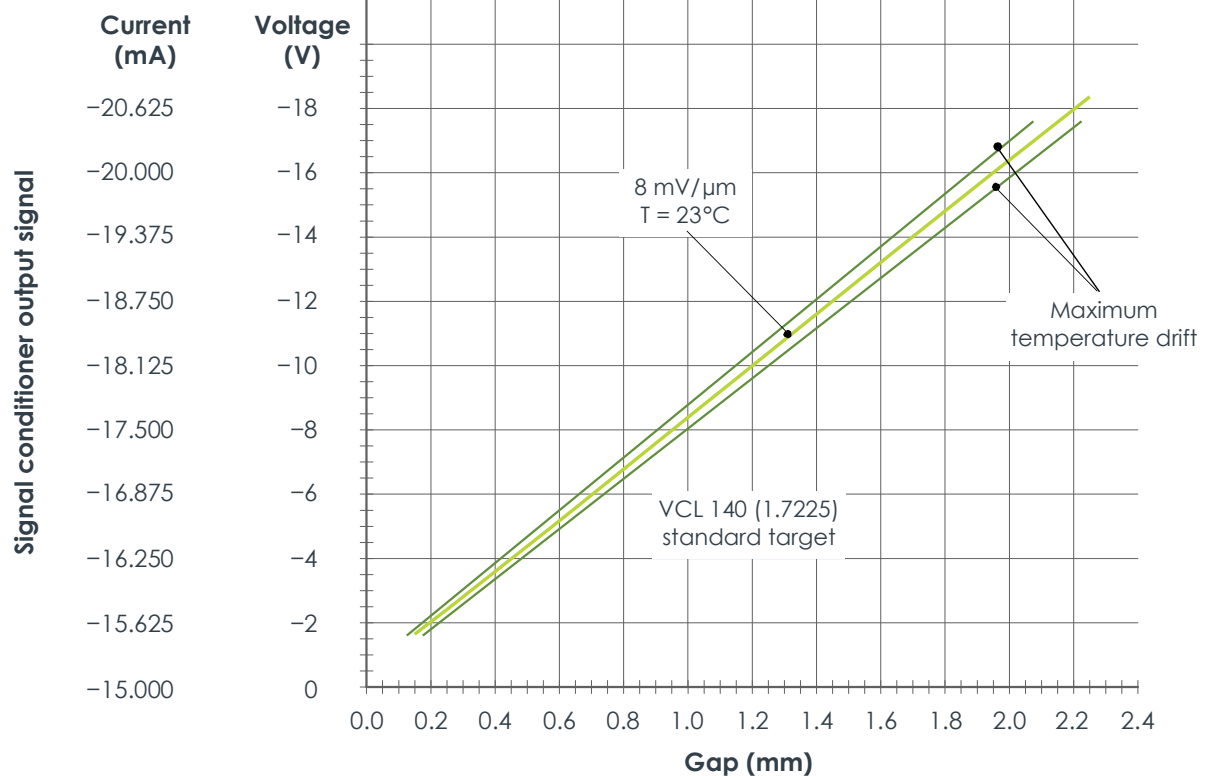
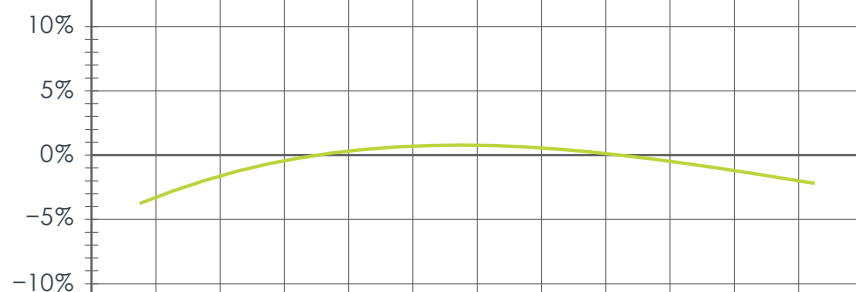
SPECIFICATIONS *(continued)*

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

Typical gap error (μm)
(Referenced to 8 mV/ μm
(2.5 $\mu\text{A}/\mu\text{m}$) line)



Typical sensitivity error
(Referenced to 8 mV/ μm
(2.5 $\mu\text{A}/\mu\text{m}$))



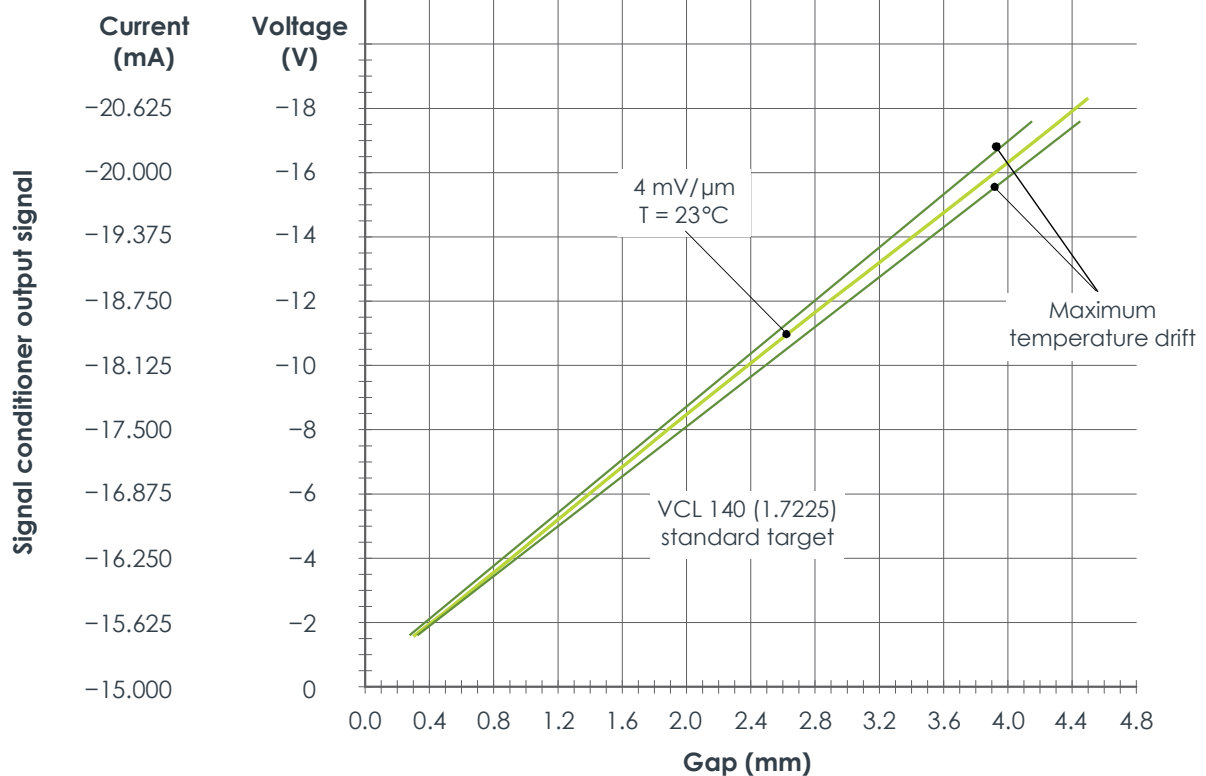
Proximity transducer: TQ442
Signal conditioner: IQS450 (ordering option B21 and B22)
Standard target material: VCL 140 (1.7225)
Equivalent materials: A 37.11 (1.0065), AFNOR 40 CD4, AISI 4140

SPECIFICATIONS *(continued)*

Performance curves for TQ442 with IQS450 (ordering options B23 and B24)

Typical gap error (μm)
(Referenced to 4 mV/ μm
(1.25 $\mu\text{A}/\mu\text{m}$) line)

Typical sensitivity error
(Referenced to 4 mV/ μm
(1.25 $\mu\text{A}/\mu\text{m}$))



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 μ H

Supply

Voltage output, 3-wire configuration

- Voltage : -20 to -32 V*
- Current : -13 mA \pm 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 μ H

Environmental

Temperature ranges

- Operating : -35 to +85°C *
- Storage : -40 to +85°C

Humidity : 95% max. non-condensing.
100% condensing (not submerged).

Protection rating : IP40
(according to IEC 60529)

Vibration : 2 g peak between 10 and 55 Hz
(according to IEC 60068-2-26)

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

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

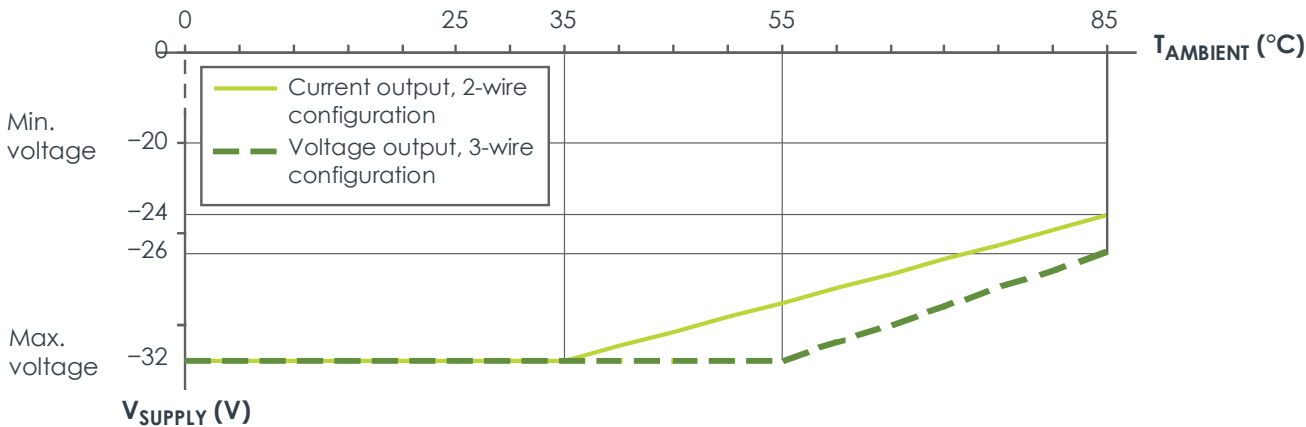
| | |
|------------------|-----------------|
| Standard version | : 140 g approx. |
| Ex version | : 220 g approx. |

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 |

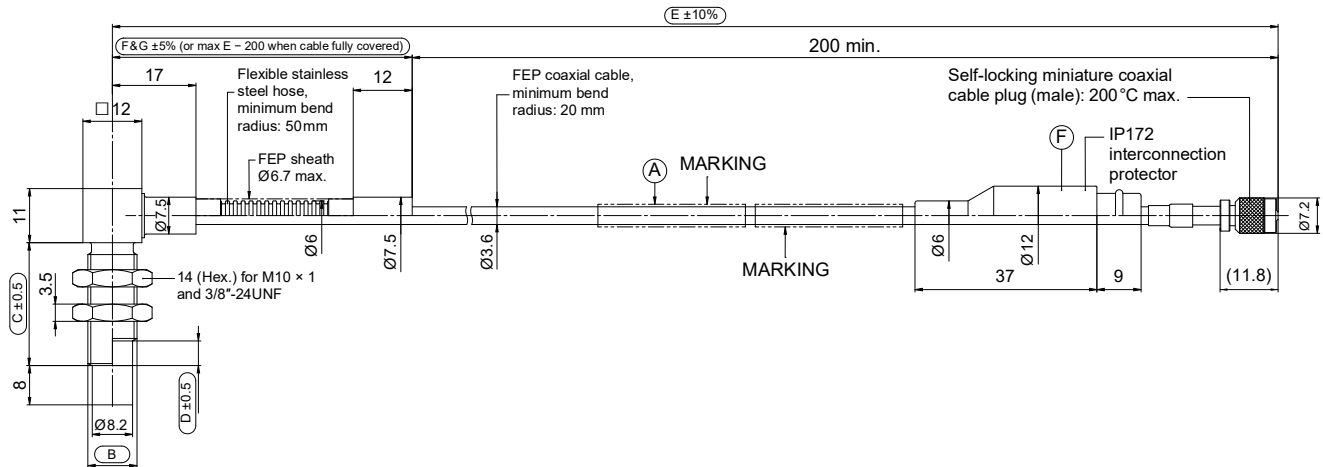
Thermal considerations

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



| 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 |

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

| 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. |

| 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 |

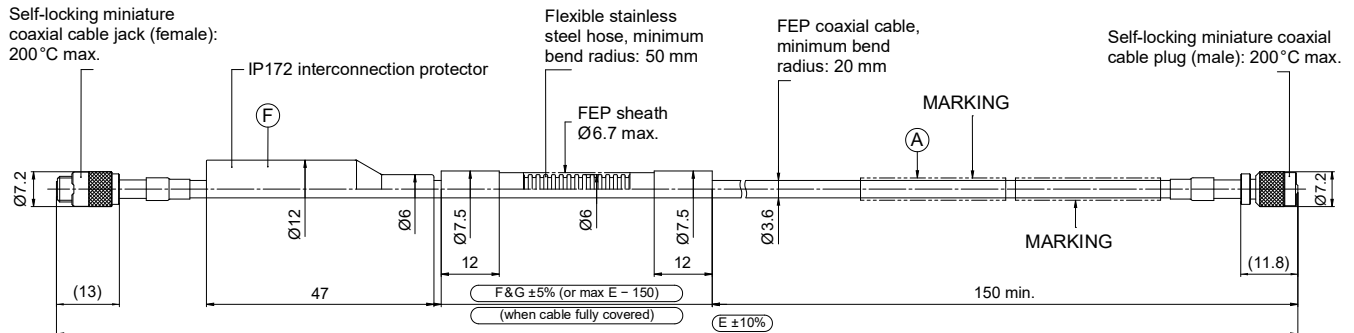
Notes

All dimensions are in mm unless otherwise stated.

- 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").
- 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 |

| 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 |

| 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. |

| 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.**

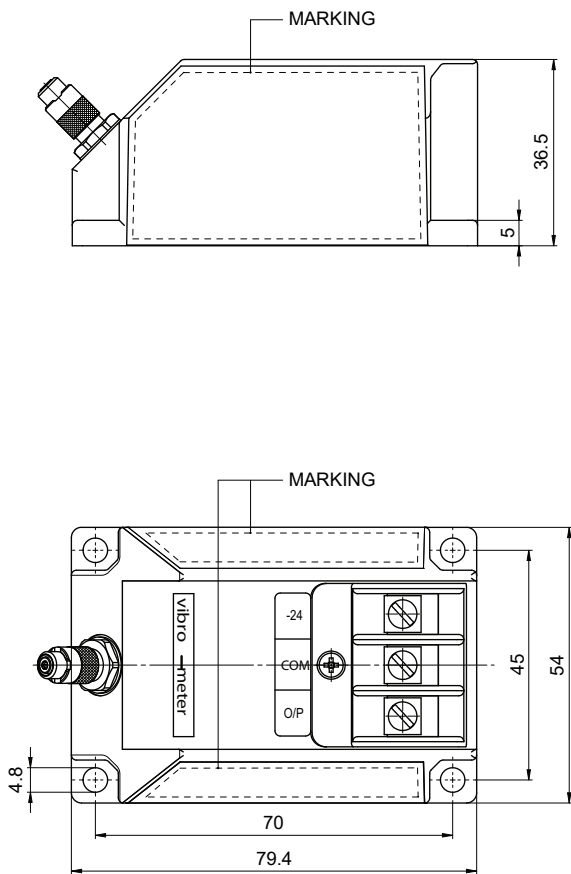
2. When optional protection such as a flexible stainless steel hose with or without an FEP sheath is ordered:

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").

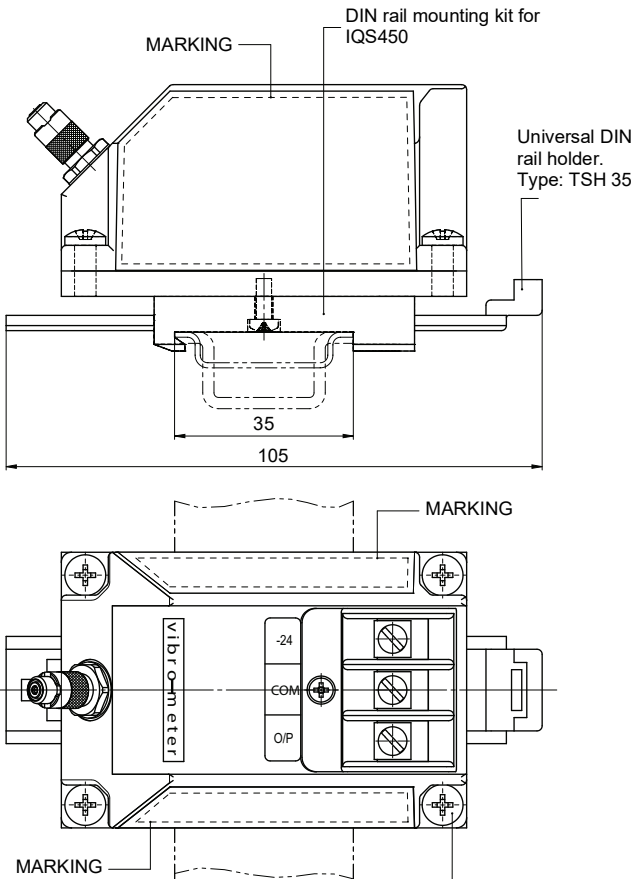
MECHANICAL DRAWINGS AND ORDERING INFORMATION *(continued)*

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.

Self-tapping cross-head (Phillips) screws:
Type: WN 1411, KA40 × 10
Mounting torque: 0.6 N•m

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

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

| 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 |

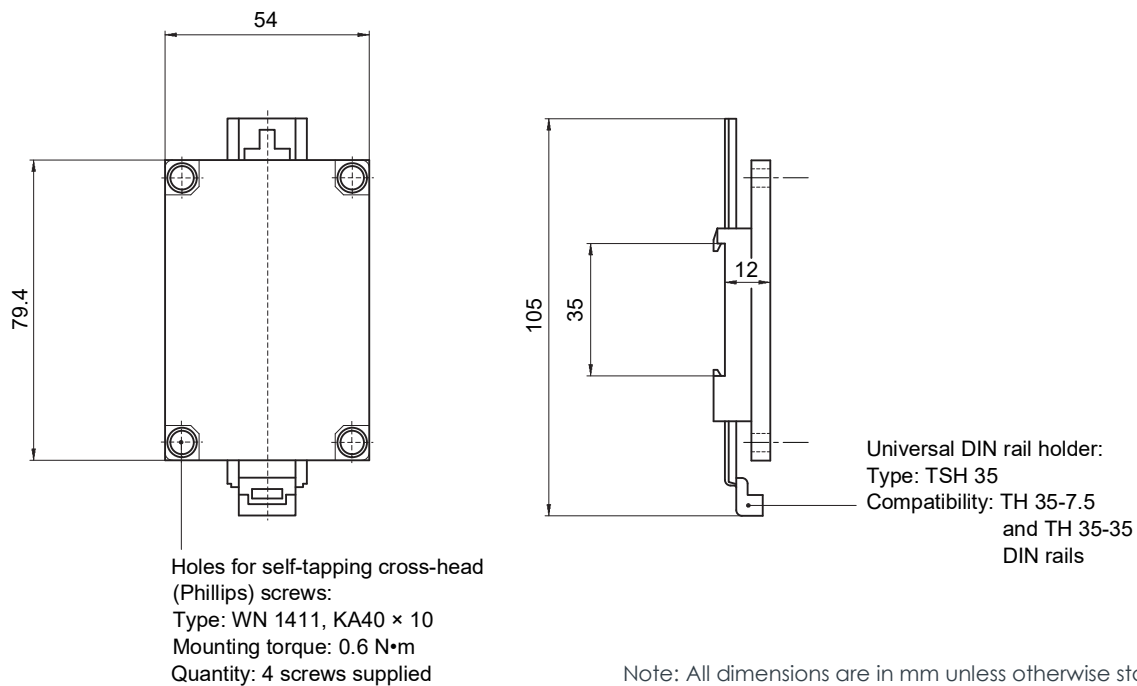
| Installation (I) | |
|------------------|--|
| 0 | Signal conditioner only |
| 1 | Signal conditioner assembled on MA130 mounting adaptor |

| 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.



All information in this document, such as descriptions, specifications, drawings, recommendations and other statements, is believed to be reliable and is stated in good faith as being approximately correct, but is not binding on Meggitt (Meggitt SA) unless expressly agreed in writing. Before acquiring and/or using this product, you must evaluate it and determine if it is suitable for your intended application. You should also check our website at www.meggittsensing.com/energy for any updates to data sheets, certificates, product drawings, user manuals, service bulletins and/or other instructions affecting the product.

Unless otherwise expressly agreed in writing with Meggitt SA, you assume all risks and liability associated with use of the product. Any recommendations and advice given without charge, whilst given in good faith, are not binding on Meggitt SA. Meggitt (Meggitt SA) takes no responsibility for any statements related to the product which are not contained in a current Meggitt SA publication, nor for any statements contained in extracts, summaries, translations or any other documents not authored and produced by Meggitt SA.

The certifications and warranties applicable to the products supplied by Meggitt SA are valid only for new products purchased directly from Meggitt SA or from an authorised distributor of Meggitt SA.

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

Copyright© 2024 Meggitt SA. All rights reserved. The information contained in this document is subject to change without prior notice.

Sales offices

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

Local representative

Head office

Meggitt SA
Route de Moncor 4
Case postale
1701 Fribourg
Switzerland

Tel: +41 26 407 11 11

Fax: +41 26 407 13 01

energy@ch.meggitt.com

www.meggittsensing.com/energy

www.meggitt.com

