



Certificate / Certificat Zertifikat / 合格証

RK 2103038 C004

exida hereby confirms that the:

Gas Detectors with Signal Converters Model SD-3 Series (RI/NC/EC(CO, H2S))

RIKEN KEIKI Co., Ltd.

Itabashi-ku, Tokyo - Japan

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; SIL3 @ HFT = 1; Route 1_H

**PFH/PFD_{avg} and Architecture Constraints
must be verified for each application**

Safety Function:

The Model SD-3 Series is a fixed type explosion-proof gas detectors that continuously monitor for combustible gases, toxic gases, and oxygen in the surrounding atmosphere. when the gas concentration is over the set value. The Model SD-3 Series detect gas leaks and activate an alarm when preset concentrations are exceeded. The Model SD-3 Series detect gas concentrations and convert 4-20 mA output with HART signal. The Model SD-3 Series has two types, direct sensor mount type and remote sensor type.

Application Restrictions:

The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements.

The manufacturer
may use the mark:



Revision 2.1 December 3, 2021
Surveillance Audit Due
August 31, 2024



Kiyoshi Takai
Evaluating Assessor

[Signature]
Certifying Assessor

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Random Capability: Type B Element

SIL 2 @ HFT=0; SIL 3 @ HFT = 1; Route 1_H

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Gas Detectors with
Signal Converters
Model SD- 3 Series
(RI/NC/EC(CO, H2S))

Systematic Capability:

The product has met manufacturer design process requirements of Safety Integrity Level (SIL) 3. These are intended to achieve sufficient integrity against systematic errors of design by the manufacturer.

A Safety Instrumented Function (SIF) designed with this product must not be used at a SIL level higher than stated.

Random Capability:

The SIL limit imposed by the Architectural Constraints must be met for each element. This element meets *exida* criteria for Route 2_H.

IEC 61508 Failure Rates in FIT*

Device/Configuration		λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF
SD-3RI	Direct Sensor Mount type	-	32	1,098	88	92.8%
	Remote Sensor type	-	36	1,528	106	93.7%
SD-3NC	Direct Sensor Mount type	-	256	6,667	329	95.5%
	Remote Sensor type	-	262	7,033	346	95.5%
SD-3EC (CO, H2S)	Direct Sensor Mount type	-	1517	2,391	244	94.1%
	Remote Sensor type	-	1522	2,849	262	94.3%

* FIT = 1 failure / 10⁹ hours

SIL Verification:

The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of PFH/PFD_{avg} considering redundant architectures, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failure rates of all products included in the SIF. Each element must be checked to assure compliance with minimum hardware fault tolerance (HFT) requirements.

The following documents are a mandatory part of certification:

Assessment Report: RK 21-03-038 R005 V2 R1 Assessment SD-3 (RI/NC/EC(CO, H2S)) (or later)

Safety Manual: PT2E-306 Rev.2 (or later)



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