ENGINEERING SAFETY CONSULTANTS

The Global Provider of Functional Safety Expertise and Technical Consultancy

Certificate of Conformity to IEC 61508 Safety Integrity Level (SIL) 2

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 SIL 2 low demand Safety Function with regards to systematic, random failure rates and architectural constraints.

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+2+3 Iss2 02Aug18.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;**
- **ESC ltd report IEC 61508 Functional Safety Assessment Part 1 Functional Safety Management: D053_SM001 rev.5;**
- **ESC Ltd report: IEC 61508 Functional Safety Assessment Part 3 Software Development: D053_SM002 rev.6;**
- **ESC Ltd report: IEC 61508 Functional Safety Assessment Part 2 Hardware and System Development: D053_SM003 rev.5;**
- **Renewal letter from TFSG, signed by T.A. James, Special Hazards Team Leader, dated: 19/10/2020.**

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
FV411f	516.300.411	No camera
FV412f	516.300.412	PAL camera
FV413f	516.300.413	NTSC camera

The assessment was carried out to determine compliance with IEC 61508 with regards to:

- Random Hardware Failures (Predicted PFD <3E-03) based on a proof test carried out at least once a year;
- 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.

Chairman: Kenneth G L Simpson
Member of the IEC 61508 committee
Original Assessment Date: October 2014
Renewal Date: October 2020, valid to October 2022
Certificate: D053_CT001 rev. 5

ENGINEERING SAFETY CONSULTANTS LTD is ISO9001-certified by Global Group, itself a UKAS-accredited ISO9001 certification body

Reg: 12Q12086

ENGINEERING SAFETY CONSULTANTS LTD
Tuition House
27-37 St George's Road Wimbledon London SW19 4EU UK
Telephone/Fax: +44 (0)20 8542 2807
E-Mail: info@esc.uk.net Web: www.esc.uk.net
Registered in England and Wales: 7006868
Registered Office: 27-37 St George's Road Wimbledon London SW19 4EU

Attachment 1 for Certificate D053_CT001 rev. 5

The following models are covered by this certificate:	Interface	λ_{DUP} Dangerous Undetected Failures (detected by proof test)	λ_{DUN} Dangerous Undetected Failures (never detected)	λ_{DD} Dangerous Detected Failures	λ_S Safe Failures	Safe Failure Fraction	PFD_{avg}
FV411	Relay	1.0E-07/hr	2.3E-08/hr	1.8E-06/hr	1.2E-06/hr	96%	2.0E-03
FV411	4-20mA	7.5E-08/hr	2.4E-08/hr	1.9E-06/hr	8.7E-07/hr	97%	2.0E-03
FV411	Conventional	9.3E-08/hr	2.3E-08/hr	1.8E-06/hr	9.3E-07/hr	96%	2.0E-03
FV412, FV413	Relay	1.0E-07/hr	2.3E-08/hr	1.8E-06/hr	1.2E-06/hr	96%	2.0E-03
FV412, FV413	4-20mA	7.5E-08/hr	2.4E-08/hr	1.9E-06/hr	8.9E-07/hr	97%	2.0E-03
FV412, FV413	Conventional	9.3E-08/hr	2.3E-08/hr	1.8E-06/hr	9.5E-07/hr	96%	2.0E-03

ENGINEERING SAFETY CONSULTANTS LTD
Tuition House
27-37 St George's Road Wimbledon London SW19 4EU UK
Telephone/Fax: +44 (0)20 8542 2807
E-Mail: info@esc.uk.net Web: www.esc.uk.net
Registered in England and Wales: 7006868
Registered Office: 27-37 St George's Road Wimbledon London SW19 4EU