

SIL



Functional Safety Certificate

No. 1N211215.NATCO56

Certificate's Holder: Nanjing AIYI Technologies Co., Ltd.
Building 13, No. 1318 Qingshuiting East Road, Jiangning District,
Nanjing City 210000, Jiangsu Province, China.

Product: Gas Detection System

Model(s): AF, Anr series Gas Detector: AF110, AF111, GTQ-AF110, GTQ-AF111, GT-AF112-R, Anr, Anr-N, Anr-S, AF111-R, GTQ-Anr-A, GTQ-Anr-D, GTQ-GY30, GTQ-GY31;
AG series Gas Detector: AG200, AG210, AG211, AG310, AG311, AG313;
Control Panel: AGS1000, AGS1000B, AGS1000D, AGS1000F, AGS1600F, AGS2000F, AGS2600F, AGS3600F, JUDD, JUDD-S, AEGDS2000.

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 2 (SIL 2 Capable)
Random Capability: Type B Element
SIL 2 @ HFT= 0; Route 1_H
PFD_{avg} and Architecture Constraints must be verified for each application.

* Safety Function:
Gas detection and alarm function when the detected gas exceeds the standard within specified safety time.

* 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 2**.

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 15 December 2021

Expiry date 14 December 2026

Service Manager
Luca Bedonni



Deputy Manager
Amanda Payne



Ente Certificazione Macchine

Annex I

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1. The use of the product must obey the required rules to conservation of SIL2 properties, these rules are recalled in the §6 of the Assessment Report reference: [SIL Capability assessment report].
2. Acceptable environmental constraints for the system are recalled in the safety Manual (Ref: [SIL-SM-02]). These elements must be checked for each integration operation of the product.
3. IEC 61508 Failure Rates in FIT*.

Device	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF	DC	t_{CE}	PFD	SIL
AF110	2.99E-08	1.20E-06	1.54E-06	4.14E-08	98.53%	97.39%	1.29E+02	2.05E-04	2
AF111	3.05E-08	1.53E-06	2.03E-06	6.80E-08	98.14%	96.76%	1.43E+02	3.00E-04	2
GTQ-AF110	3.06E-08	1.60E-06	2.02E-06	4.30E-08	98.83%	97.91%	1.18E+02	2.42E-04	2
GTQ-AF111	3.00E-08	1.31E-06	1.61E-05	1.64E-06	91.40%	90.75%	2.75E+02	4.88E-03	2
GT-AF112-R	2.99E-08	1.82E-06	2.54E-06	5.21E-08	98.83%	97.99%	1.16E+02	3.01E-04	2
Anr	3.00E-08	1.28E-06	1.53E-06	1.65E-08	99.42%	98.94%	9.53E+01	1.48E-04	2
Anr-N	3.07E-08	1.68E-06	2.00E-06	1.81E-08	99.52%	99.11%	9.16E+01	1.85E-04	2
Anr-S	3.01E-08	1.39E-06	1.61E-05	1.62E-06	91.55%	90.87%	2.72E+02	4.82E-03	2
AF111-R	3.00E-08	1.89E-06	2.53E-06	2.71E-08	99.39%	98.94%	9.52E+02	2.43E-04	2
GTQ-Anr-A	2.94E-08	9.83E-07	1.56E-05	1.62E-06	91.15%	90.63%	2.77E+02	4.78E-03	2
GTQ-Anr-D	2.95E-08	1.09E-06	3.02E-05	3.22E-06	90.69%	90.38%	2.83E+02	9.46E-03	2
GTQ-GY30	2.94E-08	1.60E-06	1.66E-05	1.63E-06	91.82%	91.09%	2.67E+02	4.88E-03	2
GTQ-GY31	2.93E-08	1.49E-06	2.06E-06	2.55E-08	99.29%	98.78%	9.88E+01	2.06E-04	2

Device	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF	DC	t_{CE}	PFD	SIL
AG200	2.93E-08	2.11E-06	3.05E-06	3.61E-08	99.31%	98.83%	9.76E+01	3.02E-04	2
AG210	2.99E-08	1.34E-06	1.68E-06	5.25E-08	98.31%	96.96%	1.39E+02	2.39E-04	2
AG211	3.05E-08	1.67E-06	2.16E-06	7.91E-08	97.99%	96.47%	1.49E+02	3.34E-04	2
AG310	3.06E-08	1.75E-06	2.15E-06	5.41E-08	98.64%	97.54%	1.26E+02	2.77E-04	2
AG311	3.00E-08	1.45E-06	1.63E-05	1.65E-06	91.47%	90.76%	2.74E+02	4.91E-03	2
AG313	2.99E-08	1.96E-06	2.67E-06	6.31E-08	98.66%	97.69%	1.23E+02	3.35E-04	2

Device	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF	DC	t_{CE}	PFD	SIL
AGS1000	8.00E-08	1.21E-06	1.38E-06	2.66E-08	99.01%	98.11%	2.47E+01	3.48E-05	2
AGS1000B	8.06E-08	1.53E-06	1.87E-06	5.32E-08	98.49%	97.23%	3.44E+01	6.59E-05	2
AGS1000D	8.07E-08	1.61E-06	1.85E-06	2.83E-08	99.21%	98.50%	2.04E+01	3.85E-05	2
AGS1000F	8.00E-08	3.31E-06	3.63E-06	5.30E-08	99.25%	98.56%	1.98E+01	7.28E-05	2
AGS1600F	8.01E-08	1.28E-06	1.37E-06	1.71E-09	99.94%	99.88%	5.36E+00	7.36E-06	2
AGS2000F	8.08E-08	1.69E-06	1.84E-06	3.34E-09	99.91%	99.82%	5.98E+00	1.10E-05	2
AGS2600F	8.01E-08	3.38E-06	3.62E-06	2.81E-08	99.60%	99.23%	1.24E+01	4.54E-05	2
AGS3600F	7.93E-08	2.98E-06	3.15E-06	2.65E-08	99.58%	99.17%	1.31E+01	4.17E-05	2
JUDD	7.94E-08	9.89E-07	1.55E-05	1.60E-06	91.17%	90.62%	1.07E+02	1.82E-03	2
JUDD-S	7.96E-08	1.10E-06	3.01E-05	3.20E-06	90.70%	90.37%	1.09E+02	3.64E-03	2
AEGDS2000	8.02E-08	1.39E-06	1.60E-05	1.60E-06	91.57%	90.87%	1.04E+02	1.83E-03	2

*FIT=1 failure/10⁹ hours

Tests intervals = 6months, MTTR=72h