

## ***Translation***

Supplementary requirements for the testing and certification of proximity devices for safety functions

Date of issue: 2011-06

Expert committee for electrical engineering  
Testing and certification body  
Gustav-Heinemann-Ufer 130  
50968 Köln

**GS-ET 14**

The principles set out here will be periodically revised and extended in consideration of technical progress and the latest findings in the area of occupational health and safety.

The most recent edition shall be binding for all tests conducted by the testing and certification department of the committee for electrical engineering.

The test principles serve to verify that in conjunction with DIN EN 60947-5-3, the requirements of the German Equipment and Product Safety Act (GPSG) and therefore also the 1st and 9th Regulations pursuant to it are observed.

This is the English translation of the German test principle. The German original version is obligatory.

### **Changes from the 2009-10 edition:**

#### **4.6 EMC requirements**

*New section:* supplementary requirements according to DIN EN 61326-3-1.

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## 1 **General**

### 1.1 **Scope**

Proximity devices with defined behaviour under fault conditions need to agree with the requirements and tests to DIN EN 60947-5-3.

The test principles complement the requirements to DIN EN 60947-5-3 in selected points.

### 1.2 **Technical rules**

The present test principles are based upon the following:

Where references are undated, the most recent edition of the document referred to (including all amendments) shall apply.

DIN EN 1088	„Safety of machinery – Interlocking devices associated with guards – Principles for design and selection”
DIN EN 60947-1 VDE 0660-100	„Low voltage switchgear and controlgear”; Section 1: General definitions
DIN EN 60947-5-1 VDE 0660-200	„Low voltage switchgear and controlgear”; Section 5-1: Control circuit devices and switching elements - electromechanical control circuit devices“
DIN EN 60947-5-2 VDE 0660-208	“Low voltage switchgear and controlgear”; Section 5-2: Control circuit devices, switching elements, proximity devices
DIN EN 60947-5-3 VDE 0660-214 2005-11	“Low voltage switchgear and controlgear”; Section 5-3: : Control circuit devices and switching elements - Requirements for proximity devices with defined Behaviour under fault conditions” (PDF)
DIN EN 61326-3-1 VDE 0843-20-3-1	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications

## **2 Terms and definitions**

Section 2 of DIN EN 60947-5-3 shall apply, with the following additional provisions:

### **Defeating by reasonably foreseeable means**

Defeating by reasonably foreseeable means is the rendering of a proximity device inoperative by hand or by the use of a readily available object.

### **Readily available objects may include:**

- Screws, needles, sheet metal pieces, magnets,
- Objects in daily use, such as keys, coins, adhesive tape, string and wire
- Spare actuators,
- Tools required for the intended use of the machine or which are readily available (such as screwdrivers, wrenches, Allen keys and pliers)

"Defeating by reasonably foreseeable means" encompasses the removal of guard locking devices or actuators by means of the tools referred to above with the intention of rendering an interlocking device inoperative.

## **3 Test documentation to be submitted**

### **3.1 Technical documentation**

The information for wiring up and commissioning of the proximity devices shall be supplied with the device in the form of drawings, wiring diagrams, tables and user information. The following documentation shall be submitted for the technical test:

- All user information supplied with the device (instruction handbook, assembly instructions, etc.)
- Sales brochure
- Overview of the actuators which may be employed with the proximity device
- Block circuit diagram (if necessary)
- Schematic circuit diagram
- Technical drawings
- Parts list(s)
- PCB layouts (where applicable)
- Description of the functional sequence (if necessary)
- Single fault analysis (e.g. FMEA)
- Fault combination analysis (e.g. FTA)
- Software documentation in accordance with the applicable standard
- Maintenance procedure and instructions for adjustment (if necessary)

- Description of behaviour in case of fault-mode (if necessary)
- If available, data sheets, test certificates, certificates for the proximity device and/or parts employed within it

The test body may require the submission of further documentation if necessary.

### **3.2 Type samples**

Section 8.3.1 of DIN EN 60947-5-3 shall apply.

The number of type samples to be submitted shall be specified by the test body. At least five type samples shall generally be provided to fulfil the committed test sequence according to DIN EN 60947-5-3.

Where populated printed circuit boards are employed, a set of bare printed circuit boards shall be submitted.

## **4 Additional test requirements**

### **4.1 Markings and Labelling**

Section 5.2 of DIN EN 60947-5-3 shall apply with the following additional provisions:

- Symbols, letters and numbers have to be 2mm in height at least
- Additional minimum information printed on the case:
  - Company name and full address of the manufacturer,
  - Description of the safety device,
  - Series- and type designation
  - CE-Marking,
  - Year of manufacture

The designation of the safety component needs to confirm with the designation that is used in the instruction handbook. If an abbreviation is not used, preference should be given to English for the designation.

If the space should be not sufficient for all labels, an identification plate bearing the manufacturer's full address and the product name may be fitted to a component of the proximity device.

The labelling must be visible on the product itself without removing the covers.

Testing: Visual inspection, comparison with technical documentations, review for completeness, correctness and freedom from contradictions, measurement of the type height, rub test (rubbing with two cotton cloths, one soaked in water and the other in test fluid, for 15 sec each). The markings must remain easily legible following the tests. Marking labels shall not permit easy removal by hand, nor shall they suffer wrinkling or creasing.

\*The chemical product with the trade name "n Hexan to the Analyse", which satisfies the requirements for a test fluid set out in DIN EN 60335-1 and DIN EN 60950-1, shall be used as the test fluid.

## 4.2 User manual

Section 5 of DIN EN 60947-5-3 shall apply with the following additional provisions:

- 4.2.1** The proximity device shall be accompanied by information required for proper wiring up and commissioning. Safety-related information shall be in a language, which is accepted in the country where the proximity device is to be installed. Should the instruction handbook not be in German, a German translation shall be provided. Testing shall be conducted with reference to the German translation.

The instruction handbook shall also contain the following information where applicable:

- ▶ Company name and full address of the manufacturer,
- ▶ Description of the safety component (e.g. proximity device),
- ▶ Information contained in the declaration of conformity (with the exception of the serial number and signature),
- ▶ General description of the proximity device and of its intended use,
- ▶ Instructions for fitting, assembly and wiring up of the proximity device
- ▶ Description of necessary maintenance works,
- ▶ Fault- mode behaviour,
- ▶ Information in accordance with DIN EN ISO 13849-1:
  - Category
  - PL
  - MTTFd or PFH
  - Note to the user, that the overall concept of the control system into which the proximity device is incorporated must be validated in accordance with DIN EN ISO 13849-2
- ▶ Statement by using DIN EN 62061:
  - SILCL
  - PFHD
  - Note to the user, that the overall concept of the control system into which the proximity device is incorporated must be validated in accordance with DIN EN EN 62061.
- ▶ Function description and terminal diagrams,
- ▶ Reference to any constraints upon the service position, in particular concerning impairments in function which may be anticipated where the device is used in a heavily soiled environment (e.g. cuttings, dust, liquids),

- ▶ Indication clearly emphasized in comparison with the surrounding text, that the requirements of DIN EN 1088 and in particular of Section 5.7, "Design to minimise defeat possibilities", are to be observed during fitting and operation.
- ▶ Indication that where guard locking devices/position switches are connected in series, the Performance Level to DIN EN 13849-1 is reduced owing to the reduction in fault detection.
- ▶ Information for the user that the overall concept of the control system into which the proximity device is incorporated must be validated in accordance with DIN EN ISO 13849-2

#### **4.2.2** Proximity devices for safety functions need to be constituted in a way that they can not be inactivated by reasonably foreseeable means.

If the proximity device does not have a code, safety labelling in the complete product information for selection and setting-up (e.g. instruction handbook, catalogue, setting-up-instruction) has to be contained which ensure that in case of intended or unintended action the switching state is not susceptible.

The product information has to contain the in section "safety information" at least.

- Notes about how to install this sensor in a way, that protection against;
  - Accidental operation and
  - Circumvent the proximity device by using usually available material
- Exemplary description for an according installation of the sensor.

If the proximity device has a code, the user manual has to contain safety information that the actuator has to be installed or fixed in a way that he is not removable by hand or by means of readily available objects, e.g. by using nonreturnable screws, riveting, heat-sealing, bore of screw heads, clue-connections e.g.

Testing: Inspection of the technical documentation and comparison with the requirements; review of the data for completeness, correctness, and freedom from contradictions

### **4.3 Sales brochures**

Sales brochures in which the proximity device is described must not contradict the user manual with regard to the safety aspects.

Where performance characteristics are described in the sales brochure, they must be consistent with the information in the user manual.

Testing: Inspection of the submitted documents; review for correctness and freedom from contradictions

#### **4.4 Mounts**

Mounts for proximity devices are not allowed to get dismantled by hand or under use of easily available objects.

If the manufacturer encloses fastening screws for proximity devices and/or delivers actuators, these have to be nonreturnable screws.

Testing: Inspection of the delivered mounts

#### **4.5 Test sequence to DIN EN 60947-5-3**

Section 8 of DIN EN 60947-5-3 shall apply with the following additional provisions:

If the manufacturer indicates the fulfilment of the requirements of DIN EN ISO 13849-1 and/or DIN EN 62061, so the fulfilment of these requirements is to be proved by test sequences and validation.

#### **4.6 Electromagnetic compatibility (EMC)**

Proximity switches for safety functions shall meet in addition to the EMC requirements according to DIN EN 60947-5-3 addition the requirements for immunity according to DIN EN 61326 3 1.

Testing: See DIN EN 61326-3-1