

Project name: 100556

File date: 22.07.2026 14:41:06 Report date: 22.07.2026 Checksum: bde97f4d90dfec6f4ca8bed18efa0f19

**PR Project name: 100556**

|                          |                                                                                                                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project file name:       | C:\Users\jkh\Documents\Projects\20231219-002\100556 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:                | bde97f4d90dfec6f4ca8bed18efa0f19                                                                                                                                                            |
| Options:                 | <input checked="" type="checkbox"/> Use DC intermediate levels for calculation of PFH (more precise)<br><input type="checkbox"/> MTTFD capping for category 4 lower from 2500 to 100 years. |
| Status:                  | <input checked="" type="checkbox"/> green                                                                                                                                                   |
| Note:                    | There are no warnings listed for this project (or it's subordinate basic elements).                                                                                                         |

**Print options**

- |                                                                              |                                                                                                           |
|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Show device details                      | <input checked="" type="checkbox"/> Show requirements on PL and Category                                  |
| <input checked="" type="checkbox"/> Show documentations on SF, SB, BL and EL | <input checked="" type="checkbox"/> Show parameter documentations on PLr, PL, Category, CCF, MTTFD and DC |
| <input type="checkbox"/> Show CCF and DC measures in detail                  | <input checked="" type="checkbox"/> Show messages                                                         |

**Contained safety functions****SF** Name: STO

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Required: PLr c | Reached: PL c | PFH [1/h]: 1,15E-6 | Status: green |
|-----------------|---------------|--------------------|---------------|

**List of documented messages:**

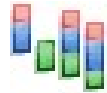
- No messages known -

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

- No devices known -

**SF** Name: PUS (operation pressure)

|                 |               |                    |               |
|-----------------|---------------|--------------------|---------------|
| Required: PLr e | 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 e

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

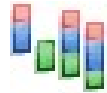
Status: green

**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: STO

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

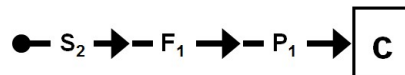
PLr (by risk graph): c

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

Frequency / exposure times to hazard (F): Seldom to less often / exposure time is short

Possibility of avoiding (P): Possible under specific conditions

Risk graph:



Documentation:

Document:

### Performance Level Safety function

Reached PL: c

PFH [1/h]: 1,15E-6

### Electromagnetic immunity, EMI (Annex L) Safety function

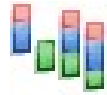
Route for fulfilment  
of EMI measures: n/a

Documentation:

Document:

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

Device list:

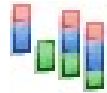


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**SF Safety function: STO***Status / Messages Safety function***Status:** green**Subsystems (1 / 1)****SB Name:** Output**Reference designator:****Inventory number:***Device details Subsystem***Device Manufacturer:****Device Identifier:****Device group:****Part 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: STO**

|             |   |            |         |
|-------------|---|------------|---------|
| Reached PL: | c | PFH [1/h]: | 1,15E-6 |
|-------------|---|------------|---------|

**Documentation:***Category Subsystem*

|       |   |
|-------|---|
| Cat.: | 1 |
|-------|---|

|                        |           |
|------------------------|-----------|
| 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-tried components (clause 6.1.11) are being used. [fulfilled]
- Well-tried safety principles are being used. [fulfilled]
- MTTFD is at least High. [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 |
|-------------------|----|----------------------------|----|

*Status / Messages Subsystem*

|         |       |
|---------|-------|
| Status: | green |
|---------|-------|

**Channels / Test channels (1 / 1)****CH** Name: Channel 1

MTTFD [a]: 100

**Blocks (1 / 1)****BL** Name: 2 x 3/2 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



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**SF Safety function: STO**

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:

*Status / Messages Block*

Status: green

**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:

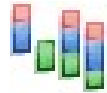
Demand rate:

Running-on time:

Priority:

Documentation:

Document:



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## Safety function: PUS (operation pressure)

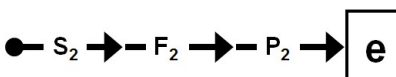
### Required Performance Level Safety function

PLr (by risk graph): e

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): Scarcely possible

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:

### Status / Messages Safety function

Status: green

### Subsystems (1 / 1)

 Name: Output

Reference designator:

Inventory number:

#### Device details Subsystem

Device Manufacturer:

Device Identifier:

Device group:

Part number:

Revision:

Function: ☐ Input ☒ Output ☐ Logic ☐ unknown



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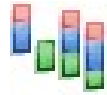
**SF Safety function: PUS (operation pressure)****Use case:****Description of the use case:***Documentation Subsystem***Documentation:****Document:***Performance Level Subsystem***PL determination:** Determine PL/PFH from Category, MTTFD and DCavg*Qualitative aspects (e.g. software, see sections 7, 10.3) 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]

**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:**



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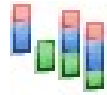
**SF Safety function: PUS (operation pressure)****Source (e.g. standard) Category:****File:***MTTFD and Mission time Subsystem***MTTFD [a]:** 100 (High)**Mission time [a]:** 20 **Shortest mission time [a]:** 20*Diagnostic coverage Subsystem***DCavg [%]:** 90 (Medium)*Common cause failure Subsystem***CCF 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: 2 x 3/2 Directional control valve**Reference designator:** Q2**Inventory number:***Device details Block***Device Manufacturer:****Device Identifier:****Device group:****Part number:****Revision:**



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**SF Safety function: PUS (operation pressure)**

|                                     |                                                                              |                                                                    |
|-------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------|
| <b>Function:</b>                    | <input type="checkbox"/> Input<br><input checked="" type="checkbox"/> Output | <input type="checkbox"/> Logic<br><input type="checkbox"/> unknown |
| <b>Technology:</b>                  | unknown                                                                      |                                                                    |
| <b>Category:</b>                    | -                                                                            |                                                                    |
| <b>Use case:</b>                    |                                                                              |                                                                    |
| <b>Description of the use case:</b> |                                                                              |                                                                    |

*Documentation Block*

|                       |
|-----------------------|
| <b>Documentation:</b> |
| <b>Document:</b>      |

*MTTFD and Mission time Block*

|                          |              |                                   |        |
|--------------------------|--------------|-----------------------------------|--------|
| <b>MTTFD [a]:</b>        | 380,5 (High) |                                   |        |
| <b>Mission time [a]:</b> | 20           | <b>Shortest mission time [a]:</b> | 20     |
| <b>B10 [cycles]:</b>     | 10000000     | <b>RDF [%]:</b>                   | 50     |
| <b>B10D [cycles]:</b>    | 20000000     | <b>nop [cycles/a]:</b>            | 525600 |
| <b>Documentation:</b>    |              |                                   |        |
| <b>Document:</b>         |              |                                   |        |

*Diagnostic coverage Block*

|                       |                                                                                                               |
|-----------------------|---------------------------------------------------------------------------------------------------------------|
| <b>DC [%]:</b>        | 90 (Medium)                                                                                                   |
| <b>Measure:</b>       | Indirect monitoring (e.g. monitoring by pressure switch, electrical position monitoring of machine actuators) |
| <b>Documentation:</b> |                                                                                                               |
| <b>Document:</b>      |                                                                                                               |

*Status / Messages Block*

|                |       |
|----------------|-------|
| <b>Status:</b> | 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:**



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### Safety function: PUS (operation pressure)

#### 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

B10 [cycles]: 10000000

RDF [%]: 50

B10D [cycles]: 20000000

nop [cycles/a]: 2190

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

### Safety function: PUS (pilot pressure)



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**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*

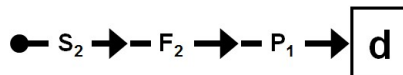
PLr (by risk graph): d

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:



Documentation:

Document:

*Performance Level Safety function*

Reached PL: e

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

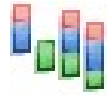
*Electromagnetic immunity, EMI (Annex L) Safety function*Route for fulfilment  
of EMI measures: n/a

Documentation:

Document:

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

Device list:



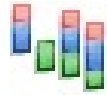
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**SF Safety function: PUS (pilot pressure)***Status / Messages Safety function***Status:** green**Subsystems (1 / 1)****SB Name:** Output**Reference designator:****Inventory number:***Device details Subsystem***Device Manufacturer:****Device Identifier:****Device 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 (pilot pressure)**

|             |   |            |         |
|-------------|---|------------|---------|
| 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-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) |
|------------|------------|

|                   |    |                            |    |
|-------------------|----|----------------------------|----|
| Mission time [a]: | 20 | Shortest mission time [a]: | 20 |
|-------------------|----|----------------------------|----|

*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 |
|---------|-------|



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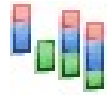
File date: 22.07.2026 14:41:06 Report date: 22.07.2026 Checksum: bde97f4d90dfec6f4ca8bed18efa0f19

**SF Safety function: PUS (pilot pressure)****Channels / Test channels (1 / 2)****CH** Name: Channel 1

MTTFD [a]: 100

**Blocks (1 / 1)****BL** Name: 2 x 3/2 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 (pilot pressure)****Documentation:****Document:***Status / Messages Block***Status:** green**Channels / Test channels (2 / 2)****CH** Name: Channel 2

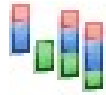
MTTFD [a]: 100

**Blocks (1 / 1)****BL** Name: 3/2 Directional control valve**Reference designator:** K1**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)

|                          |    |                                   |    |
|--------------------------|----|-----------------------------------|----|
| <b>Mission time [a]:</b> | 20 | <b>Shortest mission time [a]:</b> | 20 |
|--------------------------|----|-----------------------------------|----|

|                      |          |                 |    |
|----------------------|----------|-----------------|----|
| <b>B10 [cycles]:</b> | 10000000 | <b>RDF [%]:</b> | 50 |
|----------------------|----------|-----------------|----|

|                       |          |                        |      |
|-----------------------|----------|------------------------|------|
| <b>B10D [cycles]:</b> | 20000000 | <b>nop [cycles/a]:</b> | 2190 |
|-----------------------|----------|------------------------|------|



Project name: 100556

File date: 22.07.2026 14:41:06 Report date: 22.07.2026 Checksum: bde97f4d90dfec6f4ca8bed18efa0f19

## Safety function: PUS (pilot pressure)

### Documentation:

#### Document:

#### *Diagnostic coverage Block*

**DC [%]:** 90 (Medium)

#### **Measure:**

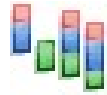
Indirect monitoring (e.g. monitoring by pressure switch, electrical position monitoring of machine actuators)

### Documentation:

#### Document:

#### *Status / Messages Block*

**Status:** green



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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.

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Internet: [www.dguv.de](http://www.dguv.de)

## NOTE

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

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## CONTACT

Company contact details unknown

**Name in block letters**

**Date, signature**

Authors

Authors

Inspectors

Inspectors