

WELCOME TO WEBINAR

NEW TQ9xx
proximity measurement chain

Product introduction

TQ/EA/IQS9XX

New proximity measurement system



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Date: September 16th 2020

CONTEXT

TQ9-based proximity measurement system

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Context

Safety driven market

- API670 ed. 5th standard
- Safety (SIL) certification need from different markets
- Compliance with the latest environmental RoHS directive and EMC standard (CE)

Design

- New IQS9xx platform for a future low power solution with 4 to 20mA output
- Backward compatibility with our current proximity measurement system
- Obsolescence of several IQS450 components

Legacy

- Years of experience in harsh environments
- More than 100,000 proximity measurement systems sold globally

PRODUCT FEATURES

TQ/EA/IQS9xx proximity measurement system

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Key features

Standards and Certifications

- Fully compliant to API670 ed. 5th
- Multiple Ex certifications for many regions and countries
- Suitable for use in functional safety contexts with SIL 2 certification by design

New features

- Possibility to test the IQS transfer through the “TEST” pin
- Raw signal in voltage available through the “RAW” pin without disconnecting the device

Continuity

- Backward compatible with our TQ/EA/IQS 4XX proximity measurement system
- Configurable sensitivity and measuring range
- Current (2-wire) for long distance transmission or Voltage (3-wire) output

TECHNICAL IMPROVEMENTS

Environmental and certifications

Technical improvements

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Ex certifications

Ex ia and **ec** Ga (Gas) and **Da (Dust)**
vs. Ex ia and nA Ga (Gas)for the
TQ/EA/IQS4xx



Functional safety

Certification by TÜV

Safety Integrity Level (SIL) 2 in
accordance with IEC 61508
(Functional safety standard)

PL c Cat 1 in accordance with ISO 13849
(Safety of machinery standard)



RF emission /
susceptibility

Tested for EMC against **EN 61326-3-2**
by an accredited laboratory as per
IEC 61508 (SIL) regulations thanks to the
new grounding concept improving our
frame-voltage immunity



Operational
temperature

-40°C to 85°C for the IQS900
vs. -35°C to 85°C for the IQS450

System compatibility

Technical improvements

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Better output characteristics for an extended monitoring system compatibility



2-wire current transmission

- Output impedance: $> 60 \text{ k}\Omega$ for IQS900
vs. not defined for the IQS450
- Monitoring system impedance: $< 350 \text{ }\Omega$.

3-wire voltage transmission

- Output impedance: **$< 100 \text{ }\Omega$ (DC) / $< 300 \text{ }\Omega$ (20kHz)** for the IQS900
vs. $< 435 \text{ }\Omega$ (DC) / $< 800 \text{ }\Omega$ (20kHz) for the IQS450
 - ✓ **Voltage output signal transmission over longer distances**
vs. IQS450
- Monitoring system impedance: $> 50 \text{ k}\Omega$

Fully compliant to the API 670, 5th Edition

Technical improvements



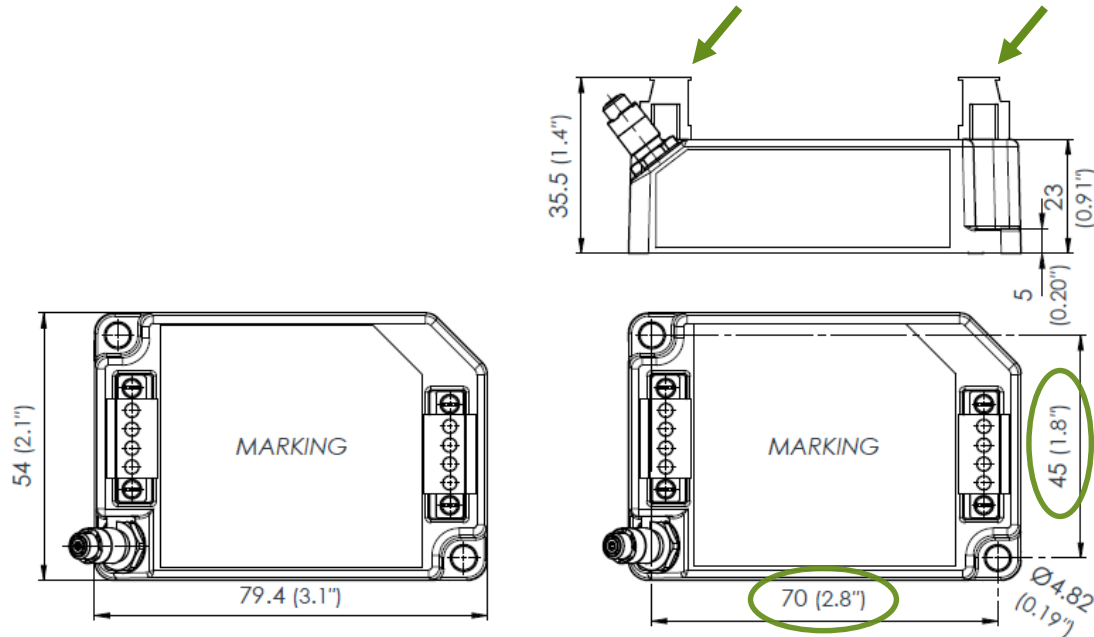
- TQ9xx with PPS blend injection-molded tip crimped to the housing
 - Differential pressure of 6 bars (100 psid) between probe tip and probe body without leakage vs. 1 bar for the TQ4xx
- TQ9xx integral cable securely attached
 - Withstand a pull test without damage of a minimum tensile load of 225N (50lb) vs. 200N (45lb) for the TQ4xx
- TQ/EA9xx self-locking miniature coaxial connectors and cable design
 - Withstand a pull test without damage of a minimum tensile load of 225N (50lb) vs. 100N (22.5lb) for the TQ/EA4xx

Installation

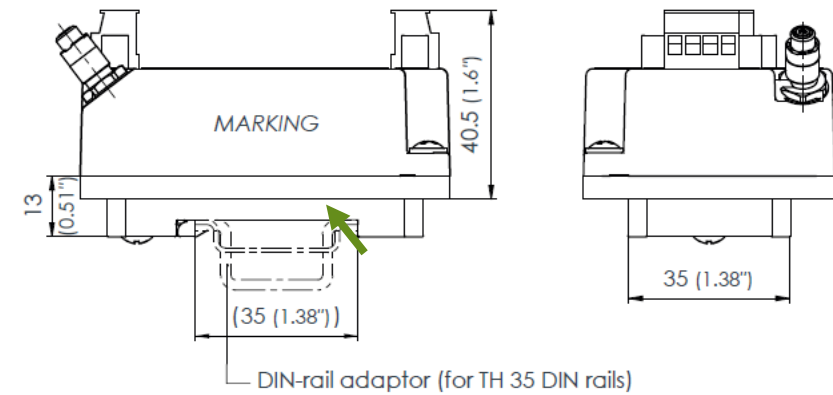
Technical improvements

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- Same footprint as IQS45x for easy replacement
- Removable connectors simplify wiring



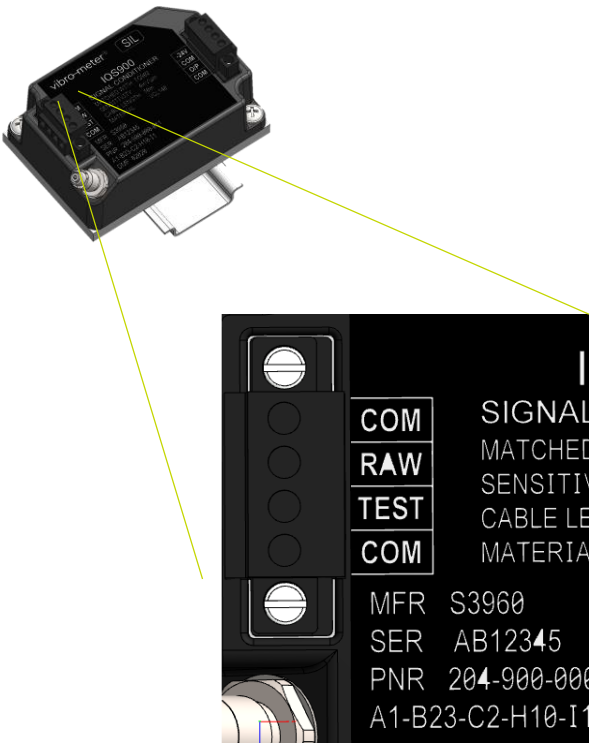
- New compact and robust DIN-rail adaptor



NEW FEATURES

IQS900 – RAW Pin

New features



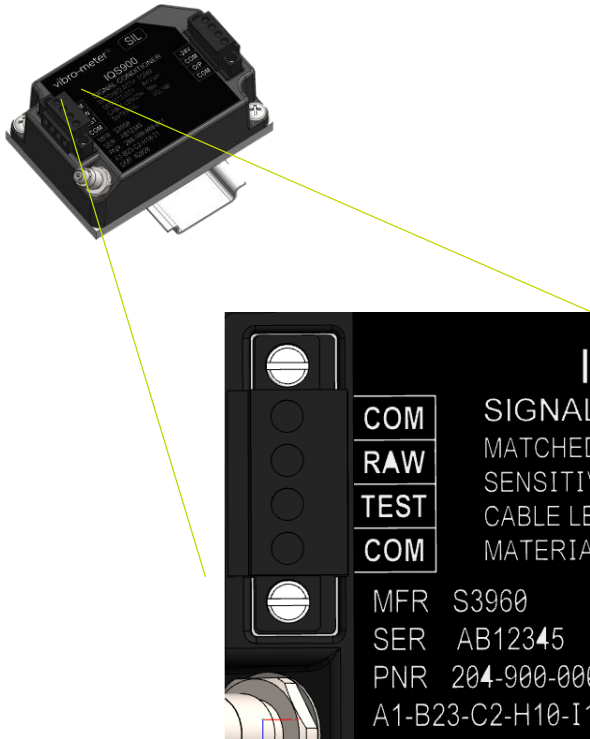
- The **RAW pin** allows operators to get a signal value from the IQS900 directly using a voltmeter without disrupting the measuring chain
- Raw outputs for each configuration:

TQ type	Range	IQS900 code (B)	Output sensitivity	Raw output sensitivity
4X1/9X1	2 mm	B11	8 mV/ μ m	4 mV/ μ m
	2 mm	B12	2.5 μ A/ μ m	4 mV/ μ m
4X2/9X2	2 mm	B21	8 mV/ μ m	4 mV/ μ m
	2 mm	B22	2.5 μ A/ μ m	4 mV/ μ m
	4 mm	B23	4 mV/ μ m	2 mV/ μ m
	4 mm	B24	1.25 μ A/ μ m	2 mV/ μ m
4X3/9X3	12 mm	B31	1.33 mV/ μ m	0.665 mV/ μ m
	12 mm	B32	0.417 μ A/ μ m	0.665 mV/ μ m

IQS900 – TEST Pin

New features

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- The **TEST pin** allows an operators to simulate an input signal and verify that the IQS transmits the correct value along the chain.
- Used for the Proof-Test (SIL-2 maintenance requirement)
- Checking full chain from IQS to MPS
- The test results can be read both on the **O/P pin** or the **RAW pin**
- The **test procedures** are listed in our Installation and Safety Manual



SIL 2 CERTIFICATION

Diagnostic concept

SIL 2 certification

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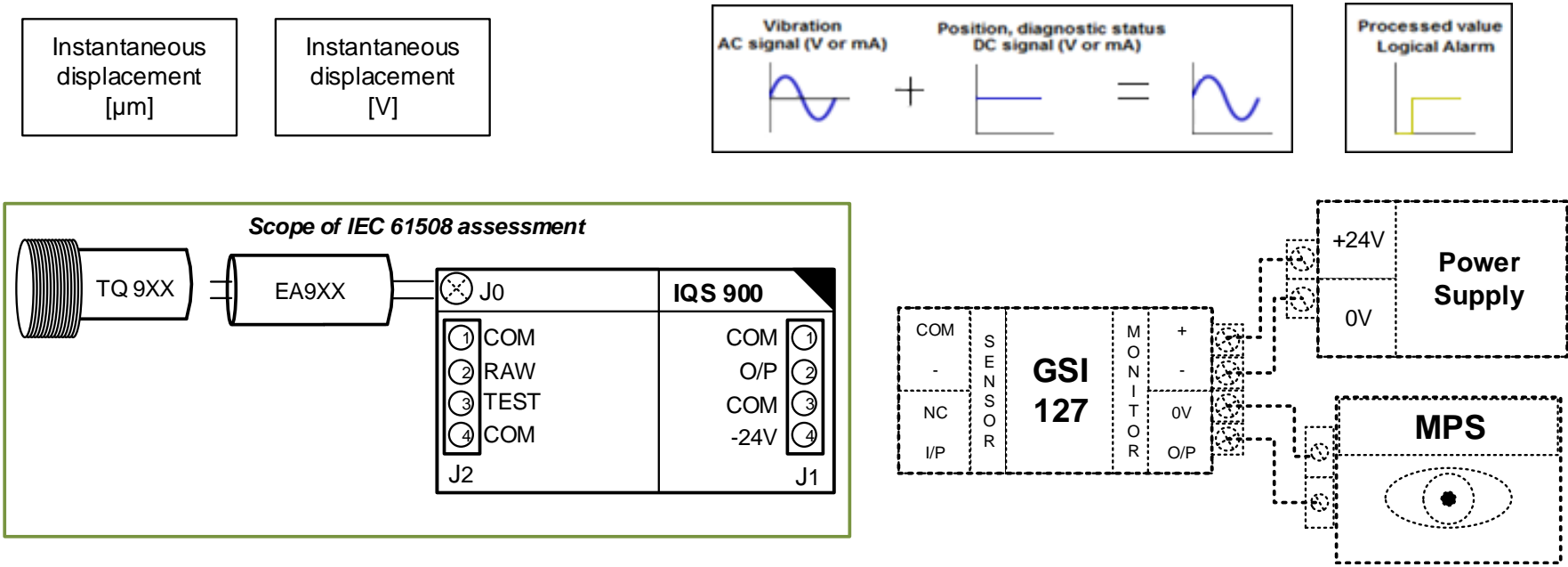


We have shown that the IQS is reliable enough to be inherently SIL-2

- This means that we have a SIL-2 level of confidence/reliability that a dangerous error would result in an output outside of the nominal range (see slide 17).
- **If configured “With diagnostics”**, the IQS900 will purposefully leave the monitoring range to signal an error if the input voltage is outside the specified range
 - -30V to -19V for voltage mode, -30V to -18V for current mode
 - This is done because for some error modes the IQS would not be able to leave its nominal output range if the input power is too low

Schematic

SIL 2 certification



- The IQS signal is composed of a DC signal (position) and an AC signal (vibration)
- If the output instantaneous value, leaves the operating limits, the MPS will need to raise the alarm

Diagnostic performance

SIL 2 certification



The diagnostic is able to detect the following failures:

- Open and short circuits in the sensor element (TQ)
- Open and short circuits in the sensor integral cable (TQ) or in extension cable (EA)
- Component defects
- Under and over voltage on the power supply

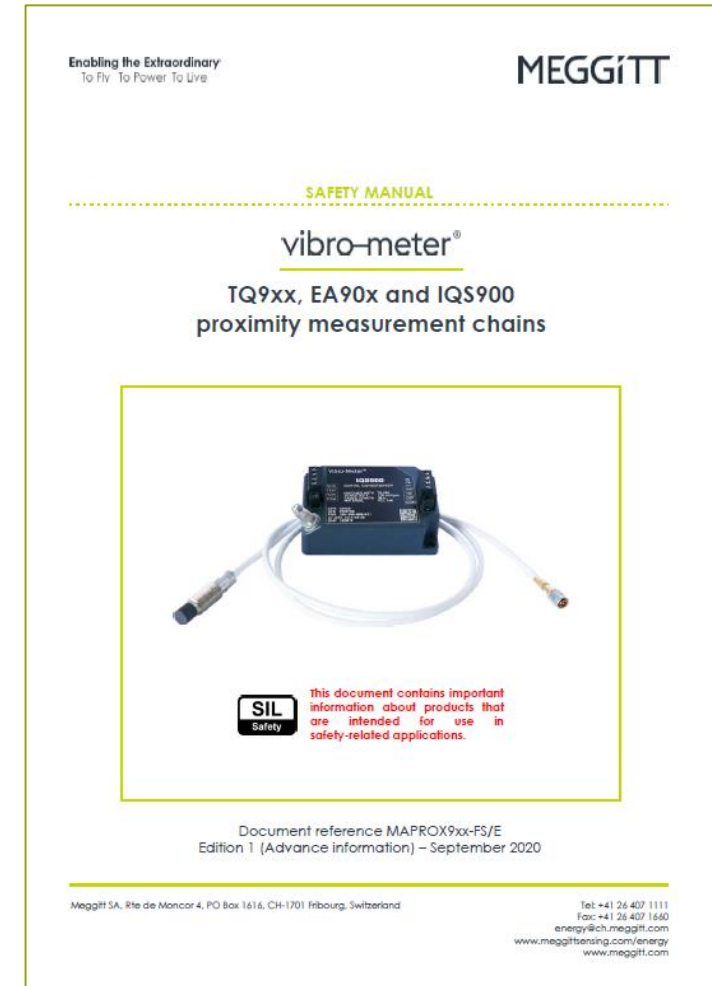
Diagnostic component (DC) value for an IQS900			Measurement chain OK?
Description	Current output (2-wire transmission)	Voltage output (3-wire transmission)	
Normal operation	-15.5mA to -20.5mA	-1.6V to -17.6V	Yes
Problem in the proximity chain ⁽¹⁾	< -20.5mA or > -15.5mA	<-17.6V or >-1.6V	No

Measurement chains in safety-related applications

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Safety manual and installation manuals

- Information in IQS900 signal conditioner safety manual
 - Introduction
 - System description
 - How to use the system for safety
 - Configuration
 - Installation and commissioning
 - Operation and maintenance
 - Safety issues
 - Service and support



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Measurement chains in safety-related applications

Safety properties extracted from IQS900 signal conditioner safety manual

Pending

PFD, PFH and SFF computation

T1 - years	1	2	3	5	10	Remark
T1 - hours	8'760	17'520	26'280	43'800	87'600	
PFDavg computed [1/h]	1.39E-03	1.43E-03	1.47E-03	1.56E-03	1.79E-03	$PFD_{avg} = (\lambda_{DU} + \lambda_{DD}) * t_{ce} = \lambda_D * t_{ce}$
PFDavg requirement for SIL2 [1/h]	1.00E-02					PFDavg for SIL2 ($\geq 1e-03$ to $< 1e-02$)
PFDavg computed versus PFDavg Requirement (Budget consumption)	13.9%	14.3%	14.7%	15.6%	17.9%	<20% SIL 2 budget

- Safe failure fraction (SFF): 81% (calculated) - Required: > 60%
- Process safety time (PST): < 25ms
- Allocation of SIL Budget: PFDavg <20% of the SIL2 budget for a PTI≤10 years (PTC of 25%)
- Safety accuracy: Sensitivity: ±10% (can depend on sensor attached)

HFT: Hardware fault tolerance

PTI: Proof test interval / PTC: Proof test coverage

PFDavg: Average probability of failure on demand

PFH: Probability of failure per hour (high demand system)

ORDERING INFORMATION

Simple ordering

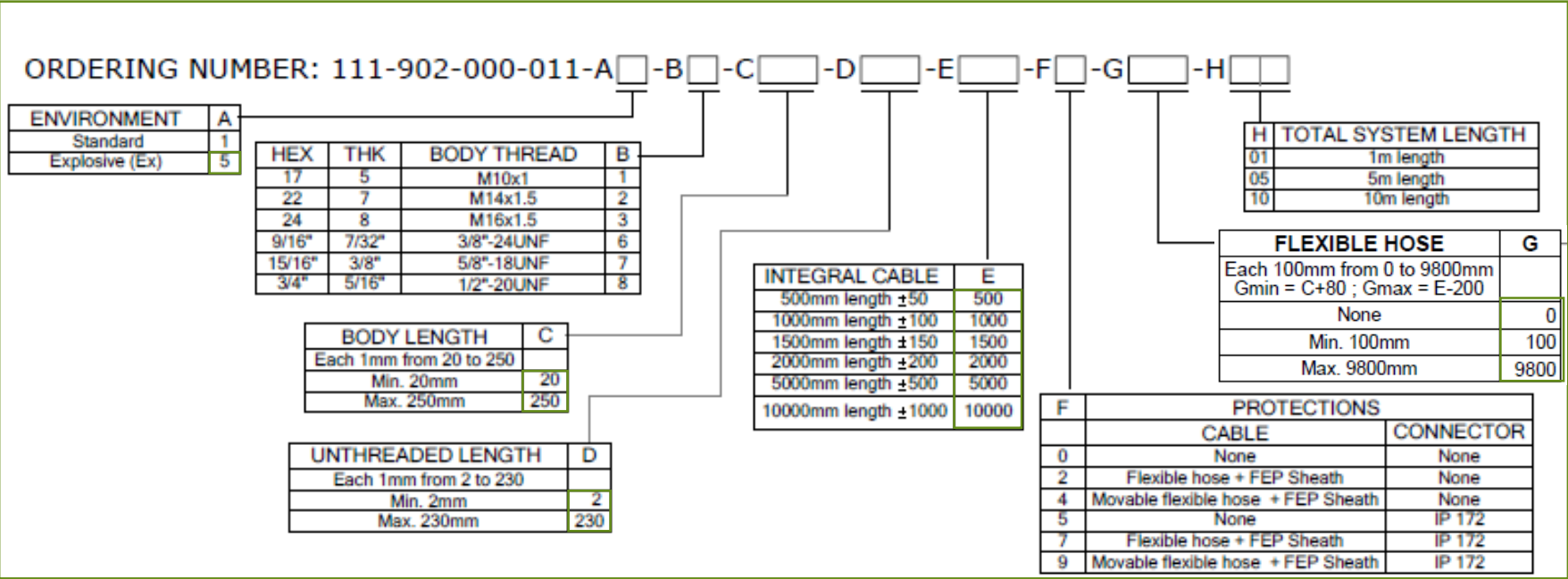
Ordering information

A unique coding **A5** for all Explosive Zones to replace previous A2 (Zones 0 and 1) and A3 (Zone 2)

- **Simplify sales** as it may be difficult to know in which Explosive zones the product will be installed
- **Simplify competitors replacement** that does not differentiates Ex Zones

Coding **C, D, E** and **G** (lengths) are now numerical and in mm

- In line with other Vibro-Meter® configurable products (eg. EC cables)
- **No risk of mistake** with previous coding
- Gives **statistics** and **forecasting** possibilities



Simple ordering

Ordering information

A unique F2 cable protection with FEP Sheath

- **Simplify sales** as it may be difficult to understand the customers needs for protection
- **Sealed** protection and **electrically insulated**
- Bigger volume and **better price**

Unthreaded length now from D2

- Minimum for D is now **2mm**

ORDERING NUMBER: 111-902-000-011-A -B -C -D -E -F -G -H

ENVIRONMENT	A
Standard	1
Explosive (Ex)	5

HEX	THK	BODY THREAD	B
17	5	M10x1	1
22	7	M14x1.5	2
24	8	M16x1.5	3
9/16"	7/32"	3/8"-24UNF	6
15/16"	3/8"	5/8"-18UNF	7
3/4"	5/16"	1/2"-20UNF	8

BODY LENGTH	C
Each 1mm from 20 to 250	
Min. 20mm	20
Max. 250mm	250

UNTHREADED LENGTH	D
Each 1mm from 2 to 230	
Min. 2mm	2
Max. 230mm	230

INTEGRAL CABLE	E
500mm length ±50	500
1000mm length ±100	1000
1500mm length ±150	1500
2000mm length ±200	2000
5000mm length ±500	5000
10000mm length ±1000	10000

H	TOTAL SYSTEM LENGTH
01	1m length
05	5m length
10	10m length

FLEXIBLE HOSE		G
Each 100mm from 0 to 9800mm Gmin = C+80 ; Gmax = E-200		
None		0
Min. 100mm		100
Max. 9800mm		9800

F	PROTECTIONS	
	CABLE	CONNECTOR
0	None	None
2	Flexible hose + FEP Sheath	None
4	Movable flexible hose + FEP Sheath	None
5	None	IP 172
7	Flexible hose + FEP Sheath	IP 172
9	Movable flexible hose + FEP Sheath	IP 172

Ordering information

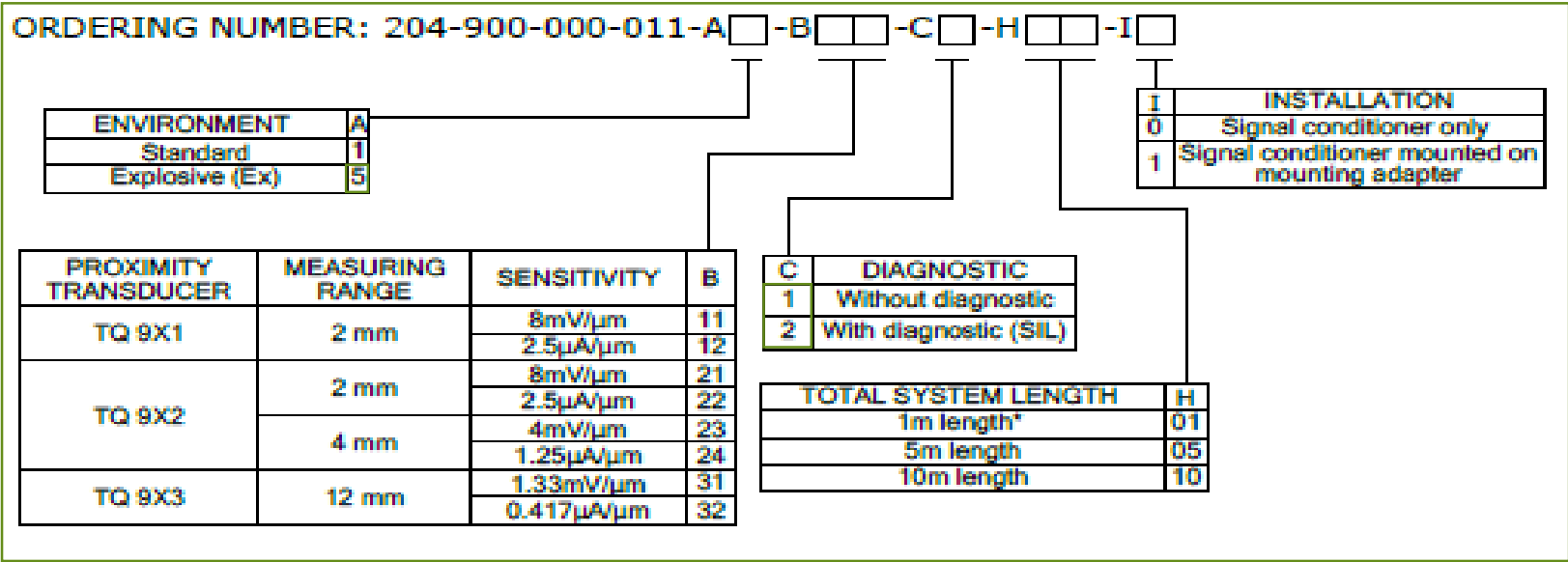
Ordering information

A unique coding **A5** for all Explosive Zones to replace previous A2 (Zones 0 and 1) and A3 (Zone 2)

- **Simplify sales** as it may be difficult to know in which Explosive zones the product will be installed
- **Simplify competitors replacement** that does not differentiates Ex Zones

New **C** coding for diagnostics (SIL2)

- For use in **safety-related** application



Conversion example: TQ402 vs. TQ902

Ordering information

TQ Coding	111-402-000-013	111-902-000-011	Comments
A: Environment	A2	A5	A unique coding for all Ex certifications
B: Body thread	B1	B1	--
C: Body length	C020	C20	Numerical value in mm
D: Unthreaded length	D005	D5	Numerical value in mm
E: Integral Cable	E050	E5000	Numerical value in mm
F: Protection	F1	F2	A unique cable protection
G: Flexible hose length	G030	G3000	Numerical value in mm
H: Total System length	H05	H05	--

Conversion example: IQS450 vs. IQS900

Ordering information

IQS Coding	204-450-000-002	204-900-000-011	Comments
A: Environment	A2	A5	A unique coding for all Ex certifications
B: Sensitivity	B11	B11	--
C: Diagnostic	N/A	C1	New diagnostic feature
H: Total System length	H05	H05	--
I: Installation	I0	I0	Also available as kit

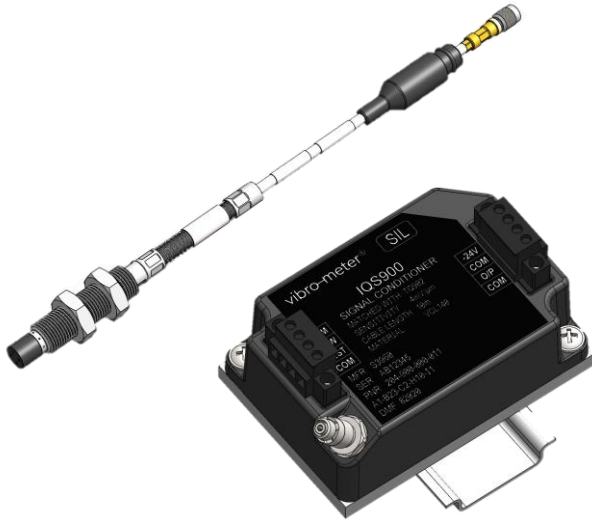
NEXT STEPS



Tool Kit

Want to learn more?

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Tool Kit :

- ✓ Today's presentation
- ✓ Today's webinar recording
- ✓ Product overview – advance information
- ✓ Datasheet – advance information
- ✓ Replacement letters for IQS45x and TQ4x2/EA402

Products availability form Q4 2020, subject to stock availability

<https://meggittsensing.com/energy/proximitychains/>

TQ9xx-based proximity chains

TQ9xx proximity sensors, EA90x extension cables and the IQS900 signal conditioner are the components of vibro-meter’s new state-of-the-art SIL 2-rated eddy-current proximity measurement chains.

TQ9xx-based proximity measurement chains allow contactless measurement of the relative displacement of moving machine elements. For example, the measurement of relative vibration and axial position for rotating machine shafts such as those found in steam, gas and hydraulic turbines, as well as in alternators, turbo compressors, and pumps.

Our expertise

In order to respond to an increasingly safety-driven market, we have been continuously improving our portfolio and developing new products to meet the highest safety standards like SIL and API 670.

☰ Specifications
📖 Design
🛡 Standards & Certifications
📋 Continuity

Related Articles



Key features

Diagnostic circuitry
Enhanced reliability and significant risk reduction.

SIL 2 by design
Suitable for use in functional safety contexts.

Legacy
More than 100,000 TQ-based systems sold globally over the last 30 years.

📄 Downloads



Save the date

WEBINAR II - Technical “how to” on SpeedSys300

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October 21th 2020

Webinar II

SpeedSys300 how to

- ✓ **Theme:** in depth technical knowledge, certifications, trouble shooting etc
- ✓ **Tool Kit:** Presentation, FAQ, manual.

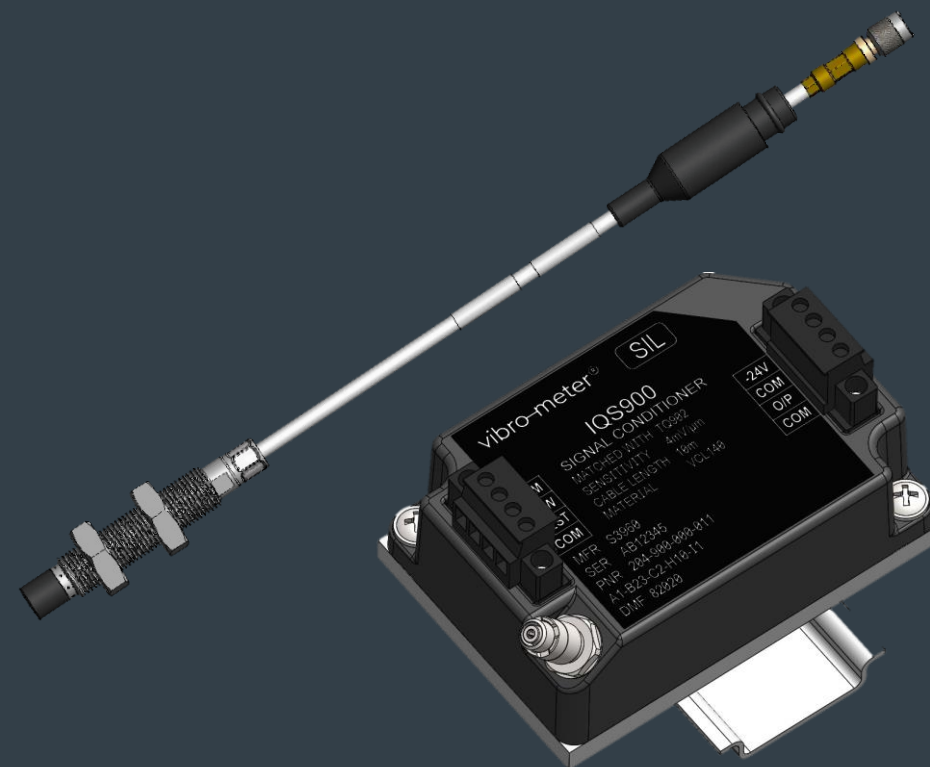


Q&A

How would you rate today's session?

Go to www.menti.com and use the code 49 99 57 1

THANK YOU!



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