



The manufacturer  
may use the mark:



Revision 2.5 August 4, 2021  
Surveillance Audit Due  
August 31, 2024



# Certificate / Certificat Zertifikat / 合格証

RK 1310015 C001

*exida* hereby confirms that the:

**SD-1RI Infrared Gas Detector,  
SD-1EC Electrochemical method Gas Detector,  
SD-1OX Galvanic cell method Gas Detector**  
**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; SIL 3 @ HFT = 1; Route 1<sub>H</sub>  
PFH/PFD<sub>avg</sub> and Architecture Constraints  
must be verified for each application**

### Safety Function:

The SD-1RI/EC/OX are a three-wire / four wire, 4-20 mA smart device which detects combustible gas hazards. It contains self-diagnostics and is programmed to send its output to a specified failure state upon internal detection of a failure.

### Application Restrictions:

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



*Kiyoshi Takai*  
Evaluating Assessor

*[Signature]*  
Certifying Assessor

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**SD-1RI  
Infrared Gas Detector,**

**SD-1EC  
Electrochemical  
method Gas Detector,**

**SD-1OX  
Galvanic cell method  
Gas Detector**

## **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<sub>H</sub>.

## **IEC 61508 Failure Rates in FIT\***

Device	$\lambda_{SD}$	$\lambda_{SU}$	$\lambda_{DD}$	$\lambda_{DU}$	SFF
SD-1RI	0	119	785	41	96.7%
SD-1EC	0	112	3127	121	96.4%
SD-1OX	0	170	3013	191	94.3%

\* FIT = 1 failure / 10<sup>9</sup> hours

## **SIL Verification:**

The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of PFH/PFD<sub>avg</sub> 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:** : SD-1RI: RK 13-10-015 R001 V3 R1 (or later )

SD-1EC: RK 15-06-015 R003 V3 R1 (or later )

SD-1OX: RK 15-06-015 R004 V2 R3 (or later )

**Safety Manual:** : SD-1RI : No. PT2E-218 Rev.16 (or later )

SD-1EC: No. PT2E-238 Rev.10 (or later )

SD-1OX: No. PT2E-239 Rev. 9 (or later )



80 N Main St  
Sellersville, PA 18960

T-110, V5R1