

SISTEMA - Safety Integrity Software Tool for the Evaluation of Machine



Project name: 100419

File date: 14.07.2026 09:27:03 Report date: 14.07.2026 Checksum: 9fba5de72741f7aeb713da41b560d2c9

PR Project name: 100419

Project file name:	C:\Users\jkh\OneDrive - Festo\Dokumente\Know-how\SPN\20220913-003 PUS Cat3 PL e 5-2 bl\100419 Sistema Project V3.0.4 - EN.ssm
Creation date:	14.12.2021 08:17:10
Project status:	
Project number:	
Project version:	
Authors:	
Project managers:	
Inspectors:	
Dangerous point/machine:	
Documentation:	
Document:	
Version of software:	3.0.4 build 3
Version of standard:	ISO 13849-1:2023, ISO 13849-2:2012
Checksum:	9fba5de72741f7aeb713da41b560d2c9
Options:	☒ Use DC intermediate levels for calculation of PFH (more precise) ☐ MTTFD capping for category 4 lower from 2500 to 100 years.
Status:	✔ green
Note:	There are no warnings listed for this project (or it's subordinate basic elements).

Print options

- | | |
|--|---|
| ☒ Show device details | ☒ Show requirements on PL and Category |
| ☒ Show documentations on SF, SB, BL and EL | ☒ Show parameter documentations on PLr, PL, Category, CCF, MTTFD and DC |
| ☐ Show CCF and DC measures in detail | ☒ Show messages |

Contained safety functions

SF Name: PUS (operation pressure)

Required: PLr d	Reached: PL e	PFH [1/h]: 4,29E-8	Status: green
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List of documented messages:

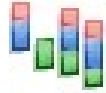
- No messages known -

List of devices with a permissible operation time (T10D) of less than 20 years:

- No devices known -

SF Name: PUS (pilot pressure)

Required: PLr d	Reached: PL d	PFH [1/h]: 4,29E-8	Status: green
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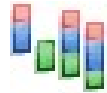
PR Project name: 100419

List of documented messages:

- No messages known -

List of devices with a permissible operation time (T10D) of less than 20 years:

- No devices known -



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SF Safety function: PUS (operation pressure)

Identifier of the Safety function:

Safety function type:

Triggering event:

Reaction and
Behaviour on power failure:

Safe state:

Operation mode:

Interfaces:

Demand rate:

Running-on time:

Priority:

Documentation:

Document:

Required Performance Level Safety function

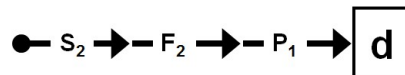
PLr (by risk graph): d

Severity of injury (S): Serious (normally irreversible) injury or death

Frequency / exposure times to hazard
(F): Frequent to continuous / exposure time is long

Possibility of avoiding (P): Possible under specific conditions

Risk graph:



Documentation:

Document:

Performance Level Safety function

Reached PL: e

PFH [1/h]: 4,29E-8

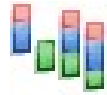
*Electromagnetic immunity, EMI (Annex L) Safety function*Route for fulfilment
of EMI measures: n/a

Documentation:

Document:

List of devices with a permissible operation time (T10D) of less than 20 years:

Device list:

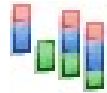


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SF Safety function: PUS (operation pressure)*Status / Messages Safety function***Status:** green**Subsystems (1 / 1)****SB Name:** Output**Reference designator:****Inventory number:***Device details Subsystem***Device Manufacturer:****Device Identifier:****Device group:****Part number:****Revision:****Function:**☐ Input☒ Output☐ Logic☐ unknown**Use case:****Description of the use case:***Documentation Subsystem***Documentation:****Document:***Performance Level Subsystem***PL determination:** Determine PL/PFH from Category, MTTFD and DCavg*Qualitative aspects (e.g. software, see sections 7, 10.3) Subsystem***Qualitative aspects suitable up to PL:** n/a**Documentation:****Document:***Electromagnetic immunity, EMI (Annex L) Subsystem***Route for fulfilment of EMI measures:** The fulfilment of the measures for electromagnetic immunity (EMI) was documented in the associated safety function.**PL requirements:** fulfilled**The PL shall be determined by the estimation of the following aspects (section 6.1.1):**

- Behaviour of the safety function under fault conditions [fulfilled]
- Safety-related software according to clause 7 and Annex J or no software included [fulfilled]
- Systematic failure (see clause 6.1.7 and Annex G) [fulfilled]
- Ability to perform a safety function under expected environmental conditions [fulfilled]



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SF Safety function: PUS (operation pressure)

Reached PL:	e	PFH [1/h]:	4,29E-8
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Documentation:

Category Subsystem

Cat.:	3
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Category requirements:	fulfilled
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Requirements for the category:

- Accordance with relevant standards to withstand the expected influences. [fulfilled]
- Basic safety principles are being used. [fulfilled]
- Well-tries safety principles are being used. [fulfilled]
- A single fault tolerance and reasonable fault detection are given. [fulfilled]
- MTTFD is at least Low. [fulfilled]
- Requirement fulfilled because of the assumed limit value accuracy of 5 percentage points. [fulfilled]
- The achieved score of the CCF-rating is at least 65. [fulfilled]

Documentation:

Source (e.g. standard) Category:

File:

MTTFD and Mission time Subsystem

MTTFD [a]:	100 (High)
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Mission time [a]:	20	Shortest mission time [a]:	20
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Diagnostic coverage Subsystem

DCavg [%]:	90 (Medium)
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Common cause failure Subsystem

CCF Points:	95 (fulfilled)
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CCF Measures:

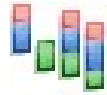
- 15 Points | Separation/segregation
- 20 Points | Diversity
- 15 Points | Protection against over-voltage, over-pressure, over-current, over-temperature
- 5 Points | Assessment/analysis
- 5 Points | Training
- 25 Points | Prevention of EMI or impurity of fluidic medium
- 10 Points | Other influences

Documentation:

Document:

Status / Messages Subsystem

Status:	green
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SF Safety function: PUS (operation pressure)

Channels / Test channels (1 / 2)

CH Name: Channel 1

MTTFD [a]: 100

Blocks (1 / 1)

BL Name: 5/2 Directional control valve

Reference designator: Q2

Inventory number:

Device details Block

Device Manufacturer:

Device Identifier:

Device group:

Part number:

Revision:

Function:

☐ Input
☒ Output

☐ Logic
☐ unknown

Technology: unknown

Category: -

Use case:

Description of the use case:

Documentation Block

Documentation:

Document:

MTTFD and Mission time Block

MTTFD [a]: 380,5 (High)

Mission time [a]: 20

Shortest mission time [a]: 20

B10 [cycles]: 10000000

RDF [%]: 50

B10D [cycles]: 20000000

nop [cycles/a]: 525600

Documentation:

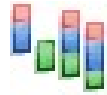
Document:

Diagnostic coverage Block

DC [%]: 90 (Medium)

Measure:

Indirect monitoring (e.g. monitoring by pressure switch, electrical position monitoring of machine actuators)



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SF Safety function: PUS (operation pressure)

Documentation:

Document:

*Status / Messages Block***Status:** green**Channels / Test channels (2 / 2)****CH** Name: Channel 2

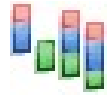
MTTFD [a]: 100

Blocks (1 / 1)**BL** Name: 3/2 Directional control valve**Reference designator:** Q1**Inventory number:***Device details Block***Device Manufacturer:****Device Identifier:****Device group:****Part number:****Revision:****Function:**☐ Input
☒ Output☐ Logic
☐ unknown**Technology:** unknown**Category:** -**Use case:****Description of the use case:***Documentation Block***Documentation:****Document:***MTTFD and Mission time Block***MTTFD [a]:** 91324,2 (High)

Mission time [a]:	20	Shortest mission time [a]:	20
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B10 [cycles]:	10000000	RDF [%]:	50
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B10D [cycles]:	20000000	nop [cycles/a]:	2190
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SF Safety function: PUS (operation pressure)

Documentation:

Document:

Diagnostic coverage Block

DC [%]: 90 (Medium)

Measure:

Indirect monitoring (e.g. monitoring by pressure switch, electrical position monitoring of machine actuators)

Documentation:

Document:

Status / Messages Block

Status: green

SF Safety function: PUS (pilot pressure)

Identifier of the Safety function:

Safety function type:

Triggering event:

Reaction and
Behaviour on power failure:

Safe state:

Operation mode:

Interfaces:

Demand rate:

Running-on time:

Priority:

Documentation:

Document:

Required Performance Level Safety function

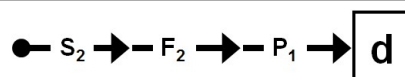
PLr (by risk graph): d

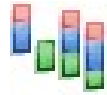
Severity of injury (S): Serious (normally irreversible) injury or death

Frequency / exposure times to hazard (F): Frequent to continuous / exposure time is long

Possibility of avoiding (P): Possible under specific conditions

Risk graph:





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SF Safety function: PUS (pilot pressure)

Documentation:

Document:

Performance Level Safety function

Reached PL:	d	PFH [1/h]:	4,29E-8
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Electromagnetic immunity, EMI (Annex L) Safety function

Route for fulfilment of EMI measures: n/a

Documentation:

Document:

List of devices with a permissible operation time (T10D) of less than 20 years:

Device list:

Status / Messages Safety function

Status: green

Subsystems (1 / 2)

SB Name: Output

Reference designator:

Inventory number:

Device details Subsystem

Device Manufacturer:

Device Identifier:

Device group:

Part number:

Revision:

Function:	☐ Input	☐ Logic
	☒ Output	☐ unknown

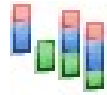
Use case:

Description of the use case:

Documentation Subsystem

Documentation:

Document:



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File date: 14.07.2026 09:27:03 Report date: 14.07.2026 Checksum: 9fba5de72741f7aeb713da41b560d2c9

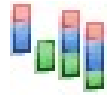
SF Safety function: PUS (pilot pressure)*Performance Level Subsystem***PL determination:** Determine PL/PFH from Category, MTTFD and DCavg*Qualitative aspects (e.g. software, see sections 7, 10.3) Subsystem***Qualitative aspects suitable up to PL:** n/a**Documentation:****Document:***Electromagnetic immunity, EMI (Annex L) Subsystem***Route for fulfilment of EMI measures:** The fulfilment of the measures for electromagnetic immunity (EMI) was documented in the associated safety function.**PL requirements:** fulfilled**The PL shall be determined by the estimation of the following aspects (section 6.1.1):**

- Behaviour of the safety function under fault conditions [fulfilled]
- Safety-related software according to clause 7 and Annex J or no software included [fulfilled]
- Systematic failure (see clause 6.1.7 and Annex G) [fulfilled]
- Ability to perform a safety function under expected environmental conditions [fulfilled]

Reached PL: e **PFH [1/h]:** 4,29E-8**Documentation:***Category Subsystem***Cat.:** 3**Category requirements:** fulfilled**Requirements for the category:**

- Accordance with relevant standards to withstand the expected influences. [fulfilled]
- Basic safety principles are being used. [fulfilled]
- Well-trying safety principles are being used. [fulfilled]
- A single fault tolerance and reasonable fault detection are given. [fulfilled]
- MTTFD is at least Low. [fulfilled]
- Requirement fulfilled because of the assumed limit value accuracy of 5 percentage points. [fulfilled]
- The achieved score of the CCF-rating is at least 65. [fulfilled]

Documentation:**Source (e.g. standard) Category:****File:***MTTFD and Mission time Subsystem***MTTFD [a]:** 100 (High)**Mission time [a]:** 20 **Shortest mission time [a]:** 20



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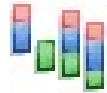
SF Safety function: PUS (pilot pressure)*Diagnostic coverage Subsystem***DCavg [%]:** 90 (Medium)*Common cause failure Subsystem***CCF Points:** 95 (fulfilled)**CCF Measures:**

- 15 Points | Separation/segregation
- 20 Points | Diversity
- 15 Points | Protection against over-voltage, over-pressure, over-current, over-temperature
- 5 Points | Assessment/analysis
- 5 Points | Training
- 25 Points | Prevention of EMI or impurity of fluidic medium
- 10 Points | Other influences

Documentation:**Document:***Status / Messages Subsystem***Status:** green**Channels / Test channels (1 / 2)****CH** Name: Channel 1

MTTFD [a]: 100

Blocks (1 / 1)**BL** Name: 5/2 Directional control valve**Reference designator:** Q2**Inventory number:***Device details Block***Device Manufacturer:****Device Identifier:****Device group:****Part number:****Revision:****Function:**☐ Input
☒ Output☐ Logic
☐ unknown**Technology:** unknown**Category:** -**Use case:****Description of the use case:**



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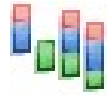
SF Safety function: PUS (pilot pressure)*Documentation Block***Documentation:****Document:***MTTFD and Mission time Block***MTTFD [a]:** 380,5 (High)**Mission time [a]:** 20**Shortest mission time [a]:** 20**B10 [cycles]:** 10000000**RDF [%]:** 50**B10D [cycles]:** 20000000**nop [cycles/a]:** 525600**Documentation:****Document:***Diagnostic coverage Block***DC [%]:** 90 (Medium)**Measure:**

Indirect monitoring (e.g. monitoring by pressure switch, electrical position monitoring of machine actuators)

Documentation:**Document:***Status / Messages Block***Status:** green**Channels / Test channels (2 / 2)****CH** Name: Channel 2

MTTFD [a]: 100

Blocks (1 / 1)**BL** Name: 3/2 Directional control valve**Reference designator:** K1**Inventory number:***Device details Block***Device Manufacturer:****Device Identifier:****Device group:****Part number:****Revision:**



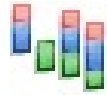
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SF Safety function: PUS (pilot pressure)

Function:	☐ Input	☐ Logic
	☒ Output	☐ unknown
Technology:	unknown	
Category:	-	
Use case:		
Description of the use case:		
<i>Documentation Block</i>		
Documentation:		
Document:		
<i>MTTFD and Mission time Block</i>		
MTTFD [a]:	91324,2 (High)	
Mission time [a]:	20	Shortest mission time [a]: 20
B10 [cycles]:	10000000	RDF [%]: 50
B10D [cycles]:	20000000	nop [cycles/a]: 2190
Documentation:		
Document:		
<i>Diagnostic coverage Block</i>		
DC [%]:	90 (Medium)	
Measure:	Indirect monitoring (e.g. monitoring by pressure switch, electrical position monitoring of machine actuators)	
Documentation:		
Document:		
<i>Status / Messages Block</i>		
Status:	green	

Subsystems (2 / 2)**SB** Name: 5/2 Directional control valve, main stage with fault exclusion**Reference designator:** Q2**Inventory number:***Device details Subsystem***Device Manufacturer:****Device Identifier:**



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SF Safety function: PUS (pilot pressure)

Device group:

Part number:

Revision:

Function:

☐ Input
☒ Output☐ Logic
☐ unknown

Use case:

Description of the use case:

Documentation Subsystem

Documentation:

Document:

Performance Level Subsystem

PL determination:

Enter PL/PFH directly (manufacturer ensures compliance with the requirements of the Category and of the PL)

PL:

d

Qualitative aspects (e.g. software, see sections 7, 10.3) Subsystem

Qualitative aspects suitable up to PL: n/a

Documentation:

Document:

*Electromagnetic immunity, EMI (Annex L) Subsystem*Route for fulfilment
of EMI measures:

The fulfilment of the measures for electromagnetic immunity (EMI) was documented in the associated safety function.

Reached PL:

d

PFH [1/h]:

0.0E+0

Documentation:

PL e must not be based solely on fault exclusion (ISO 13849-1, 6.1.10.3), so that the maximum possible PL is limited to PL d.

Mission time [a]:

20

Shortest
mission time [a]:

20

Category Subsystem

Cat.:

3

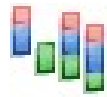
Category requirements:

fulfilled

Requirements for the category:

Since the category is given by the manufacturer he is responsible to satisfy the requirements.

Documentation:



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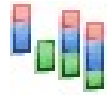
SF Safety function: PUS (pilot pressure)

Source (e.g. standard) Category:

File:

Status / Messages Subsystem

Status: green



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EXCLUSION OF LIABILITY

Care has been taken in production of the software SISTEMA, which corresponds to the state of the art. It is made available to users free of charge.

Die Haftung des Institut für Arbeitsschutz der DGUV (IFA) ist damit auf Vorsatz und grobe Fahrlässigkeit (§ 521 BGB) bzw. bei Sach- und Rechtsmängel auf arglistig verschwiegene Fehler beschränkt (523, 524 BGB).

The Institute for Occupational Safety and Health of the German Social Accident Insurance undertakes to keep its website free of viruses; nevertheless, no guarantee can be given that the software and information provided are virus-free. The user is therefore advised to take appropriate security precautions and to use a virus scanner prior to downloading software, documentation or information.

German Social Accident Insurance (DGUV)
Glinkastraße 40
D-10117 Berlin

E-mail: info@dguv.de
Internet: www.dguv.de

NOTE

This document is not a complete technical documentation according to EN ISO 13849-1:2023, clause 12.

CONTACT

Company contact details unknown

Name in block letters

Date, signature

Authors

Authors

Inspectors

Inspectors