Certificate – Сертификат – 證明書 – Certificat – 증명서 – شهادة

SIL

Functional Safety Certificate

No. 6G240905.Q&TCD53

Certificate's Holder: Q&T Instrument Co.,Ltd.
No.1, Wangbai Road, Huanglong Industrial Zone, Kaifeng, Henan province, China

Manufacturer: Q&T Instrument Co.,Ltd.
No.1, Wangbai Road, Huanglong Industrial Zone, Kaifeng, Henan province, China

Product: Thermal Mass Flow Meter

Model(s): QTMF-15~QTMF-4000

Standard: Has been assessed per the relevant requirements of:
IEC 61508:2010 Parts 1-7

And meets requirements providing a level of integrity to:
Systematic Capability: SC 3 (SIL 3 Capable)
Random Capability: Type B Element
SIL 2 @ HFT= 0; SIL 3@ HFT=1; Route 2_H
PFD_{AVG} and Architecture Constraints must be verified each application

* Safety Function:
The thermal mass flow meter measures gas flow based on the concept of convective heat transfer. The embedded fluid or plug-in probe of the instrument supports two sensors connected to the measured gas. For Sage instruments, the sensor is a resistance temperature detector (RTD) consisting of an extremely durable reference grade platinum winding wrapped in a protective 316 SS or Hastelloy C sheath. One of the sensors is heated by an integrated circuit and serves as a flow sensor, while the second detector serves as a reference sensor and determines the gas temperature. Sage proprietary circuits can maintain continuous overheating between flow sensors and reference sensors. When gas flows through a heated sensor, the flowing gas molecules take away heat from the sensor, resulting in cooling and energy loss of the sensor. The circuit balance is disrupted, causing a change in the temperature difference Δ T between the heating RTD and the reference sensor. Within one second, the circuit recovers the lost energy by heating the flow sensor to regulate the overheating temperature. The power required to maintain this overheating represents the mass flow signal.

* Is suitable to be safety function according to the description and the configuration defined in Annex I.

Verification Mark:

The Verification Mark can be affixed on the product. It is NOT permitted to alter the Verification Mark in any way

Remark: This SIL Verification of Compliance has been issued on a voluntary basis. ECM confirms that a Test Report is existent for the above listed product(s) and found to meet the requirements of above standards for application in safety related system up to Safety Level of **SIL 3**. The unit must be properly designed into a Safety Instrument Function as per the requirements in the Safety Manual. The Verification Mark shown above can be affixed on the product. It is NOT permitted to alter the Verification Mark in any way. In addition the Verification's Holder is NOT allowed to transfer the Verification to third parties. This certificate can be checked for validity at www.entecerma.it

Date of issue 05 September 2024

Expiry date 04 September 2029

For online check:

Approver
Ente Certificazione Macchine
Legal Representative
Luca Bedonni

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Annex I

No. 6G240905.Q&TCD53

1. The use of the product must obey the required rules to conservation of SIL3 properties. These rules are recalled in the §6 of the Assessment Report reference: [SIL Capability assessment report].

2. The product version of hardware components used for validation and type tests are the following:

Product:	Thermal Mass Flow Meter
Model(s):	QTMF-15~QTMF-4000

3. Acceptable environmental constraints for the system are recalled in the safety Manual. These elements must be checked for each integration operation of the product.

4. Hypothesis used for calculations are presented here under:
   - The mode of operation is Low demand, which means less than 1 trip demand each year;

Component architecture	SIL Capability	Demand frequency	PFD
1oo1 configuration	SIL2	Low	7.95E-04
1oo2 configuration	SIL3	Low	3.45E-05

5. IEC 61508 Failure Rates in FIT*

Failure Category	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF
Average	15.89	33.62	601.22	47.56	93.20%
Tests intervals=12months, MTTR=24h					

**FIT=1 failure/10^9 hours*

6. The Safety Integrated Level of the safety function using the product shall be calculated taking into account the characteristics of the whole system.

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