

## Random Hardware Reliability and Systematic Assessment Certificate

### **Functional Safety of Safety-Related Programmable Electronic Systems**

**Manufacturer:** Tyco Fire & Security GmbH (TFSG), Victor Von Bruns-Strasse 21 ,8212 Neuhausen am Rheinfall, Schaffhausen, Switzerland

The **TFSG, FV400 Flame Detector range** has been assessed and the variants listed below are considered capable for use in a low demand Safety Function up to (and including) SIL 2, with regards to random hardware failures, architectural constraints and systematic capability.

The assessment was based on the assumptions, data provided, and recommendations given in:

- **Failure Mode, Effects, and Diagnostics Analysis for the FV400 Range of Flame Detectors Reports: FMEDA: FMEDA 516\_300\_411+412+413 Iss3 17Oct22.docx;**
- **Failure Mode, Effects, and Diagnostics Analysis for the FV400 Range of Flame Detectors Analysis Spreadsheet: FMEDA 516\_300\_411+2+3 Iss2 02Aug18.xlsm;**
- **Engineering Safety Consultants Ltd Report: IEC 61508 Functional Safety Assessment Part 1 Functional Safety Management: D053\_SM001 rev.6;**
- **Engineering Safety Consultants Ltd Report: IEC 61508 Functional Safety Assessment Part 3 Software Development: D053\_SM002 rev.7;**
- **Engineering Safety Consultants Ltd Report: IEC 61508 Functional Safety Assessment Part 2 Hardware and System Development: D053\_SM003 rev.6;**
- **Renewal letter from TFSG, signed by T.A. James, Special Hazards Team Leader, dated: 17/10/2022.**

The assessment was carried out against failure modes where the detector was unable to detect and signal alarms to the control function. The following models were assessed based on the different output signal presented in attachment 1:

Product	Stock-code Number	Description
<b>FV411f</b>	516.300.411	No camera
<b>FV412f</b>	516.300.412	PAL camera
<b>FV413f</b>	516.300.413	NTSC camera

The assessment was carried out to determine compliance with IEC 61508 (2010 Edition) with regards to:

- SIL 2 with a HFT = 0 via Route 1H;
- Architectural Constraints (Low demand, Type B, SFF 90 - 99%);
- Systematic against IEC 61508 (2010 edition) parts 1,2 and 3;
- See Attachment 1 for data for each device and output mode.

**IMPORTANT:** It should be noted that this assessment does not include confirmation of the response time of the device. For response times (along with any relevant assumptions) reference should be made to the Safety Manual of each device and the total SIF response time **MUST** be compared against the process safety time for the specific application.



# ENGINEERING SAFETY CONSULTANTS

*The Global Provider of Functional Safety Expertise and Technical Consultancy*

## Attachment 1 for Certificate D053\_CT001 rev. 6

The following models are covered by this certificate:	Interface	$\lambda_{DUP}$ Dangerous Undetected Failures (detected by proof test)	$\lambda_{DUN}$ Dangerous Undetected Failures (never detected)	$\lambda_{DD}$ Dangerous Detected Failures	$\lambda_S$ Safe Failures	Safe Failure Fraction
FV411	Relay	1.0E-07/hr	2.3E-08/hr	1.8E-06/hr	1.2E-06/hr	96%
FV411	4-20mA	7.5E-08/hr	2.4E-08/hr	1.9E-06/hr	8.7E-07/hr	97%
FV411	Conventional	9.3E-08/hr	2.3E-08/hr	1.8E-06/hr	9.3E-07/hr	96%
FV412, FV413	Relay	1.0E-07/hr	2.3E-08/hr	1.8E-06/hr	1.2E-06/hr	96%
FV412, FV413	4-20mA	7.5E-08/hr	2.4E-08/hr	1.9E-06/hr	8.9E-07/hr	97%
FV412, FV413	Conventional	9.3E-08/hr	2.3E-08/hr	1.8E-06/hr	9.5E-07/hr	96%

Note: The PFD or PFH of a complete SIF (inclusive of sensor, logic solver and final element subsystems) must be determined, considering any redundancy, Proof Test Interval (PTI), Proof Test Coverage (PTC), Mission Time and Mean Time To Restoration (MTTR) for all elements. Each subsystem should be verified to ensure compliance with the minimum HFT requirements.

Managing Director: Simon Burwood  
 Original Assessment Date: October 2014  
 Renewal Date: October 2022, valid to October 2024  
 Certificate: D053\_CT001 rev. 6

Page 2 of 2

### ENGINEERING SAFETY CONSULTANTS LTD

2nd Floor, Exchequer Court, 33 St. Mary Axe,  
 London, EC3A 8AA UK

Telephone/Fax: +44 (0)20 8542 2807

E-Mail: [info@esc.uk.net](mailto:info@esc.uk.net) Web: [www.esc.uk.net](http://www.esc.uk.net)

Registered in England and Wales: 7006868

Registered Office: 33 St. Mary Axe, London EC3A 8AA