Certificate / Certificat

Zertifikat / 合格証

YEC 1501126 C001

exida hereby confirms that the:

TDLS 8000 Tunable Diode Laser Spectrometer

Yokogawa Electric Corporation
Musashino-shi, 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_H
PFD_{AVG} and Architecture Constraints must be verified for each application

Safety Function:
The TDLS Tunable Diode Laser Spectrometer will measure selected target gasses in gas phase samples directly and output a 4-20 mA signal within the stated safety accuracy.

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

Kiyoshi Takai
Evaluating Assessor

John C Gozallinas
Certifying Assessor

The manufacturer may use the mark:

Revision 1.3 April 28, 2017
Surveillance Audit Due
May 1 , 2018

ANSI Accredited Program
ISO/IEC 17065
PRODUCT CERTIFICATION BODY
#1004

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Random Capability: Type B Element
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Yokogawa TDSL 8000 Tunable Diode Laser Spectrometer

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.

IEC 61508 Failure Rates in FIT*

Device	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF[1]
TDLS 8000 using 1 AI	-	680	21363	668	97.1%
TDLS 8000 using 2 AI	-	707	21432	696	97.0%

* FIT = 1 failure / 10^9 hours

SIL Verification:

The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of 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: YEC 15-01-126 R001 V1R2

Safety Manual: IM11Y01D01JA and IM11Y01D01EN 1st ed. and above

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Sellersville, PA 18960