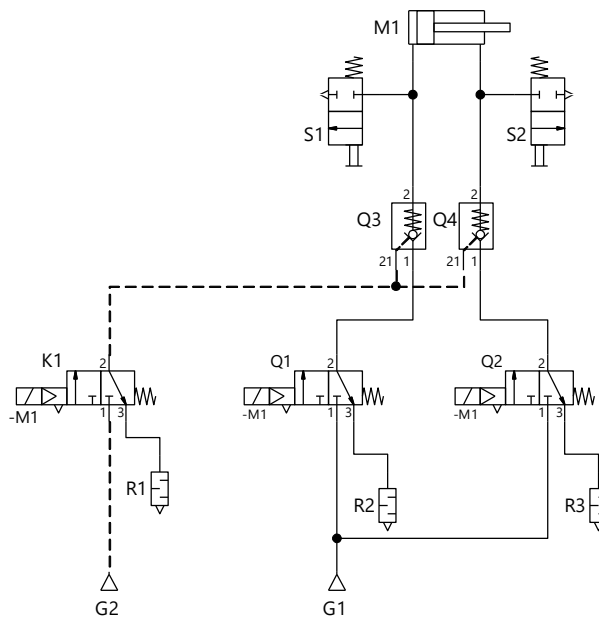
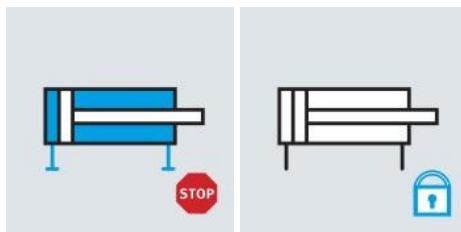


Safety-Subfunctions Pneumatic

SSC – Safe Stopping and Closing – Cat. 1, PL c

PUS – Prevention Unexpected Start-up – Cat. 1, PL c



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Title Safety Subfunctions Pneumatics - Circuit
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Author Festo
Date 14.08.2026

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

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1 General

1.1 Objectives of this Document

- This document shows a possible example circuit for the safety sub-functions SSC (Safe Stopping and Closing) with up to category 1, up to PL c and PUS (Prevention of unexpected startup) with up to category 1, up to PL c).
- The most important features for the implementation of the safety sub-function are listed.
- Based on these features, suitable products from Festo are listed.

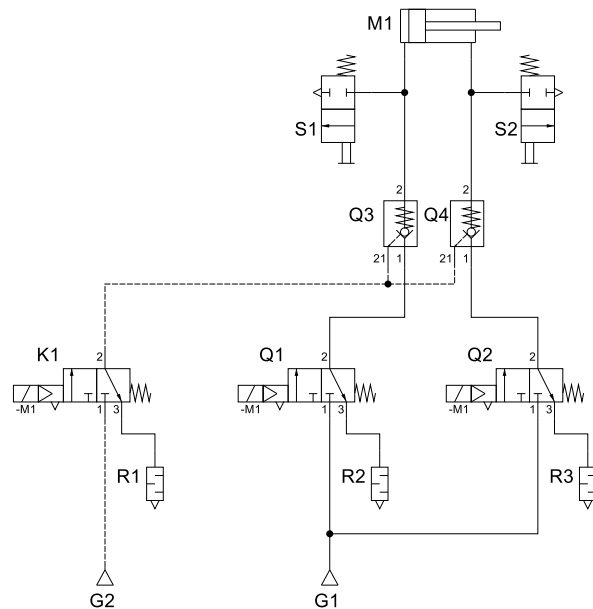
1.2 General Notes

- The given circuit is a principle circuit which cannot be complete due to clarity and scope. It is a recommendation that does not exclude other possibilities.
- The abbreviations used for the safety subfunctions are based on the definitions in VDMA 24584 for pneumatics. The definitions used and important notes are given in the document [↗ 100406 Pneumatic Safety Subfunctions – SSC, PUS](#).
- The requirements for the valve are only considered in the context of the pneumatic circuit. Suggestions for the electrical wiring of individual valves or valve terminals have not been considered in this document.
 - For single valves, the document [↗ 100393 Safe electrical switch-off of individually controlled valves](#) should be considered.
 - For valve terminals, the document [↗ 100394 Safe electrical switch-off of valve terminals](#) should be considered.
- In the product list included here with recommendations for suitable products, we have checked the specified requirements for the pneumatic circuit. However, if further information is available to us, e.g. through our product observation, this data can be changed on a daily basis. Therefore, these data must be checked in the data sheets available online before final use to see if there has been any change.
- Whether a recommended product is suitable for a particular application must be checked by the user and confirmed in his technical documentation.
- For the Sistema project file of this circuit, the document [↗ 100395 Notes on Sistema project files](#) must be taken into account.

1.3 Notes on safety-related features of the partial circuit

- For safety sub-functions with 1-channel architecture of the safety circuit (here category 1), a failure leads to a failure of the safety sub-function.
- The consideration of measures for failures due to common cause (CCF) are not necessary for category 1.
- The calculation of the MTTF₀ characteristics from the B₁₀ values are included in the Sistema project file. The B₁₀ value and actuation rate must be adjusted according to the valves used.

2 Circuit



According to ISO 14118 enclosed pressurized air shall be marked and shall be provided with a possibility for manual pressure release. A dangerous movement can occur if the pressure is manually exhausted. Leakage can cause movements that cannot be stopped. Additional protective measures may be necessary.



In the event of a failure of Q1 or Q2 compressed air can flow through the piloted check valves until the forces are balanced. This can lead to an increased run-on time or movement of the drive, which should not lead to any hazard.

Parts list

Pos...	Identifi...	Description
1	G1	Operation pressure
2	G2	Pilot air
3	K1	3/2-way valve
4	M1	Double-acting drive
5	Q1	3/2-way valve
6	Q2	3/2-way valve
7	Q3	Piloted check valve
8	Q4	Piloted check valve
9	R1	Silencer
10	R2	Silencer
11	R3	Silencer
12	S1	2/2-way valve
13	S2	2/2-way valve

Safety subfunction

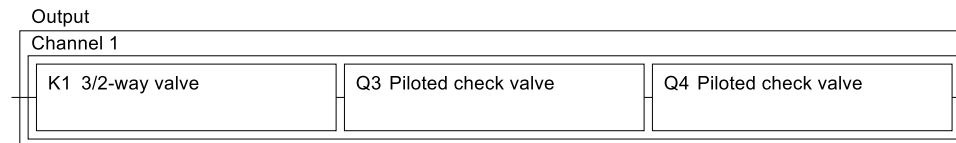
SSC - Safe Stopping and Closing

up to category 1, up to PL c can be reached

PUS - Prevention unexpected start-up

up to category 1, up to PL c can be reached

Block diagram



3 Suitable Products for Valve K1

- Based on the following features, suitable valves from Festo can be selected using the features in the data sheets available online.
- Depending on the application, it must be evaluated whether this list of features needs to be extended.
- Additional information on these features can be found in the document [↗ 100396 Notes on features of directional control valves.](#)

Feature	Value
Product category	Electrically actuated valves
Valve function	3/2 closed monostable 2 x 3/2 closed monostable
Type of actuation	Electric
Type of piloting	Pilot actuated
Pilot air supply	Internal or external
Type of reset	Mechanical spring
Duty cycle	100 % OR 100 % with holding current reduction
Service-life value B ₁₀	Specified
Relevant basic safety principles	Yes
Relevant well-tried safety principles	Yes
Well-tried component	Yes

Other values for the features may be possible and must be considered separately.

Note: These valves were selected as examples from different series and sizes.

No.	Material		Designation/Type (Sorting ↑)	Code ¹	Data Sheet	Data Sheet Product Reliability
<i>Single valves</i>						
1.	574348		Solenoid valve VUVG-L10-T32C-MT-M5-1P3		↗	↗
2.	574352		Solenoid valve VUVG-L10-T32C-MZT-M5-1P3		↗	↗
3.	575274	★	Solenoid valve VUVS-L20-M32C-MD-G18-F7-1C1		↗	↗
4.	575273	★	Solenoid valve VUVS-L20-M32C-MZD-G18-F7-1C1		↗	↗
<i>Valve for valve terminals</i>						
5.	556838		Solenoid valve VMPA1-M1H-KS-PI	KS	↗	↗
6.	573413		Solenoid valve VUVG-B10-T32C-MZT-F-1T1L	VK	↗	↗
7.	8187061		Solenoid valve VUVX-BK10-T32C-MZH-F-1T1L	K	↗	↗

★ Core product range

¹ Code of the valve for the configurator or in the order code of the valve terminal.

4 Suitable Products for Valve Q1, Q2

- Based on the following features, suitable valves from Festo can be selected using the features in the data sheets available online.
- Depending on the application, it must be evaluated whether this list of features needs to be extended.
- Additional information on these features can be found in the document [↗ 100396 Notes on features of directional control valves](#).

Feature	Value
Product category	Electrically actuated valves
Valve function	3/2 closed monostable 2 x 3/2 closed monostable
Type of actuation	Electric
Type of piloting	Pilot actuated
Pilot air supply	Internal or external
Type of reset	Mechanical spring
Duty cycle	100 % OR 100 % with holding current reduction

Other values for the features may be possible and must be considered separately.

Note: These valves were selected as examples from different series and sizes.

No.	Material		Designation/Type (Sorting ↑)	Code ¹	Data Sheet	Data Sheet Product Reliability
<i>Single valves</i>						
1.	574348		Solenoid valve VUVG-L10-T32C-MT-M5-1P3		↗	↗
2.	574352		Solenoid valve VUVG-L10-T32C-MZT-M5-1P3		↗	↗
3.	575274	★	Solenoid valve VUVS-L20-M32C-MD-G18-F7-1C1		↗	↗
4.	575273	★	Solenoid valve VUVS-L20-M32C-MZD-G18-F7-1C1		↗	↗
<i>Valve for valve terminals</i>						
5.	556838		Solenoid valve VMPA1-M1H-KS-PI	KS	↗	↗
6.	573413		Solenoid valve VUVG-B10-T32C-MZT-F-1T1L	VK	↗	↗
7.	8187061		Solenoid valve VUVX-BK10-T32C-MZH-F-1T1L	K	↗	↗

★ Core product range

¹ Code of the valve for the configurator or in the order code of the valve terminal.

5 Suitable Products for Valve Q3, Q4

- Based on the following features, other suitable valves from Festo can also be selected using the features in the data sheets available online.
- Depending on the application, it must be evaluated whether this list of features needs to be added.

Feature	Value
Product category	piloted check valve
Valve function	piloted non-return function
Type of actuation	Pneumatic
Service-life value B ₁₀	specified
Well-tried component	yes

Other values for the features may be possible and must be considered separately.

Note: These valves were selected as examples from different series and sizes.

No.	Material	★	Designation/Type (Sorting ↑)	Data Sheet	Data Sheet Product Reliability
1.	530030	★	Piloted non return valve HGL-1/2-QS-B	↗	↗
2.	8001459		One-way flow control valve VFOF-LE-BAH-G18-Q6	↗	↗

★ Core product range

6 Suitable Products for Valve S1, S2

- The valves S1, S2 shall not negatively influence the implemented safety sub-functions. It is possible to use manual overrides with fault exclusions. Other measures may also be suitable.
- Based on the following features, suitable valves from Festo can be selected using the features in the data sheets available online.
- Depending on the application, it must be evaluated whether this list of features needs to be extended.

Feature	Value
Product category	Manual override
Valve function	2/2 monostable
Type of actuation	Manual
Service-life value B ₁₀	Specified
Relevant basic safety principles	Yes
Relevant well-tried safety principles	Yes
Well-tried component	Yes
Fault exclusions	• Bursting of the valve housing: externally directed failure of the material structure with a sudden release of the medium and associated pressure drop (according to ISO 5598, 3.2.85). • Spontaneous opening of the manual exhaust function in pressurised and depressurised condition.

Other values for the features may be possible and must be considered separately.

Note: These valves were selected as examples from different series and sizes.

No.	Material	Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability	Operating life
1.	184585	HAB-1/8	↗	↗	2000 cycles (value stated in internal data sheet)

Note regarding the manual override HAB

- Confirmation as a “well-tried component in accordance with ISO 13849-1” is considered unnecessary, since a fault exclusion has been established for each of the dangerous failures “bursting” and “spontaneous opening.” Other failures, such as “sticking in the actuated or rest position,” were assessed by us as non-dangerous and detectable.

7 Used Literature

7.1 Cited Documents from Festo

- [1] [100393 Safe electrical switch-off of individually controlled valves](#)
- [2] [100394 Safe electrical switch-off of valve terminals](#)
- [3] [100395 Notes on Sistema project files](#)
- [4] [100396 Notes on features of directional control valves](#)
- [5] [100406 Safety subfunctions pneumatics – SSC, PUS](#)

7.2 Standards

- [6] DIN EN ISO 4414:2011-04 – Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010); German version EN ISO 4414:2010
- [7] ISO 5598:2020-01 – Fluid power systems and components - Vocabulary
- [8] VDMA 24584:2022-06 – Safety functions of regulated and unregulated (fluid) mechanical systems; German Version
- [9] 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
- [10] DIN EN ISO 13849-1:2023-12 – Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2023); German version EN ISO 13849-1:2023
- [11] 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
- [12] ISO 19973-1:2015-08 - Pneumatic fluid power - Assessment of component reliability by testing - Part 1: General procedures
- [13] DIN EN 61508:2011-02 - Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508:2010); German version EN 61508:2010
- [14] DIN EN 61508-4:2011-02 - Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and abbreviations (IEC 61508-4:2010); German version EN 61508-4:2010
- [15] DIN EN 61511:2019-02 - Functional safety - Safety instrumented systems for the process industry sector - (IEC 61511:2016); German version EN 61511:2017
- [16] DIN EN IEC 62061:2023-02 - Safety of machinery - Functional safety of safety-related control systems (IEC 62061:2021); German version EN IEC 62061:2021

7.3 Legal Regulations

- [17] 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)
- [18] Machinery Regulation: Regulation (EU) 2023/1230 of the European Parliament and of the Council of 14 June 2023 on machinery and repealing Directive 2006/42/EC of the European Parliament and of the Council and Council Directive 73/361/EEC

8 Information about the Document

8.1 General Information

Document Number	100501	
Safety Subfunction	SSC	PUS
Category	up to category 1 can be reached	up to category 1 can be reached
PL	up to PL c can be reached	up to PL c can be reached

8.2 Revision History

Ver.	Date	Ed.	Chapter	Description of Change/Impact
1.10	2023-03-21	JKHL	All	Creation of the document
1.40	14.08.2026	JKHL	Last page	Addition contact possibilities
			2	Note on drawing adapted
			3, 4, 5	Product lists updated
			6	Section added
			2, 4, 5, 6, 7	Updating the links to the Support Portal and standards
1.30	2024-05-10	JKHL	2, 4, 7	Updating the links to the Support Portal and standards
1.40	14.08.2026	JKHL	All	Update layout
			6	Manual override HAB added

8.3 Approval/Release of the Document

Role	Signature
Release	

8.4 Period of Validity

Document is valid until 2029-08-14 or until one of the documents used or the required relevant base are changed.



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