SIL Declaration of conformity

ABB Automation GmbH
60488 Frankfurt am Main
Germany

declares that the products

Continuous Gas Analyzers EasyLine EL3000 series Oxygen Analyzer Magnos28 (Models EL3020, EL3040) or EasyLine EL3060 Series Oxygen Analyzer Magnos28 (EL3060-Magnos28), without flow or pressure sensor,

comply with the requirements of the European Standards for Functional Safety :

EN 61508 (2010) part 2 [identical with IEC 61508 (2010)]

The catalog numbers are recorded in the analyzer data sheet:

Analyzer	System	Housing	Electronic Module	Module
EL3020-Magnos28* *IP20, twofold analog output*	24042-111011000000	24342-111011000001	24442-1100110000N1	24644-1110110500H1
EL3040-Magnos28* *IP65, twofold analog output*	24042-121031x00000	24342-121031x00001	24442-120031x000N1	24644-121031x500L1
EL3040-Magnos28* *IP65, twofold analog output*	24042-121231x00000	24342-121231x00001	24442-120231x000N1	24644-121231x500L1
EL3060-Magnos28* *IP65, fourfold analog output*	24042-151131x00000	24342-151131x20001	24442-150131x000X1	24644-151131x200X1

x random character
* without flow or pressure sensor

The assessment of hardware failure rates was carried out for single channel and redundant operation of Magnos28 by the company embeX (see compliance statement) as independent consultant confirming the correctness of this declaration. The conditions of safety related operation specified overleaf have to be obeyed by the user to achieve the claimed SIL compliance.

	Single channel use (one out of one)	Redundant use (one out of two)
Safety function	Oxygen measurement with 4–20 mA output The fault relay in normal energized mode is part of the safety function because several internal faults will be signaled by de-energizing the relay and not via current output.	
Measuring ranges - Standard	0–25 Vol.% / 0–100 Vol.% Oxygen	
Smallest measuring range	0–0,5 Vol.% Oxygen	
SIL capability hardware	2	3
Type of Device	B	
Proof test interval	1 year	
MTTR	24 h	
SFF	90,80 %	
HFT	0	1
β Factor	—	5 %
PFD_{avg}	$7{,}05 \times 10^{-4}$	$3{,}51 \times 10^{-5}$
PFH	$1{,}53 \times 10^{-7}$	$8{,}01 \times 10^{-9}$
λ_{du}	$1{,}53 \times 10^{-7}$ (per h)	
λ_{dd}	$1{,}28 \times 10^{-6}$ (per h)	
λ_{su}	$1{,}07 \times 10^{-7}$ (per h)	
λ_{sd}	$1{,}21 \times 10^{-7}$ (per h)	

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i.V. Dr. Carsten Rathke
IMS & OPEX Manager
IMS & OPEX Manager

i.V. Dr. Jürgen Kappler
Head of R&D
Leiter Entwicklung

Annex / *Anhang*

Annexes are part of this declaration. This declaration certifies conformance with the above mentioned Standards. Affirmation of attributes in a legal sense is not included. Security declarations given in the product documentation have to be considered.

Conditions for use

The values for the SIL-Capability of the analyzer and the determined failure rates are valid only if the following conditions for use are observed:

- Output signals of the analyzer of ≤ 2,5 mA (fail low) and ≥ 21,5 mA (fail high) have to be recognized by the control unit (e.g. PLC) as analyzer failure.
- De-energizing of the fault relay has to be recognized by the control unit (e.g. PLC) as analyzer failure.
- The analyzer has to be maintained regularly following the manufacturer's instructions and to be calibrated using a certified calibration gas mixture.
- The Safety Reference Manual/Instructions has to be followed.

Annual Proof Test

Minimum once per year a proof test has to be carried out for the overall safety function. For the analyzer the proof test is a regular calibration /adjustment, the manual testing of the relays and the checking of all parameters and the calibration data. The proof test is described in detail in the Safety Reference Manual/Instructions.