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Industrial valves - Functional safety of safety-related automated valves

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This standard includes the English version of the European Standard.

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English Version

Industrial valves - Functional safety of safety-related automated valves

Robinetterie industrielle - Sécurité fonctionnelle des appareils de robinetterie automatisés assurant une fonction de sécurité

Industriearmaturen - Funktionale Sicherheit sicherheitsbezogener automatisierter Industriearmaturen

This European Standard was approved by CEN on 7 July 2024.

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European foreword

This document (EN 17955:2024) has been prepared by Technical Committee CEN/TC 69 “Industrial valves”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2024, and conflicting national standards shall be withdrawn at the latest by February 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Introduction

Mechanical compliant items such as valves or actuators are integral parts of many automated safety-related systems. It is therefore necessary to assess the suitability of mechanical compliant items within the safety functions as well as those of electrical compliant items. This document defines aspects for implementing safety-related functions with mechanical compliant items. It describes procedures and methods with which all relevant compliant items can be evaluated in order to integrate them into a safety-related system. It can also be applied to the mechanical portion of a compliant item if it consists only partially of mechanical components.

In the case of mechanical compliant items, separation between random and systematic failures is not always possible. A method for determining random failure rates is described. Failures of unknown origin are to be included in a random failure rate if no systematic cause of the failure could be identified and resolved. Hence, the random failure rate is understood as a worst-case estimation which includes failures of unknown origin. This method can be used in cases where no clear identification of failure mechanisms (e.g. fatigue, wear or ageing) is possible. Any other identified systematic failures can be prevented by systematic measures according to the principle “first qualify – then quantify”. Systematic fault avoidance measures are for example functional safety management, design calculation, fabrication surveillance, testing or user instructions.

This document is intended for manufacturers of final elements or their compliant items to enable a consistent approach to evaluate the functional safety of their compliant items. The compliant items are considered individually according to the specifications of this document. The final combination is evaluated according to the principles defined in EN 61508 and derived application standards such as EN 61511.

NOTE “Safety-related system” is used as equivalent to “safety instrumented system (SIS)” in this document.

1 Scope

This document defines the requirements for how mechanical compliant items in a final element can be evaluated according to the principles of EN 61508 to integrate them into a safety-related system. It provides a method to determine all relevant factors, associated with the product, and thereby meet the specific needs of users of the product.

The basic prerequisite for the application of this document is that the intended use is known. This document describes a system to minimize systematic faults to achieve the targeted Safety Integrity Level (SIL).

This document is applied to single compliant items (e.g. valve, actuator or mechanical portions of solenoid valves) or to assemblies of several of these compliant items and interconnecting compliant items and components (e.g. gears, adaptors, brackets, etc.). Electrical, electronic or programmable electronic components are assessed according to EN 61508.

This document does not apply to:

— manually operated valves;

— items in safety systems or risk-reducing devices that are not assessed and operated according to the principles of functional safety (e.g. automatic safety valves like pressure relief valves).

The methods described can also be used for other mechanical compliant items in a final element of the safety-related system if the applicability is confirmed by appropriate expert knowledge (e.g. dampers, brakes, clutches).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN IEC 60812, *Failure modes and effects analysis (FMEA and FMECA)*

EN 61508-1:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements (IEC 61508-1:2010)*

EN 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems (IEC 61508-2:2010)*

EN 61508-4:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 4: Definitions and abbreviations (IEC 61508-4:2010)*

EN 61508-6:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3*

EN 61508-7:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 7: Overview of techniques and measures*