Functional Safety of Safety Related Systems and Components

FM Approval addresses functional safety with a concern for both the finished product and the process for its development. Approval is based on the international standard IEC 61508 for electric/electronic/programmable electronic (E/E/PE) safety related systems, and the American standard ANSI/ISA S84.01 for functional safety in the process industries.

The standards apply to safety related systems. FM Approvals evaluates components against the requirements of the standards, and approves the components as "fit for use" in particular applications, at given safety integrity levels.

This equipment is used in industries
1) to facilitate the monitoring of temperature, pressure, speed, and other process variables,
2) to compare process variables and derived quantities (singly and in combination) against various limits, and
3) to control valves and actuate other final elements in order to implement safety functions.

To enhance safety, an application may incorporate smart sensors and smart final elements. These are able to monitor and diagnose their internal operations and status, and to provide reports to the PES.

The following definitions may be referred to in the listings:

PES, programmable electronic system - a system that consists of programmable logic controller (PLC) or a logic solver, with input and output modules.

PLC, programmable logic controller - hardware and software that the user or manufacturer can program to exercise control.

SIL, safety integrity level - a measure of the probability that the safety related system will fail dangerous. The value of SIL ranges from 1 (the lowest) to 4 (the highest). The table below is adapted from IEC 61508-1:7.6.2.9:

Safety integrity level	*Low demand mode of operation (Average probability of failure to perform its design function on demand)*	*High demand or continuous mode of operation (Probability of a dangerous failure per hour)*
4	≥10-5 to <10-4	≥10-9 to <10-8
3	≥10-4 to <10-3	≥10-8 to <10-7
2	≥10-3 to <10-2	≥10-7 to <10-6
1	≥10-2 to <10-1	≥10-6 to <10-5

MooN , de-energize to trip, is a safety system of N components that will function (de-energize) if, and only if, at least M of the components can function. Examples are 1oo2, 1oo3, 2oo3, etc.

MooND , de-energize to trip, is a safety system of N components with diagnostics that will remove components that fail the diagnostics and will thereby reduce the value of N. At any time, the safety system will function (de-energize), if and only if, at least M of the current N components can function. If N is reduced below M, then the safety system will de-energize. An example is 1oo2D.

Sensing Elements

U2-101xS

U2-101xS series Flame Scanners Models U2-1010S, U2-1010S-PF, U2-1012S, U2-1012S-PF, U2-1016S, U2-1016S-PF, U2-1018S, U2-1018S-PF

“Fit for Use” in a SIL3 Application

Model	SFF	PFD	SIL	λ_S	λ_{DD}	λ_{DU}

U2-1010S U2-1010S-PF	99.96%	$1.20X10^{-4}$	3	$1.23X10^{-5}$	$3.34X10^{-7}$	$5.38X10^{-9}$
U2-1012S U2-1012S-PF	99.68%	$1.16X10^{-4}$	3	$1.64X10^{-6}$	$1.77X10^{-9}$	$5.32X10^{-9}$
U2-1016S U2-1016S-PF	99.95%	$1.15X10^{-4}$	3	$1.06X10^{-5}$	$1.74X10^{-9}$	$5.27X10^{-9}$
U2-1018S U2-1018S-PF	99.95%	$1.16X10^{-4}$	3	$1.16X10^{-5}$	$1.77X10^{-9}$	$5.32X10^{-9}$

Special Conditions of Use:
1. 1oo1 Low Demand Configuration
2. Proof test interval equals 5 years.
3. Repair time equals 8 hours.

Company Name:	Maxon - A Honeywell Company
Company Address:	201 E 18th St, Box 2068, Muncie, Indiana 47302, USA
Company Website:	http://www.maxoncorp.com
New/Updated Product Listing:	No
Listing Country:	United States of America
Certification Type:	FM Approved
Certificate Number:	