



The manufacturer
may use the mark:



Revision 1.6 September 26, 2018
Surveillance Audit Due
September 1, 2021



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

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 outputs 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. Yozallinas
Certifying Assessor

Certificate / Certificat / Zertifikat / 合格証

YEC 1501126 C001

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Yokogawa TDLS 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*

	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}	SFF
One Input/One Output	-	681	21363	668	97.1%
Two Inputs/One Output	-	708	21432	697	97.0%
One Input/Two Outputs	-	689	21415	677	97.0%
Two Inputs/Two Outputs	-	716	21482	705	96.9%

* 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 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 V2R3

Safety Manual: IM11Y01D01JA 1st ed.

IM11Y01D01EN 1st ed. and above



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T-002, V3R8