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IEC 61508 Functional Safety Capability Statement

Tyco Fire & Security GmbH (TFSG), FV400 Flame Detector

Manufacturer:	Tyco Fire & Security GmbH (TFSG) Victor Von Bruns-Strasse 21, 8212 Neuhausen am Rheinfall, Schaffhausen, Switzerland
Product:	Flame Detector
Model:	FV411f: 516.300.411 (No Camera), FV412f: 516.300.412 (PAL Camera), FV413f: 516.300.413 (NTSC Camera)

Application:	Low Demand Mode Safety Instrumented Function
Safety Function:	Upon detection of fire, action is initiated (Logic solver and final element subsystems not part of this analysis)
Applied standard:	IEC 61508 Ed2 2010 Parts 1-3 & IEC 61511 Ed1
Systematic Capability:	Suitable up to SIL 2
Applicable report:	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 Environmental Resources Management Ltd Report: IEC 61508 Functional Safety Assessment Part 1 Functional Safety Management: D053_SM001 rev.7 Environmental Resources Management Ltd Report: IEC 61508 Functional Safety Assessment Part 3 Software Development: D053_SM002 rev.8 Environmental Resources Management Ltd Report: IEC 61508 Functional Safety Assessment Part 2 Hardware and System Development: D053_SM003 rev.7

Assessment Route:	1_H
Hardware Fault Tolerance:	0
Type:	B
Application restrictions:	None

Model No.	λDU (By Proof Test) (/hr)	λDU (Never Detected) (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL SC
FV411 – Relay Interface	1.0E-07	2.3E-08	1.8E-06	1.2E-06	96%	SIL 2	SC 2

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Model No.	λDU (By Proof Test) (/hr)	λDU (Never Detected) (/hr)	λDD (/hr)	λS (/hr)	SFF	SIL AC (HFT = 0)	SIL SC
FV411 – 4-20mA Interface	7.5E-08	2.4E-08	1.9E-06	8.7E-07	97%	SIL 2	SC 2
FV411 – Conventional Interface	9.3E-08	2.3E-08	1.8E-06	9.3E-07	96%	SIL 2	SC 2
FV412/413 – Relay Interface	1.0E-07	2.3E-08	1.8E-06	1.2E-06	96%	SIL 2	SC 2
FV412/413 – 4-20mA Interface	7.5E-08	2.4E-08	1.9E-06	8.9E-07	97%	SIL 2	SC 2
FV412/413 – Conventional Interface	9.3E-08	2.3E-08	1.8E-06	9.5E-07	96%	SIL 2	SC 2

SIL AC (Architectural Constraints): Represents the maximum allowable SIL of each hardware element, assuming Hardware Fault Tolerance (HFT) = 0.

SIL SC (Systematic Capability): A measure of confidence (expressed on a scale of SC 1 to SC 4) of the confidence that the systematic safety integrity of a device meets the requirements of the specified SIL.

It should be noted that for a device to claim compliance with a specified SIL, the SIL AC and SC of the device needs to both be met. In addition to this, the required Average Probability of Failure on Demand (PFDavg) value for the complete Safety Instrumented Function (SIF) needs to adhere to the SIL PFDavg ranges.

IMPORTANT: It should be noted that this assessment considers only the Tyco Fire & Security GmbH (TFSG), FV400 Flame Detector. It does not cover opening and closing time requirements and a random hardware failures assessment must be conducted for the entire safety function for each application as per the appropriate Safety Requirements Specification.

The Tyco Fire & Security GmbH (TFSG), FV400 Flame Detector has been assessed and is considered capable for use in a low demand mode safety function up to (and including) SIL 2 with regards to random hardware failures, architectural constraints and systematic capability.

Note 1: The SIL of a complete SIF (sensor, logic solver and final element subsystems) must be verified to calculate the required Probability of Failure on Demand (PFD) / Probability of Failure per Hour (PFH), considering any redundancy, Proof Test Interval (PTI), Proof Test Coverage (PTC), Mission Time and Mean Time To Restoration (MTTR) for all elements included in the SIF. Each subsystem should be verified to ensure compliance with the minimum HFT requirements.

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Chantal Sealey FS Eng (TÜV Rheinland) Assessor chantal.sealey@erm.com	Simon Burwood FS Expert (TÜV Rheinland) Assessment Authority simon.burwood@erm.com

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