



Functional safety in accordance with DIN EN 61508 (VDE 0803) as regards fire detection and fire alarm systems

Leaflet on Fire Protection

The standards of series DIN EN 61508 specify safety requirements for electrical, electronic and programmable electronic systems (E/E/PE) with 4 so-called Safety Integrity Levels (SIL). The standard specifies the activities during the entire safety lifecycle, i.e. from concept via planning and realisation to decommissioning of the system, for systems comprising electrical/electronic and/or programmable electronic (E/E/PE) elements – systems used to ensure functional safety.

The standard was developed for assessing E/E/PE systems in safety-relevant applications and as instructions for the development of standards, where no application-specific international standards exist for the respective systems (see Scope of DIN EN 61508). However, for fire detection and fire alarm systems national or European standards exist, some of them are even harmonised.

Requirements for components of fire detection and fire alarm systems and for alerting persons in the event of a fire are covered by component and

system standards. These standards also belong to Guideline 89/106/EEC – Construction Products Directive – of the European Union, i.e. the European Commission has commissioned the European Committee for Standardisation CEN and associated members by mandate M/109 to develop and apply standards for the above components. Examples are the standards of series DIN EN 54 containing requirements for certain performance characteristics, but also comprehensive test procedures for verifying the reliable functioning of the respective components. Additionally, factory production controls shall be carried out by the manufacturer and monitored and assessed continuously/periodically by an independent body. All of this grants the operational availability. Practical experience gained with fire detection and fire alarm systems is proof of this. The same applies to other fire protection systems.

Table 1 illustrates the differences between the special requirements for FDAS and the general approach of DIN EN 61508:

Special requirements for FDAS: EN54-xx + DIN 14675 + DIN VDE 0833-1, -2	Functional safety acc. DIN EN 61508
General requirements	
Requirements for components and systems ¹ , planning and installation, operation (maintenance, ...) and requirements for the executing companies are covered separately by different regulations.	Product requirements, planning, installation (e.g. in terms of system architecture) and operation are mixed <ul style="list-style-type: none"> ■ e.g. everything is taken into account for the calculation of the failure probability.

Special requirements for FDAS: EN54-xx + DIN 14675 + DIN VDE 0833-1, -2	Functional safety acc. DIN EN 61508
Requirements for the system	
<ul style="list-style-type: none"> ■ The requirements for planning and installation cover most of the applications. ■ Different strain levels with different application conditions (e.g. contamination, damage of a transmission path, ...) are taken into account in the various regulations. ■ The various regulations also take into account the effect of ambient conditions. ■ The safety level thus ensured is fully sufficient for most applications. A case by case approach might be recommendable for special risks. 	<ul style="list-style-type: none"> ■ Requirements result from a risk analysis relating to the respective application. ■ Case by case approach to each individual application of the system.
Safety requirements	
<ul style="list-style-type: none"> ■ General safety requirements ■ There are various fire risks, but the probability of an outbreak of a fire is generally very low. ■ Protection aim: the FDAS shall detect a fire, no matter how likely the outbreak of a fire is. ■ An FDAS always has the same tasks <ul style="list-style-type: none"> ■ detection of a fire ■ transmission of the alarm ■ if necessary, alerting of persons ■ The requirements for ambient conditions are specified (application limits), e.g.: <ul style="list-style-type: none"> ■ place of installation of CIE ■ ambient temperature range ■ locations of detectors ■ Special risks are taken into account in the planning and installation guidelines, e.g. coincidence detection for extinguishing systems (protection of life). 	<ul style="list-style-type: none"> ■ Gradual safety requirements according to the result of the risk assessment ■ The protection aims depend on the application. ■ The ambient conditions determine the requirements.
Quality assurance in production process	
<ul style="list-style-type: none"> ■ is specified 	<ul style="list-style-type: none"> ■ Requirements for quality assurance partly depend on the SIL class to be achieved.
Failure risks	
<ul style="list-style-type: none"> ■ The robustness of the components and systems is tested with regard to most failure risks. 	<ul style="list-style-type: none"> ■ Failure is assessed theoretically with regard to failure probabilities. ■ The results of the assessment do not apply independently of the data base.

Requirements for planning and installation and maintenance	
<ul style="list-style-type: none"> ■ The failure risk is to be reduced to a minimum at all times. ■ "Gradual" safety is achieved with planning and installation requirements <ul style="list-style-type: none"> ■ e.g. redundancies starting from certain sizes and/or numbers of detectors in a detection zone 	<ul style="list-style-type: none"> ■ are taken into account in the SIL assessment
<p>¹ in terms of the functional compatibility of the components tested</p>	
<p>Table 1: Differences between the special requirements for FDAS and the general approach of DIN EN 61508</p>	

For the manufacturer the requirements of DIN EN 61508 mean much more work. For instance, a belated FMEDA for a circuit with just a few active components may take 3-4 days.

However, if a product is designed and developed in accordance with the requirements of e.g. SIL 2, it will achieve SIL 2, possibly by means of diagnosis procedures, redundancies etc. included in the design process.

The calculation of the failure probability is not the decisive factor, but the entire development process.

Conclusion:

When applying the application regulations and the harmonised standard for FDAS, DIN EN 54, whose requirements shall be fulfilled anyway, the graduation of requirements in accordance with DIN EN 61508 is of no added value in terms of safety aspects.

It would not make any sense to replace the existing application regulations by a DIN EN 61508, as this standard does not specify any requirements for planning and installation. Otherwise e.g. a separate safety assessment would have to be carried out for the positioning of each individual detector.

Nevertheless, any requirements applied in addition to the existing European standards, which are not part of these standards, bring about an unacceptable competitive situation in public invitations to tender ("market distortion").

The required additional effort on the one hand and the resulting benefits on the other hand do not constitute an argument for introducing an additional assessment in accordance with DIN EN 61508 for the safety-related integrity (SIL) of fire detection and fire alarm systems.

Type testing in accordance with harmonised European standards and an additional assessment and realisation of functional safety (SIL) is not justifiable for economic reasons alone.



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