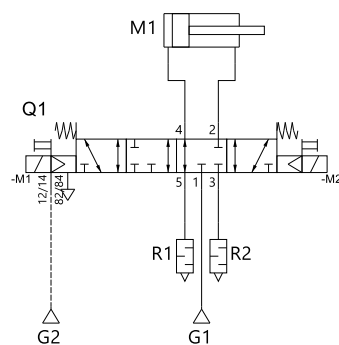
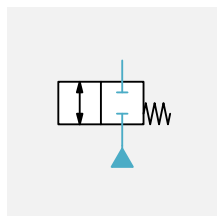


Circuit

SC – Safe Closing with Cat. 1, PL c

Air Solenoid Valve VUVX-BK10-P54E-...



Our effort – your advantage

Our effort for the preparation of these documents

and your saved time 2 h

Free of charge for you.

Title SC with VUVX-P54E, Category 1, PL c
Version 1.10
Document number 100611
Original German
Author Festo
Date 19.08.2026

Legal Notice

In the following, the “Festo SE & Co. KG” is designated as “Festo”.

This document is not binding. This document outlines a possible solution for a sample application and makes no claim of completeness, especially with regard to configuration and equipment, as well as any eventualities for your actual application. This document is not a customised solution, it merely offers assistance with typical task assignments.

The values stated in this document are partly assumptions and assessments which do not replace a detailed examination based on ISO 13849, IEC 61508, IEC 62061 and/or IEC 61511.

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.

This document does not relieve you of the obligation to carry out a risk assessment and a validation of the specific application and to ensure the adherence to all specifications, especially the EC Machinery Directive 2006/42/EG. As the user, you are responsible for your specific application and for the correct operation of the described products.

Festo does not accept any liability for damages arising from the use of any incorrect or incomplete information contained in this documentation or any information missing therefrom. This equally applies to defects resulting from improper handling of devices and modules. In addition, all liability, with the exception of intent or gross negligence on the part of Festo, for damages arising due to non-adherence of the specifications of the EC Machinery Directive 2006/42/EG is also rejected.

The information in this document is in no way intended as a substitute for the operating instructions of the respective manufacturers or the design and testing of the application by the user. The operating instructions for products from Festo can be found at www.festo.com. Users of this document must themselves verify that all the functions described herein also work correctly in the application. Even after examining this document and using the specifications contained herein, users are nevertheless solely responsible for their own application.

Otherwise, all stipulations concerning liability included in the terms and conditions of delivery, payment and use of software from Festo, which can be found at www.festo.com and can be supplied on request, apply.

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

Copyright Notice

This documentation is the intellectual property of Festo, which also holds the exclusive copyright. Any modification of the content, duplication or reprinting of this documentation, as well as distribution to third parties, is only permissible with the express consent of Festo.

Festo reserves the right to make modifications to this document in whole or in part. All brand and product names are trademarks or registered trademarks of their respective owners.

© Festo SE & Co. KG, D - 73734 Esslingen, 2026

Internet: <https://www.festo.com>

Table of Contents

- 1 General 4**
 - 1.1 Objectives of this Document 4
 - 1.2 General Notes 4
 - 1.3 Operation of Air Solenoid Valve VUVX-P54E 4
 - 1.4 Notes on Safety-related Features of the Subcircuit 5
- 2 Circuit Safety Subfunction SC 6**
- 3 Suitable Products for Valve Q1 7**
- 4 Used Literature 8**
 - 4.1 Cited Documents from Festo 8
 - 4.2 Standards 8
 - 4.3 Legal Regulations 8
- 5 Information about the Document 9**
 - 5.1 General Information 9
 - 5.2 Revision History 9
 - 5.3 Approval/Release of the Document 9
 - 5.4 Period of Validity 9

1 General

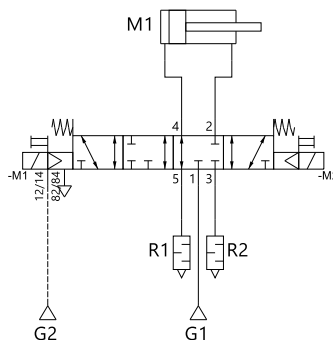
1.1 Objectives of this Document

- This document shows a possible example circuit for the air solenoid valve VUVX-P54E for the safety sub-function “SC – safe closing” 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 safety subfunction SC is based on SSC, where only the closing of the compressed air supply is assessed. The definition and important notes for the safety subfunction used by Festo are contained in the following document:
 - ➤ [100607 Safety Subfunctions Pneumatics – SC](#)
- 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 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 Operation of Air Solenoid Valve VUVX-P54E



The air solenoid valve VUVX-P54E is a special valve with two normal positions and two switching positions. When a valve coil -M1 or -M2 is controlled, the valve shifts to one of the two switching positions. If the valve coils are not controlled, the valve shifts to the nearest normal position. In one of the normal positions, the flow paths through the valve are designed so that one flow path traps compressed air to hold the pneumatic drive in its end position, while the other flow path is exhausted. By trapping compressed air in one chamber of the pneumatic drive, energy is saved because no exhausting occurs.

Important notes

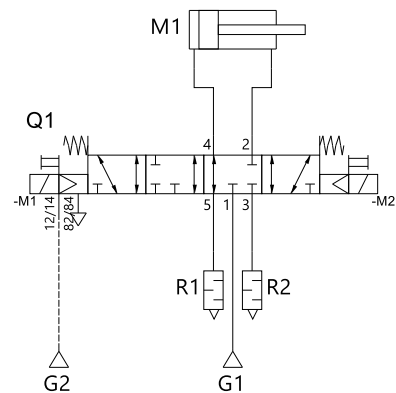
With this type of valve, the valve's switching element can switch between the two middle normal positions during operation even without an input signal. Therefore, it is not possible to assess the safety subfunction "Prevention of unexpected start (PUS)."

Even when switching between the middle resting positions, port 1 remains closed, so no additional compressed air can flow in.

1.4 Notes on Safety-related Features of the Subcircuit

- For safety sub-functions with 1-channel architecture of the safety circuit (here category 1), a failure can lead to a failure of the safety sub-function.
- The consideration of measures due to common cause failures (CCF) are not necessary for category 1.
- The calculation of the $MTTF_0$ characteristics from the B_{10} values are included in the Sistema project file. The B_{10} value and the actuation rate must be adjusted according to the valves used.

2 **Circuit Safety Subfunction SC**



Parts list

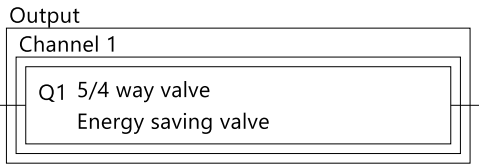
Pos....	Identifi...	Description
1	G1	Operation pressure
2	G2	Pilot pressure
3	M1	Double-acting drive
4	Q1	5/4 way valve
5	R1	Silencer
6	R2	Silencer

Safety subfunction

SC - Safe Closing

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

Block diagram (single valves)



3 Suitable Products for Valve Q1

- 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	5/4 exhausted
Type of actuation	Electric
Type of piloting	Pilot actuated
Pilot air supply	External
Type of reset	Mechanical spring
Duty cycle	100 %
Service-life value B ₁₀	Specified
Basic safety principles	Yes
Well-tried safety principles	Yes Note: the well-tried safety principle of a “safe position” for the two normal positions is not maintained.
Well-tried component	Yes

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

No.	Material	Designation/Type (Sorting ↑)	Code ¹	Link Data Sheet	Link Data Sheet Product Reliability
	<i>Valve for valve terminals</i>				
1.	8187067	Air solenoid valve VUVX-BK10-P54E-MZH-F-1T1L	ND	↗	↗

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

Important notes

- The safety subfunction “Prevention of unexpected start (PUS)” cannot be evaluated. The reasons are:
 - According to the product reliability datasheet, an excessive back pressure (simultaneous exhausting of 18 pilot valves on the same valve terminal) can cause switching between the two normal positions of the valve's main stage.
 - There is no fault exclusion for “spontaneous change of the main stage without an input signal” for the two normal positions.

4 Used Literature

4.1 Cited Documents from Festo

- [1] [100607 Safety Subfunction Pneumatic – SC](#)
- [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](#)

4.2 Standards

- [5] 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
- [6] ISO 5598:2020-01 – Fluid power systems and components - Vocabulary
- [7] VDMA 24584:2022-06 – Safety functions of regulated and unregulated (fluid) mechanical systems; German Version
- [8] 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
- [9] 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
- [10] 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
- [11] DIN EN 61508:2011-02 - Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508:2010); German version EN 61508:2010
- [12] 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
- [13] DIN EN 61511:2019-02 - Functional safety - Safety instrumented systems for the process industry sector - (IEC 61511:2016); German version EN 61511:2017
- [14] 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

4.3 Legal Regulations

- [15] 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 Information about the Document

5.1 General Information

Document Number	100611
Safety Subfunction	Safe Closing (SC)
Category	1
PL	c

5.2 Revision History

Ver.	Date	Ed.	Chapter	Description of Change/Impact
1.10	19.08.2026	JKHL	All	Creation of document

5.3 Approval/Release of the Document

Role	Signature
Release	

5.4 Period of Validity

Document is valid until 2031-08-19 or until one of the documents used or the required relevant base are changed.



Do you have any questions about this Application Note?

You are welcome to send us your questions via the contact form.



Are you looking for Safety Application Notes with solution examples for the most important safety sub-functions in pneumatics?

We regularly expand our collection of documents in the Support Portal.



Do you want to get a general overview of machine and system safety?

We have compiled information on machine and functional safety in our guide.

Download the guide.



Do you need further support?

We also offer services for machine safety

- Risk assessment
- Safety concept
- Circuit design
- Verification / validation



You can request a quotation via the contact form.

Do you need training or further education?

At Festo Didactic you will find training courses on machine safety, functional safety and CE marking.



Request a quote for training or workshop.

