Safety Application Note ISO 13849

FESTO

Notes on Sistema Project Files

100395

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This document is only suitable for persons with sufficient expertise for machine safety based on ISO 12100, ISO 13849, IEC 61508, IEC 62061 and IEC 61511. In addition, the following qualifications are required in the project team:

- Specialist in pneumatics
- Specialist in electrical engineering
- Specialist for the programming of control systems and safety switching devices

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Table of Contents

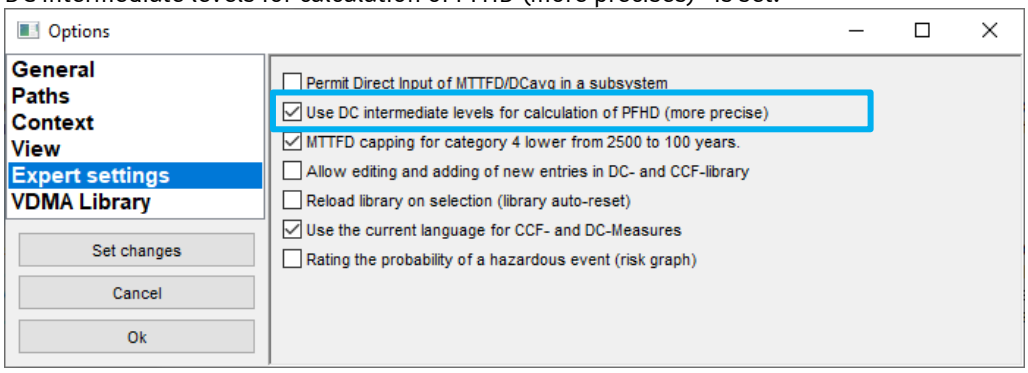
1 General

1.1 Objectives of this Document

- In this document, the assumptions made in the project files of the “Safety Application Notes ISO 13849" are specified and explained.
- For the application of the Sistema project files, certain options in Sistema have to be applied. These options are given.

1.2 General Notes

- In the Sistema project files, only the subsystem “Outputs” are evaluated. Inputs and logic must always be added by the user.
- The information in the Sistema project file is always related to the circuit of the associated Safety Application Note.
- In order for the status “green” to be output for the Sistema project, all required specifications are selected for the subsystem in the PL, Category, MTTFD, DCavg and CCF tabs. These must be checked for the application and adjusted if necessary.
- The Sistema project files require that in the menu Edit / Options under Expert Settings, the setting “Use DC intermediate levels for calculation of PFHD (more precises)” is set.



2 Assumptions for Directional Control Valves

For directional control valves the values B_{10}, RDF and n_{op} are applied. The following default values are included in the projects:

Value	Source	Description
B_{10} = 10,000,000 cycles	ISO 13849-1, Table C.1, value for pneumatic components[1]	number of cycles until 10 % of the components fail dangerously (for components with mechanical wear) **Notes** Always check whether this B_{10} value corresponds to the B_{10} value of the valve in the specific application. The information is available in the Data Sheet Product Reliability.
RDF = 50 %	ISO 13849-1, table C.1, note 1	RDF is the ratio of dangerous failures, i.e. the proportion of the total failure rate of the directional control valve that can lead to a dangerous failure. To estimate the B_{10D} value from the B_{10} value, assume RDF=50% according to ISO 13849-1, Table C.1, Note 1.
nop = 525,600 nop = 1,095		Average number of annual actuations For the number of actuation cycles, n_{op}=525,600 is assumed for a working valve (one actuation cycle per minute, 24 hours a day, 365 days a year). For the number of requests for the safety function, a n_{op}=1,095 is assumed (one actuation every 8 hours, 3 shifts a day, 365 days a year). **Notes** It must always be checked whether these assumptions of the annual actuations correspond to the intended application and are to be adapted to the real conditions of use.

Notes

- For certain directional control valves, a different value may be indicated if a B_{10} value of 10,000,000 cycles is not reached.
- If the valve(s) is/are located on a valve terminal, the output subsystem must be adapted according to the specifications in document “100394 Safe electrical switch-off of valve terminals”.

[1] In ISO 13849-1, Table C.1, a B_{10D}=20,000,000 cycles is specified. From this, according to note 1 of this table, B_{10}=10,000,000 cycles was derived.

3 Used Literature

3.1 Software

Sistema, Version 2.0.8, Standard version: ISO 13849-1:2015, ISO 13849-2:2012. Available in the Internet: https://www.dguv.de/webcode.jsp?query=e34183

3.2 Cited documents from Festo

[1] 100394 Safe electrical switch-off of valve terminals

3.3 Standards

[2] VDMA 24584:2020-10 – Safety functions of regulated and unregulated (fluid) mechanical systems; German Version

[3] DIN EN ISO 13849-1:2016-06 – Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015); German version EN ISO 13849-1:2015

3.4 For the legal notice additionally

[4] Machinery Directive: Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)

[5] DIN EN ISO 12100:2011-03 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010); German version EN ISO 12100:2010

[6] DIN EN ISO 13849-2:2013-02 – Safety of machinery - Safety-related parts of control systems - Part 2: Validation (ISO 13849-2:2012); German version EN ISO 13849-2:2012

[7] DIN EN 61508:2011-02 - Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508:2010); German version EN 61508:2010

[8] DIN EN 61511:2019-02 - Functional safety - Safety instrumented systems for the process industry sector - (IEC 61511:2016); German version EN 61511:2017

[9] DIN EN 62061:2016-05 - Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005 + A1:2012 + A2:2015); German version EN 62061:2005 + Cor.:2010 + A1:2013 + A2:2015

4 Information about the Document

4.1 General Information

Document number	100395
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4.2 Revision History

Ver.	Date	Ed.	Chapter	Description of change/impact
1.10	2022-06-02	JKHL	All	Creation of the document

4.3 Approval/Release of the Document

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4.4 Period of Validity

Document is valid until 2028-06-02 or until one of the documents used or the required relevant base are changed.