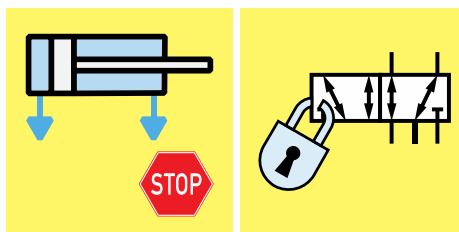


Circuit

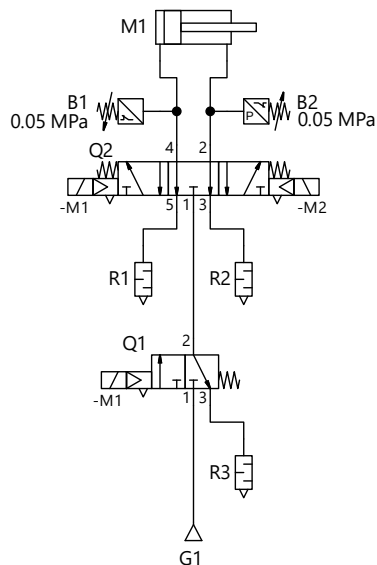
Safety-Subfunctions Pneumatic

STO – Safe Torque Off – up to Cat. 1, up to PL c

PUS – Prevention unexpected start-up – up to Cat. 2, up to PL d



100383



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Title Safety Subfunctions Pneumatics - Circuit
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The actual characteristic values that can be obtained (especially PL, PFH_D, category, DC, MTTF_D, CCF, SIL, HFT, PFH, PFD) depend on the components used, as well as their conditions of use in the actual application.

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This document is only suitable for persons with sufficient expertise for machine safety based on ISO 12100, EN 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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1 General

1.1 Objectives of this Document

- This document shows a possible example circuit for the safety sub-functions STO (up to category 1, up to PL c) and PUS (up to category 2, up to PL d).
- For the implementation of the safety sub-function relevant components, the most important features are listed.
- Based on these features, suitable products from Festo are recommended.

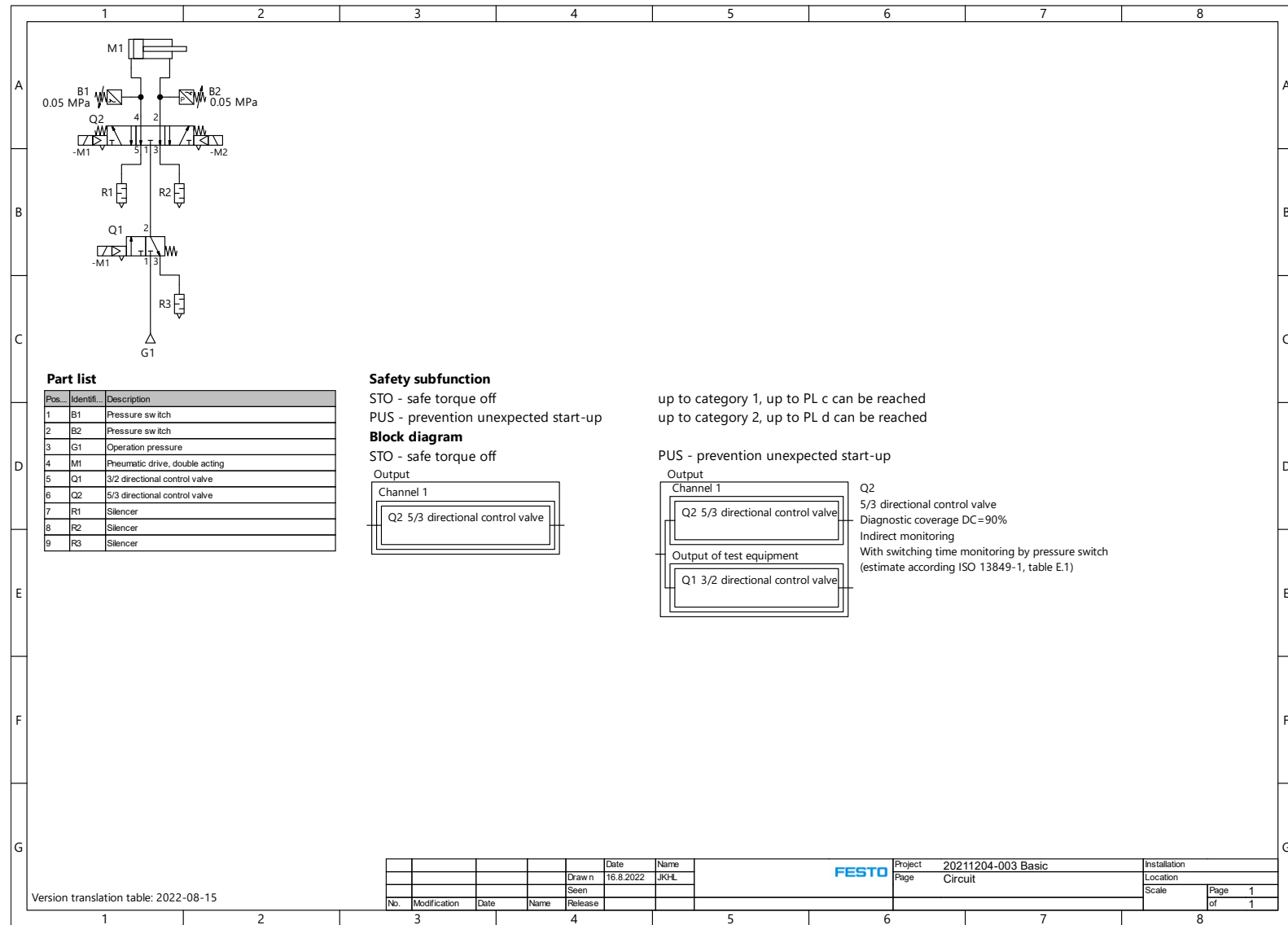
1.2 General Notes

- 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 "100380 Safety subfunctions pneumatics – STO, 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.
- The requirements specified here for the components are minimum requirements. These must be extended by the requirements of the specific application.
- 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 subfunctions with 1-channel architecture of the safety circuit (here category 1), a single fault leads to a failure of the safety subfunction.
- For safety subfunctions with 1-channel architecture and testing of the safety circuit (here category 2), a single fault between the tests can lead to the loss of the safety subfunction. The loss of the safety subfunction is detected by the test.
- The consideration of measures for failures due to common cause (CCF) are to be evaluated depending on the application. Recommendations on possible measures are contained in the document "100399 Recommendations for the implementation of measures against common cause failures (CCF)".
- The calculation of the MTTF_D characteristic from the B₁₀ values are included in the Sistema project file. The B₁₀ value must be adjusted according to the valves used.
- In order to estimate a diagnostic coverage for valve Q2, a suitable time monitoring of the control signals up to the signal change of sensors B1, B2 should be implemented (switching time monitoring).

2 Circuit



3 Suitable Products for Sensors B1, B2

3.1 Pressure Switch

- Based on the following features, other suitable pressure switches 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	Pressure switch
Measured variable	Relative pressure
Switching element function	antivalent OR NC contact OR changeover OR switchable
Operating pressure	0 – 8 bar OR 1 – 10 bar OR 1 – 12 bar OR -1 – 10 bar
As an alternative to the operating pressure the start and end value for pressure measuring range can be used.	
Start value for pressure measuring range	0 bar
End value for pressure measuring range	10 bar

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

Note: This list of suitable products does not claim to be complete.

No.	Material	Designation/Type (Sorting ↑)	Link Data Sheet
1.	10773	PRESSURE SWITCH PEV-1/4-B	↗
2.	192488	PRESSURE SWITCH PEV-1/4-B-M12	↗
3.	175250	PRESSURE SWITCH PEV-1/4-B-OD	↗
4.	161760	PRESSURE SWITCH PEV-1/4-SC-OD	↗
5.	8000210	PRESSURE SWITCH SPBA-P2R-G18-2P-M12-0,25X	↗
6.	8000033	PRESSURE SWITCH SPBA-P2R-G18-W-M12-0,25X	↗

3.2 Pressure sensors

- Based on the following features, other suitable pressure sensors 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	Pressure sensors
Measured variable	Relative pressure
Switching element function	NC/NO contact switchable OR switchable OR NC contact
Switching output	Contains "PNP"
Operating pressure	0 – 8 bar OR 1 – 12 bar OR -1 – 10 bar
As an alternative to the operating pressure the start and end value for pressure measuring range can be used.	
Start value for pressure measuring range	-1 bar OR 0 bar
End value for pressure measuring range	The end value should be ≥ 6 bar.

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

Note: This list of suitable products does not claim to be complete.

No.	Material		Designation/Type (Sorting ↑)	Link Data Sheet
1.	539679		DRUCKSENSOR SDE3-D10S-B-...-2P-...	↗
2.	539679		DRUCKSENSOR SDE3-D10D-B-...-2P-...	↗
3.	529027		DRUCKSENSOR SDE5-D10-C-...-P-...	↗
4.	542889	★	DRUCKSENSOR SDE5-D10-C-Q4E-P-M8	↗
5.	542895	★	DRUCKSENSOR SDE5-D10-C-Q6E-P-K	↗
6.	542894	★	DRUCKSENSOR SDE5-D10-C-Q6E-P-M8	↗
7.	8001449		DRUCKSENSOR SPAE-P10R-F-PNLK-2.5K	↗
8.	8001447		DRUCKSENSOR SPAE-P10R-Q3-PNLK-2.5K	↗
9.	8001448		DRUCKSENSOR SPAE-P10R-Q4-PNLK-2.5K	↗
10.	8001445		DRUCKSENSOR SPAE-P10R-S4-PNLK-2.5K	↗
11.	8001446		DRUCKSENSOR SPAE-P10R-S6-PNLK-2.5K	↗
12.	8003300		DRUCKSENSOR SPAN-B11R-...-PN..-...	↗
13.	8003300		DRUCKSENSOR SPAN-P10-...-PN..-...	↗
14.	8001200		DRUCKSENSOR SPAU-P10R-...-PNLK	↗
15.	8001200		DRUCKSENSOR SPAU-P16R-...-PNLK	↗
16.	8001200		DRUCKSENSOR SPAU-P6R-...-PNLK	↗

4 Suitable Products for Valve Q1

4.1 Standard and Single Valves

- 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.
- 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 directional control valves
Valve function	3/2-way, closed, monostable
Type of actuation	electric
Type of piloting	pilot actuated
Type of reset	mechanical spring
Duty cycle	100 %
Service-life value B ₁₀	specified
Relevant basic safety principles	yes
Relevant well-tried safety principles	yes
If the “relevant basic and well-tried safety principles” are not specified, the feature “well-tried component” can also confirm compliance with the safety principles.	
Well-tried component	yes

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

Note: This list of suitable products does not claim to be complete.

No.	Material		Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability
1.	8042554	★	SOLENOID VALVE VUVG-BK10-T32C-AT-F-1H2L-S	↗	↗
2.	8042558	★	SOLENOID VALVE VUVG-BK10-T32C-AT-F-1R8L-S	↗	↗
3.	8042570	★	SOLENOID VALVE VUVG-BK14-T32C-AT-F-1H2L-S	↗	↗
4.	8042574	★	SOLENOID VALVE VUVG-BK14-T32C-AT-F-1R8L-S	↗	↗
5.	8042538	★	SOLENOID VALVE VUVG-LK10-T32C-AT-M5-1H2L-S	↗	↗
6.	8042542	★	SOLENOID VALVE VUVG-LK10-T32C-AT-M5-1R8L-S	↗	↗
7.	8042546	★	SOLENOID VALVE VUVG-LK10-T32C-AT-M7-1H2L-S	↗	↗
8.	8042550	★	SOLENOID VALVE VUVG-LK10-T32C-AT-M7-1R8L-S	↗	↗
9.	8042562	★	SOLENOID VALVE VUVG-LK14-T32C-AT-G18-1H2L-S	↗	↗
10.	8042566	★	SOLENOID VALVE VUVG-LK14-T32C-AT-G18-1R8L-S	↗	↗
11.	575274	★	SOLENOID VALVE VUVS-L20-M32C-MD-G18-F7-1C1	↗	↗
12.	575475	★	SOLENOID VALVE VUVS-L25-M32C-AD-G14-F8-1C1	↗	↗
13.	575473		SOLENOID VALVE VUVS-L25-M32C-MD-G14-F8	↗	↗
14.	575481		SOLENOID VALVE VUVS-L25-M32C-MD-G14-F8-1B2	↗	↗
15.	575477	★	SOLENOID VALVE VUVS-L25-M32C-MD-G14-F8-1C1	↗	↗
16.	575474		SOLENOID VALVE VUVS-L25-M32C-MZD-G14-F8	↗	↗
17.	575482		SOLENOID VALVE VUVS-L25-M32C-MZD-G14-F8-1B2	↗	↗
18.	575478		SOLENOID VALVE VUVS-L25-M32C-MZD-G14-F8-1C1	↗	↗
19.	575568	★	SOLENOID VALVE VUVS-L30-M32C-AD-G38-F8-1C1	↗	↗
20.	575566		SOLENOID VALVE VUVS-L30-M32C-MD-G38-F8	↗	↗
21.	575574		SOLENOID VALVE VUVS-L30-M32C-MD-G38-F8-1B2	↗	↗
22.	575570	★	SOLENOID VALVE VUVS-L30-M32C-MD-G38-F8-1C1	↗	↗
23.	575567		SOLENOID VALVE VUVS-L30-M32C-MZD-G38-F8	↗	↗

No.	Material		Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability
24.	575575		SOLENOID VALVE VUVS-L30-M32C-MZD-G38-F8-1B2	↗	↗
25.	575571		SOLENOID VALVE VUVS-L30-M32C-MZD-G38-F8-1C1	↗	↗
26.	8043217	★	SOLENOID VALVE VUVS-LK25-M32C-AD-G14-1B2-S	↗	↗
27.	8049880	★	SOLENOID VALVE VUVS-LK30-M32C-AD-G38-1B2-S	↗	↗
28.	577490		SOLENOID VALVE VUVS-LT20-M32C-MD-G18-F7	↗	↗
29.	577511		SOLENOID VALVE VUVS-LT20-M32C-MD-G18-F7-1C1	↗	↗
30.	577491		SOLENOID VALVE VUVS-LT20-M32C-MZD-G18-F7	↗	↗
31.	577512		SOLENOID VALVE VUVS-LT20-M32C-MZD-G18-F7-1C1	↗	↗
32.	8035167		SOLENOID VALVE VUVS-LT25-M32C-MD-G14-F8	↗	↗
33.	8035171		SOLENOID VALVE VUVS-LT25-M32C-MD-G14-F8-1B2	↗	↗
34.	8035169		SOLENOID VALVE VUVS-LT25-M32C-MD-G14-F8-1C1	↗	↗
35.	8035168		SOLENOID VALVE VUVS-LT25-M32C-MZD-G14-F8	↗	↗
36.	8035172		SOLENOID VALVE VUVS-LT25-M32C-MZD-G14-F8-1B2	↗	↗
37.	8035170		SOLENOID VALVE VUVS-LT25-M32C-MZD-G14-F8-1C1	↗	↗
38.	8036672		SOLENOID VALVE VUVS-LT30-M32C-MD-G38-F8	↗	↗
39.	8036676		SOLENOID VALVE VUVS-LT30-M32C-MD-G38-F8-1B2	↗	↗
40.	8036674		SOLENOID VALVE VUVS-LT30-M32C-MD-G38-F8-1C1	↗	↗
41.	8036673		SOLENOID VALVE VUVS-LT30-M32C-MZD-G38-F8	↗	↗
42.	8036677		SOLENOID VALVE VUVS-LT30-M32C-MZD-G38-F8-1B2	↗	↗
43.	8036675		SOLENOID VALVE VUVS-LT30-M32C-MZD-G38-F8-1C1	↗	↗

4.2 On-Off Valves

- 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.
- Additional information on these features can be found in the document “100396 Notes on features of directional control valves

Feature	Value
Product category	On-off Valves
Valve function	3/2-way, closed, monostable
Type of actuation	electric
Type of piloting	pilot actuated
Type of reset	mechanical spring
Duty cycle	100 %
Service-life value B ₁₀	specified
Relevant basic safety principles	yes
Relevant well-tried safety principles	yes
If the “relevant basic and well-tried safety principles” are not specified, the feature “well-tried component” can also confirm compliance with the safety principles.	
Well-tried component	yes

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

Note: This list of suitable products does not claim to be complete.

No.	Material		Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability
1.	542578	★	ON-OFF VALVE MS4-EE-1/4-10V24	↗	↗
2.	542598	★	ON-OFF VALVE MS4-EE-1/4-10V24-S	↗	↗
3.	542599		ON-OFF VALVE MS4-EE-1/4-10V24-S-Z	↗	↗
4.	542579		ON-OFF VALVE MS4-EE-1/4-10V24-Z	↗	↗
5.	542580		ON-OFF VALVE MS4-EE-1/8-10V24	↗	↗
6.	542600		ON-OFF VALVE MS4-EE-1/8-10V24-S	↗	↗
7.	542582	★	ON-OFF VALVE MS6-EE-1/2-10V24	↗	↗
8.	542602	★	ON-OFF VALVE MS6-EE-1/2-10V24-S	↗	↗
9.	542603		ON-OFF VALVE MS6-EE-1/2-10V24-S-Z	↗	↗
10.	542583		ON-OFF VALVE MS6-EE-1/2-10V24-Z	↗	↗
11.	542584		ON-OFF VALVE MS6-EE-1/4-10V24	↗	↗
12.	542604		ON-OFF VALVE MS6-EE-1/4-10V24-S	↗	↗
13.	542586		ON-OFF VALVE MS6-EE-3/8-10V24	↗	↗
14.	542606		ON-OFF VALVE MS6-EE-3/8-10V24-S	↗	↗

4.3 Soft-Start/Quick Exhaust Valve

- Based on the following features, other suitable pressure sensors 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.
- Additional information on these features can be found in the document “100396 Notes on features of directional control valves

Feature	Value
Product category	Soft-Start/Quick Exhaust Valve
Release technical data	yes
Valve function	3/2-way, closed, monostable, soft-start function
Type of actuation	electric
Type of piloting	pilot actuated
Type of reset	mechanical spring
Duty cycle	100 %
Service-life value B ₁₀	specified
Performance Level (PL)	specified

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

Note: This list of suitable products does not claim to be complete.

No.	Material	Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability
1.	8001469	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-C-10V24-S	↗	↗
2.	8038489	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-D-10V24-2M8	↗	↗
3.	8038490	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-D-10V24-2M8-SO-AG	↗	↗
4.	8038492	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-D-10V24-2OE-SO-AG	↗	↗
5.	8038491	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-D-10V24P-2M12-SO-AG	↗	↗
6.	562580	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-E-10V24-AD1	↗	↗
7.	548715	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-E-10V24-AG	↗	↗
8.	548717	SOFT-START/QUICK EXHAUST VALVE MS6-SV-1/2-E-10V24-SO-AG	↗	↗
9.	570737	SOFT-START/QUICK EXHAUST VALVE MS9-SV-G-C-V24-S-VS	↗	↗

5 Suitable Products for Valve 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	5/3 exhausted
Type of actuation	electric
Type of piloting	pilot actuated
Type of reset	mechanical spring
Duty cycle	100 % OR 100 % with holding current reduction
Service-life value B ₁₀	specified
Well-tried component	yes

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

Note: This list of suitable products does not claim to be complete.

No.	Material	Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability
1.	546745	BASIC VALVE VSVA-B-P53E-A1-P1	↗	↗
2.	546746	BASIC VALVE VSVA-B-P53E-A2-P1	↗	↗
3.	8023545	SOLENOID VALVE VMPA14-M1H-E-G1/8-PI	↗	↗
4.	8023562	SOLENOID VALVE VMPA14-M1H-E-S-G1/8-PI	↗	↗
5.	533380	SOLENOID VALVE VMPA1-M1H-E-M7-PI	↗	↗
6.	533346	SOLENOID VALVE VMPA1-M1H-E-PI	↗	↗
7.	533389	SOLENOID VALVE VMPA1-M1H-E-S-M7-PI	↗	↗
8.	8022038	SOLENOID VALVE VMPA2-M1BH-E-PI	↗	↗
9.	537967	SOLENOID VALVE VMPA2-M1H-E-G1/8-PI	↗	↗
10.	537956	SOLENOID VALVE VMPA2-M1H-E-PI	↗	↗
11.	537976	SOLENOID VALVE VMPA2-M1H-E-S-G1/8-PI	↗	↗
12.	546706	SOLENOID VALVE VSVA-B-P53E-H-A1-1C1	↗	↗
13.	534540	SOLENOID VALVE VSVA-B-P53E-H-A1-1R2L	↗	↗
14.	534560	SOLENOID VALVE VSVA-B-P53E-H-A1-1R5L	↗	↗
15.	547144	SOLENOID VALVE VSVA-B-P53E-H-A1-5C1	↗	↗
16.	546707	SOLENOID VALVE VSVA-B-P53E-H-A2-1C1	↗	↗
17.	534779	SOLENOID VALVE VSVA-B-P53E-H-A2-1R2L	↗	↗
18.	546772	SOLENOID VALVE VSVA-B-P53E-H-A2-1R5L	↗	↗
19.	547145	SOLENOID VALVE VSVA-B-P53E-H-A2-5C1	↗	↗
20.	547084	SOLENOID VALVE VSVA-B-P53E-ZH-A1-1C1	↗	↗
21.	534530	SOLENOID VALVE VSVA-B-P53E-ZH-A1-1R2L	↗	↗
22.	534550	SOLENOID VALVE VSVA-B-P53E-ZH-A1-1R5L	↗	↗
23.	547164	SOLENOID VALVE VSVA-B-P53E-ZH-A1-5C1	↗	↗
24.	547085	SOLENOID VALVE VSVA-B-P53E-ZH-A2-1C1	↗	↗
25.	534789	SOLENOID VALVE VSVA-B-P53E-ZH-A2-1R2L	↗	↗
26.	546782	SOLENOID VALVE VSVA-B-P53E-ZH-A2-1R5L	↗	↗
27.	547165	SOLENOID VALVE VSVA-B-P53E-ZH-A2-5C1	↗	↗
28.	566451	SOLENOID VALVE VUVG-B10A-P53E-ZT-F-1P3	↗	↗
29.	566493	SOLENOID VALVE VUVG-B10-P53E-ZT-F-1P3	↗	↗

No.	Material	Designation/Type (Sorting ↑)	Link Data Sheet	Link Data Sheet Product Reliability
30.	574241	SOLENOID VALVE VUVG-B10-P53E-ZT-F-1R8L	↗	↗
31.	573420	SOLENOID VALVE VUVG-B10-P53E-ZT-F-1T1L	↗	↗
32.	566519	SOLENOID VALVE VUVG-B14-P53E-ZT-F-1P3	↗	↗
33.	574249	SOLENOID VALVE VUVG-B14-P53E-ZT-F-1R8L	↗	↗
34.	573486	SOLENOID VALVE VUVG-B14-P53E-ZT-F-1T1L	↗	↗
35.	8041968	SOLENOID VALVE VUVG-B14-P53E-ZT-F-1T1L-EX2C	↗	↗
36.	574453	SOLENOID VALVE VUVG-B18-P53E-ZT-F-1P3	↗	↗
37.	8031547	SOLENOID VALVE VUVG-B18-P53E-ZT-F-1R8L	↗	↗
38.	8004895	SOLENOID VALVE VUVG-B18-P53E-ZT-F-1T1L	↗	↗
39.	566440	SOLENOID VALVE VUVG-L10A-P53E-T-M3-1P3	↗	↗
40.	566446	SOLENOID VALVE VUVG-L10A-P53E-ZT-M3-1P3	↗	↗
41.	566460	SOLENOID VALVE VUVG-L10-P53E-T-M5-1P3	↗	↗
42.	8031475	SOLENOID VALVE VUVG-L10-P53E-T-M5-1R8L	↗	↗
43.	566477	SOLENOID VALVE VUVG-L10-P53E-T-M7-1P3	↗	↗
44.	574225	SOLENOID VALVE VUVG-L10-P53E-T-M7-1R8L	↗	↗
45.	566469	SOLENOID VALVE VUVG-L10-P53E-ZT-M5-1P3	↗	↗
46.	566485	SOLENOID VALVE VUVG-L10-P53E-ZT-M7-1P3	↗	↗
47.	566502	SOLENOID VALVE VUVG-L14-P53E-T-G18-1P3	↗	↗
48.	574233	SOLENOID VALVE VUVG-L14-P53E-T-G18-1R8L	↗	↗
49.	566511	SOLENOID VALVE VUVG-L14-P53E-ZT-G18-1P3	↗	↗
50.	8033557	SOLENOID VALVE VUVG-L18-P53E-G14-P1	↗	↗
51.	574432	SOLENOID VALVE VUVG-L18-P53E-T-G14-1P3	↗	↗
52.	8031535	SOLENOID VALVE VUVG-L18-P53E-T-G14-1R8L	↗	↗
53.	574441	SOLENOID VALVE VUVG-L18-P53E-ZT-G14-1P3	↗	↗
54.	573396	SOLENOID VALVE VUVG-S10-P53E-ZT-M5-1T1L	↗	↗
55.	573408	SOLENOID VALVE VUVG-S10-P53E-ZT-M7-1T1L	↗	↗
56.	573474	SOLENOID VALVE VUVG-S14-P53E-ZT-G18-1T1L	↗	↗
57.	8004883	SOLENOID VALVE VUVG-S18-P53E-ZT-G14-1T1L	↗	↗
58.	575252	SOLENOID VALVE VUVS-L20-P53E-MD-G18-F7	↗	↗
59.	575266	SOLENOID VALVE VUVS-L20-P53E-MD-G18-F7-1C1	↗	↗
60.	575691	SOLENOID VALVE VUVS-L20-P53E-MZD-G18-F7	↗	↗
61.	575692	SOLENOID VALVE VUVS-L20-P53E-MZD-G18-F7-1C1	↗	↗
62.	575537	SOLENOID VALVE VUVS-L25-P53E-MD-G14-F8	↗	↗
63.	575541	SOLENOID VALVE VUVS-L25-P53E-MD-G14-F8-1B2	↗	↗
64.	575539	SOLENOID VALVE VUVS-L25-P53E-MD-G14-F8-1C1	↗	↗
65.	575538	SOLENOID VALVE VUVS-L25-P53E-MZD-G14-F8	↗	↗
66.	575542	SOLENOID VALVE VUVS-L25-P53E-MZD-G14-F8-1B2	↗	↗
67.	575540	SOLENOID VALVE VUVS-L25-P53E-MZD-G14-F8-1C1	↗	↗
68.	575630	SOLENOID VALVE VUVS-L30-P53E-MD-G38-F8	↗	↗
69.	575634	SOLENOID VALVE VUVS-L30-P53E-MD-G38-F8-1B2	↗	↗
70.	575632	SOLENOID VALVE VUVS-L30-P53E-MD-G38-F8-1C1	↗	↗
71.	575631	SOLENOID VALVE VUVS-L30-P53E-MZD-G38-F8	↗	↗
72.	575635	SOLENOID VALVE VUVS-L30-P53E-MZD-G38-F8-1B2	↗	↗
73.	575633	SOLENOID VALVE VUVS-L30-P53E-MZD-G38-F8-1C1	↗	↗

6 Used Literature

6.1 Cited Documents from Festo

- [1] 100380 Safety subfunctions pneumatics – STO, PUS
- [2] 100393 Safe electrical switch-off of individually controlled valves
- [3] 100394 Safe electrical switch-off of valve terminals
- [4] 100395 Notes on Sistema project files
- [5] 100399 Recommendations for the implementation of measures against common cause failures (CCF)
- [6] 100396 Notes on features of directional control valves

6.2 Standards

- [7] 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
- [8] ISO 5598:2020-01 – Fluid power systems and components - Vocabulary
- [9] VDMA 24584:2020-10 – Safety functions of regulated and unregulated (fluid) mechanical systems; German Version
- [10] 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
- [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 61508-4:2011-02 - 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

6.3 For the Legal Notice Additionally

- [14] 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)
- [15] 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
- [16] DIN EN 61508:2011-02 - Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508:2010); German version EN 61508:2010
- [17] DIN EN 61511:2019-02 - Functional safety - Safety instrumented systems for the process industry sector - (IEC 61511:2016); German version EN 61511:2017
- [18] 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

7 Information about the Document

7.1 General Information

Document number	100383	
Project	20211204-003 Basic	
	Circuit	
Safety subfunction	STO	PUS
Category	up to category 1 can be reached	up to category 2 can be reached
PL	up to PL c can be reached	up to PL d can be reached

7.2 Revision History

Ver.	Date	Ed.	Chapter	Description of change/impact
1.10	2022-08-17	JKHL	All	Creation of the document

7.3 Approval/Release of the Document

Role	Signature
Release	

7.4 Period of Validity

Document is valid until 2027-08-17 or until one of the documents used or the required relevant base are changed.