IEC 62683-2-3

Edition 1.0   2024-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Low-voltage switchgear and controlgear – Product data and properties for information exchange – Engineering data –
Part 2-3: Functional safety and reliability

Appareillages et ensembles d'appareillages à basse tension – Données et propriétés de produits pour l'échange d'informations – Données d'ingénierie –
Partie 2-3 : Sécurité fonctionnelle et fiabilité

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.130.20

ISBN 978-2-8327-0006-8

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –
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Part 2-3: Functional safety and reliability

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IEC 62683-2-3 has been prepared by IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
121/174/FDIS	121/182/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62683 series, published under the general title *Low-voltage switchgear and controlgear – Product data and properties for information exchange – Engineering data*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

Engineering tools used for the design of safety control system of machinery and similar control systems require functional safety and reliability data.

The purpose of this document is to:

- define the structure of the engineering data model classes and properties of low-voltage switchgear and controlgear suitable for use in functional safety applications based on VDMA 66413 and other applications including dependability analysis.

- describe the method on how to provide and use these properties in typical applications.

The intended benefits of this document are to:

- reduce the costs, time and efforts of mapping data for each customer request;

- optimize the workflow of information exchange with engineering tools;

- facilitate the selection of a product, especially regarding reliability and safety;

- give access to product data everywhere regardless of country, language and culture.

This document consists of a reference dictionary of low-voltage switchgear and controlgear using existing terms from IEC standards.

For this project, the introduction of low-voltage switchgear and controlgear within the IEC 61360 database addresses the following technical aspects:

- IEC 61360 requires mandatory attributes. The complete set of mandatory attributes with additional relevant attributes for low-voltage switchgear and controlgear will be available within the IEC 61360 database. The CDD 62683 database is available at the following address:
https://cdd.iec.ch/cdd/iec62683/iec62683.nsf/TreeFrameset?OpenFrameSet&ongletactif=1
. Within the present document, only the most useful attributes will be presented;

- The switchgear and controlgear dictionary is implemented in an appropriate domain of the IEC Component Data Dictionary (CDD), IEC 61360, by creating dictionaries of blocks, classes and properties.

3   Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60947-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
attribute
data element for description of a property, a relation or a device class

EXAMPLE   The name of a property, the code of a class, the measure unit of a property.

3.2
block
<of properties> collection of properties describing one common aspect of the device class

Note 1 to entry: A block is a feature class in the sense of IEC 61360-1 and ISO 13584-42.

EXAMPLE   Diagnostic functions, control circuit.

3.3
cardinality
pattern defining the number of times a concept reoccurs within a description

Note 1 to entry: Cardinality allows a block of properties contained in a list of properties to be used more than once for a particular transaction in order to describe, for example, a device with several different outputs or more than one process cases.

[SOURCE: IEC 61987-10:2009, 3.1.5, modified – Notes 1, 2, 3, and 5 have been omitted.]

3.4
device
material element or assembly of such elements intended to perform a required function

Note 1 to entry: In this document, a device corresponds to a low voltage switchgear and controlgear.

[SOURCE: IEC 60050-151:2001, 151-11-20, modified – the note to entry has been omitted and a new note has been added]

3.5
device class
set of properties which gives a description of a device

3.6
polymorphism
pattern that allows substitution of a single concept in the same context by a different more specific (specialized) concept

Note 1 to entry: A specialised polymorphic block of properties can replace a more generic one in the same context.

Note 2 to entry: A polymorphic operator (control property) can act in selecting between of various specialisations.

[SOURCE: IEC 61987-10:2009, 3.1.21]

3.7
property
defined parameter suitable for the description and differentiation of device class specific characteristic describing an aspect of device class

4   General

The engineering data models are intended to be used as complementary to the product class descriptions of IEC 62683-1.

The attributes shall follow IEC 61360-1. Based on IEC 61360-1 data model, the structured data called cardinality and polymorphism may be used.

5   Properties

5.1   Criteria for naming properties

In order to maintain consistency and clarity in the naming of properties, terms from product standards shall be used when there are available.

Synonymous names may be associated with the property name when well established terms are used on the market.

5.2   Attributes of a property

The following attributes of a property are considered in this document: identifier, preferred name, definition, source document, data type, unit of measure, value format, value list.

6   Engineering data models

6.1   Attributes

The attributes of the engineering data models shall follow IEC 61360-1.

The following attributes of a device class are considered in this document: identifier, preferred name, definition, synonymous name and source document.

NOTE   The synonymous names are limited to those necessary to avoid confusion when selecting a device class.

6.2   Data models

6.2.1   Functional safety

6.2.1.1   General structure

The functional safety model defined in Table 1 is to be used as an additional feature block of an existing product class defined in IEC 62683-1 when the product is intended for use as a part of a safety control system according to IEC 62061, IEC 61508-2 or ISO 13849-1.

Table 1 – Functional safety

Properties of each class	Class ID	Property ID
Functional safety for machinery	ACC007	
number of functional safety sets of characteristics		ACE005
Operating conditions of functional safety characteristics	ACG057	
rated operational voltage		ACE455
rated operational current, AC		ACE533
rated operational current, DC		ACE534
type of interlocking device		ACE053
other operating conditions		ACE070
useful life in number of operations		ACE055
useful life in time interval		ACE054
Safety device types	ACG070	
functional safety device type		ACE071
Safety subsystem	ACG065	
safety integrity level		ACE051
average frequency of dangerous failure		ACE052
proof test interval		ACE058
performance level		ACE060
category		ACE063
Electronic element	ACG066	
mean time to dangerous failure		ACE057
proof test interval		ACE058
Electromechanical element	ACG067	
number of operations until ten percent dangerous failure		ACE056
proof test interval		ACE058
Inherently safe subsystem	ACG069	
safety integrity level		ACE051
proof test interval		ACE058
performance level		ACE060
category		ACE063

6.2.1.2 Polymorphism device type

Depending on the functional safety capabilities of the device, its type shall be selected among one of the four types:

a) Safety subsystem (device type 1).

b) Electronic element (device type 2).

c) Electromechanical element (device type 3).

d) Inherently safe subsystem (device type 4).

The device types 1 and 4 can be incorporated directly as a complete subsystem at the top level of the architecture of the safety control system according to IEC 62061 (SCS) or ISO 13849-1 (SRP/CS). The device type 2 and 3 are only subsystem elements to be combined with other subsystem elements in order to form a subsystem.

The selection of the applicable device type is defined by the value selected in the value list ACI142 of the polymorphic property ACE071 functional safety device type. This is controlling the creation of an instance of the block ACG070 Safety device types using the selected device type list of properties.

6.2.1.3   Decomposition in blocks

Table 2 gives the decomposition of the class and blocks of properties. The class name column is structured in three levels of class hierarchy using vertical indent alignments.

NOTE   The class hierarchy is shown on the left end side of the graphical user interface of IEC CDD.

Table 2 – Decomposition in blocks

Class name	Synonymous	Definition	Source	Class ID
Functional safety of machinery		part of the overall safety of machinery that depends on functional and physical units operating correctly in response to their inputs	IEC 60050:2013, 351-57-06, modified with "of machinery"	ACC007
Operating conditions of functional safety characteristics		operating condition limits for which the functional safety characteristics are valid		ACG057
Safety device types		selected device type depending on its safety related characteristics and its capability as subsystem or subsystem element		ACG070
Safety subsystem	device type 1, subsystem	entity of the top-level architectural design of a safety-related system where a dangerous failure of the subsystem results in dangerous failure of a safety function Note 1 to entry: This differs from common language where "subsystem" may mean any sub-divided part of an entity, the term "subsystem" is used in this document within a strongly defined hierarchy of terminology: "subsystem" is the first level subdivision of a system. The parts resulting from further subdivision of a subsystem are called "subsystem elements". Note 2 to entry: A complete subsystem can be made up from a number of identifiable and separate subsystem elements. Note 3 to entry: The subsystem specification includes its role in the safety function and its interface with the other subsystems of the SCS. Note 4 to entry: One subsystem can be part of several safety functions, e.g. the same combination of contactors can be used to de-energise a motor either in the event of detection of a person in a danger zone or also in the event of opening an interlock guard.	IEC 62061:2021, 3.2.4	ACG065
Electronic element	device type 2	element of electronic technology non evaluated according to a functional safety standard, provided with reliability data and which is necessary to be integrated specifically into a subsystem	derived from ISO 13849:2022, O.1.3	ACG066