DATA SHEET

vibro-meter®

TQ403, EA403 and IQS900 proximity measurement system

TQ403 sensor

IQS900 signal conditioner

(Images not to scale)

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)
- Conforms to API 670 recommendations
- 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: 12 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

DESCRIPTION

The TQ403, EA403 and IQS900 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.

DESCRIPTION *(continued)*

The system is based around a TQ403 non-contact sensor and an IQS900 signal conditioner. Together, these form a calibrated proximity measurement system in which each component is interchangeable. The system outputs a voltage or a 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 only with metric thread. The TQ403 has an integral coaxial cable, terminated with a self-locking miniature coaxial connector. Various cable lengths (integral and extension) can be ordered.

The IQS900 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 a painted aluminium housing.

Note: The IQS900 signal conditioner matches or betters the outstanding measurement performance and specifications of the IQS450 signal conditioner, which it replaces. Accordingly, the IQS900 is compatible with all TQ9xx and TQ4xx proximity sensors / measurement chains.

In addition, the IQS900 signal conditioner includes improvements such as: SIL 2 “by design”, improved frame-voltage immunity, improved electromagnetic immunity and emissions, smaller output impedance (voltage output), optional diagnostic circuitry (that is, built-in self-test (BIST)), raw output pin, test input pin, new DIN-rail mounting adaptor and removable screw-terminal connectors for easier installation.

The TQ403 transducer can be matched with a single EA403 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 Parker Meggitt representative.

SPECIFICATIONS

Overall proximity measurement system

Operation

Sensitivity	
• Ordering option B31	: 1.33 mV/µm (34 mV/mil)
• Ordering option B32	: 0.417 µA/µm (10.6 µA/mil)
Linear measurement range (typical)	
• Ordering option B31	: 0.75 to 12.75 mm, corresponding to a −1.6 to −17.6 V output
• Ordering option B32	: 0.75 to 12.75 mm, corresponding to a −15.5 to −20.5 mA output
Linearity	: See **Performance curves on page 8**
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 – TQ403 and EA403

Type of protection Ex i: intrinsic safety **(ordering option A2)**		
Europe	EC type examination certificate	Ⓔx II 1G (Zones 0, 1, 2) LCIE 11 ATEX 3091 X 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.АД07.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	Ⓔx II 3G (Zone 2) LCIE 11 ATEX 1010 X 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.АД07.B.03003/21 2Ex nA II T6…T3 Gc X

*Not engraved/marked on the 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 Parker Meggitt.**

⚠ **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 Parker Meggitt.**

SPECIFICATIONS *(continued)*

Available in Ex approved versions for use in hazardous areas – IQS9xx (ordering option code A5)

Protection mode	IQS9xx
Europe	
ec (Gas)	⟨Ex⟩ II 3 G (Zone 2) Ex ec IIC T6 or T5 Gc LCIE 21 ATEX 1004 X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Gas)	⟨Ex⟩ II 1 G (Zones 0, 1, 2) Ex ia IIC T6 or T5 Ga LCIE 21 ATEX 3002 X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Dust)	⟨Ex⟩ II 1 D (Zones 20, 21, 22) Ex ia IIIC T_{200} 80°C…T_{200} 115°C Da LCIE 21 ATEX 3002 X T_{200} 80°C: For −40°C ⩽ T_{amb} ⩽ +50°C T_{200} 95°C: For −40°C ⩽ T_{amb} ⩽ +65°C T_{200} 115°C: For −40°C ⩽ T_{amb} ⩽ +85°C

International	
ec (Gas)	Ex ec IIC T6 or T5 Gc IECEx LCIE 21.0005X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Gas)	Ex ia IIC T6 or T5 Ga IECEx LCIE 21.0006X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Dust)	Ex ia IIIC T_{200} 80°C…T_{200} 115°C Da IECEx LCIE 21.0006X T_{200} 80°C: For −40°C ⩽ T_{amb} ⩽ +50°C T_{200} 95°C: For −40°C ⩽ T_{amb} ⩽ +65°C T_{200} 115°C: For −40°C ⩽ T_{amb} ⩽ +85°C

SPECIFICATIONS *(continued)*

Protection mode	IQS9xx

North America	
ec (Gas)	Class I, Division 2, Groups A, B, C, D T6…T5 Ex ec IIC T6…T5 Gc Class I, Zone 2, AEx ec IIC T6…T5 Gc cCSAus 80084516
ia (Gas)	IS Class I, Division 1, Groups A, B, C, D T6 or T5 Ex ia IIC T6 or T5 Ga Class I, Zone 0, AEx ia IIC T6 or T5 Ga cCSAus 80084516
ia (Dust)	Class II, Division 1, Groups E, F, G T80°C…T115°C Ex ia IIIC T80°C…T115°C Da Zone 20, AEx ia IIIC T80°C…T115°C Da cCSAus 80084516

South Korea	
ec (Gas)	Ex ec IIC T6…T5 Gc KGS 24-GA4BO-0436X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Gas)	Ex ia IIC T6 or T5 Ga KGS 24-GA4BO-0437X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Dust)	Ex ia IIIC T_{200} 80°C…T_{200} 115°C Da KGS 24-GA4BO-0438X T_{200} 80°C: For −40°C ⩽ T_{amb} ⩽ +50°C T_{200} 95°C: For −40°C ⩽ T_{amb} ⩽ +65°C T_{200} 115°C: For −40°C ⩽ T_{amb} ⩽ +85°C

United Kingdom*	
ec (Gas)	Ⓔx II 3 G (Zone 2) Ex ec IIC T6 or T5 Gc CML 21 UKEX 4549 X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Gas)	Ⓔx II 1 G (Zones 0, 1, 2) Ex ia IIC T6 or T5 Ga CML 21 UKEX 2548 X T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Dust)	Ⓔx II 1 D (Zones 20, 21, 22) Ex ia IIIC T_{200} 80°C…T_{200} 115°C Da CML 21 UKEX 2548 X T_{200} 80°C: For −40°C ⩽ T_{amb} ⩽ +50°C T_{200} 95°C: For −40°C ⩽ T_{amb} ⩽ +65°C T_{200} 115°C: For −40°C ⩽ T_{amb} ⩽ +85°C
*UKCA marking is not engraved/marked on the products.	

SPECIFICATIONS *(continued)*

Protection mode	IQS9xx

Kazakhstan (Eurasian Economic Union)	
ec (Gas)	Ex 2Ex e IIC T6…T5 Gc X EAЭC KZ 7100841.01.01.03722 T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Gas)	Ex 0Ex ia IIC T6…T5 Ga X EAЭC KZ 7100841.01.01.03722 T6: For −40°C ⩽ T_{amb} ⩽ +70°C T5: For −40°C ⩽ T_{amb} ⩽ +85°C
ia (Dust)	Ex Ex ia IIIC T_{200} 80°C…T_{200} 115°C Da X EAЭC KZ 7100841.01.01.03722 T_{200} 80°C: For −40°C ⩽ T_{amb} ⩽ +50°C T_{200} 95°C: For −40°C ⩽ T_{amb} ⩽ +65°C T_{200} 115°C: For −40°C ⩽ T_{amb} ⩽ +85°C

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

⚠ **For a IQS9xx signal conditioner with protection mode "Ex ec" located in an Ex Zone 2, the user must ensure that the IQS9xx 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 the IQS900, refer to the *Ex product register (PL-1511) document* that is available from Parker Meggitt.**
For information on the IQS910's Ex certifications, refer to the *IQS910 signal conditioner data sheet*.

Approvals

Conformity : European Union (EU) declaration of conformity (CE marking).
Eurasian Economic Union certificate/declaration of conformity (EAC marking).

Electromagnetic compatibility

- TQ403 and EA403 : EN 61000-6-2:2005.
  EN 61000-6-4:2007 + A1:2011.
  TR CU 020/2011.
- IQS900 : EN 61000-6-2:2005.
  EN 61000-6-4:2007 + A1:2011.
  EN 61326-1:2013.
  EN 61326-3-2:2008 (SIL).

Electrical safety : EN 61010-1:2010

Environmental management : RoHS compliant (2011/65/EU)

Hazardous areas : Ex approved versions
(see **Potentially explosive atmospheres starting on page 3**)

Functional safety : SIL 2 in accordance with IEC 61508-1:2010 and IEC 61508-2:2010.
Cat 1 PL c in accordance with ISO 13849-1:2015.

SPECIFICATIONS *(continued)*

System (chain) calibration

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

Note: For applications using a non-standard or special target material, performance curves can be generated and supplied. Contact Parker Meggitt for further information.

Total system (chain) 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
• 5 m	: 1.0 m integral cable + 4.0 m extension cable. 5.0 m integral cable with no extension cable.
• 10 m	: 1.0 m integral cable + 9.0 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 (chain) 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 5 m measurement chain	: 4.4 m minimum
TSL for a 10 m measurement chain	: 8.8 m minimum