

Start - Contents Application Note

Each Safety Application Notes considers one aspect of a safety circuit. Therefore, implementing a safety circuit in a specific application always requires several documents that are linked in the application note.

Important notes

- Please unzip the zip file and save it in a folder. Some programs used cannot open files in compressed folders.
- Certain programs are required to open some files, see section → **“Fehler! Verweisquelle konnte nicht gefunden werden.”**

Contents of the application notes

Normally contains every application note the following files:

- **Application Note (in pdf format)**
Document with the description, circuit, required features of components and product recommendations from Festo.
- **Sistema project (in Sistema format and as Sistema report in pdf format)**
Sistema project for the evaluation of the sub-circuit for the safety sub-function according to the block diagram in the application note. As a rule, this is only the safety-related output of the pneumatic safety circuit.
- **FluidDraw Project (in FluidDraw format and in pdf format)**
FluidDraw project with the subcircuit for the safety subfunction according to the description in the application note.
- **FluidDraw Translation Table DE – EN (in FluidDraw format)**
- The FluidDraw project was created with a translation table in order to be able to select and display different languages (German and English). To integrate the translation table into a FluidDraw project, see → “
- Recommendations for required software

To use this Application Note fully, the following software is required:

- PDF reader for files in pdf format
We recommend the free 🗑 Adobe Acrobat Reader. Files in PDF format are stored in version 1.5 or 1.7.

Date

May 18th, 2026

Our Reference

100386

Legal form:
Limited partnership
Registered office: Esslingen a. N.
Registry court Stuttgart
HRA 211583
Value added tax id. number:
DE 145 339 206
General partner:
Festo Management SE
Registered office: Esslingen a. N.
Registry court Stuttgart
HRB 782421
Management Board:
Dr. Sebastian Beck
Dipl.-Ing. (FH) Thomas Böck
(Chairman)
Dipl.-Ing. (FH) Frank Notz
Dr. Jaroslav Patka
Prof. Dr.-Ing. Tomas Smetana
Chairman of the Supervisory Board:
Dr. Friedrich Eichiner

Festo SE & Co. KG

Ruiter Straße 82

73734 Esslingen

Phone +49(711)347-0

GERMANY

www.festo.com

- **Sistema**
Sistema is a software assistant for evaluation of safety circuits in machinery according to ISO 13849-1. This is free software provided by the Institute for Occupational Safety and Health (IFA). ➔ Software Assistant Sistema.
For creation and editing, version 2.0.8 was used. Earlier versions may not be able to open the file.
- **FluidDraw**
FluidDraw enables quick, easy creation of pneumatic, hydraulic, and electrical schematics. It is a commercial program available from Festo ➔ FluidDraw 365.
Version 6.2 of FluidDraw was used for creation and editing. Earlier versions may not be able to open the project.
- **FluidSim**
FluidSim allows simulation of pneumatic, hydraulic, and electrical circuits at schematic level. For the simulations in this Application Note, the Windows version with paid licenses for pneumatics and electrical engineering is required ➔ FluidSim.
Version 6.2 of FluidSim was used for creation and editing. Earlier versions may not be able to run the simulations.
- **MP4 video player**
A video player capable of playing MP4 files is required to view the video demonstrating the simulation of the pneumatic circuit. On Windows, the Media Player is typically available and suitable for playback.

Instructions translation table for FluidDraw”.

- **FluidSim Project (in FluidSim format)**
FluidSim project includes a possible electrical circuit and the pneumatic partial circuit for the specified safety subfunctions. This project file can be used to test and demonstrate the circuit’s operation via simulation. A description of the components used and instructions for the simulation are included in the FluidSim project. Prior knowledge of FluidSim is assumed. For an example how to use the simulation see ➔ [“Instructions for simulation with FluidSim.”](#)
- **Video**
The video shows and explains the simulation of the pneumatic part of the circuit.

Recommendations for required software

To use this Application Note fully, the following software is required:

- PDF reader for files in pdf format
We recommend the free ➔ [Adobe Acrobat Reader](#). Files in PDF format are stored in version 1.5 or 1.7.
- Sistema
Sistema is a software assistant for evaluation of safety circuits in machinery according to ISO 13849-1. This is free software provided by the Institute for Occupational Safety and Health (IFA). ➔ [Software Assistant Sistema](#).
For creation and editing, version 2.0.8 was used. Earlier versions may not be able to open the file.
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- MP4 video player
A video player capable of playing MP4 files is required to view the video demonstrating the simulation of the pneumatic circuit. On Windows, the Media Player is typically available and suitable for playback.

Instructions translation table for FluidDraw

The translation table can be loaded with the following steps:

1. Select the “Manage” menu
2. Select the “Translation tables” menu item
3. Select the “Open...” button

4. Select the file "... FluidDraw Translation Table DE - EN.xmltt"
5. The columns TextID, German and US-English are displayed in the "Words" table
6. The "Manage translation tables" window can be closed with the OK button
7. Select the "Project" menu
8. Select the "Language" menu item
9. Select the file "... Translation Table DE - EN.xmltt" in the "Translation table" selection list (usually the lowest file in the list)
10. Select the desired languages in the "Project / Page / Report" and "Translation language" selection lists.

Instructions for simulation with FluidSim

Functions of the components used

- S1 - ON/Reset
The machine is switched on. In the simulation the electrical supply valve Q10 is controlled so that the working pressure for the application is available. The preconditions are:
 - The minimum pressure (setting 3 bar) at pressure switch B10 is exceeded.
 - Emergency stop S3 is not activated.

Notes

- The safety door may be open. Background: For a safety door, the entire pneumatic system does not necessarily need to be exhausted, only the hazardous area. In the case of an emergency-stop situation, however, it must be fully exhausted.
- S2 – OFF
The machine is switched off. The electrical supply valve Q10 is de-energized so that working pressure for the application is no longer available.
- S3 – Emergency stop
Emergency stop is requested, i.e., STO for the application and SDE for the pneumatic system. Valves Q1, Q2 and Q10 are no longer actuated and go to their normal position. Q1, Q2 executes the STO stop function and then PUS when they reach their normal position. The safety subfunction SDE is executed for the pneumatic system. To reset, the emergency-stop switch S3 must be

closed again and the S1 (Reset) button pressed. The normal machine function can then be restarted with S5.

- **S4 – Safety guard door**
STO is requested for the application. Electrically actuated valve Q1, Q2 are no longer actuated and return to their normal position. Q1, Q2 execute STO as a stop function and then PUS when the valves are in normal position. To reset, the guard door switch S4 must be closed and the S1 (Reset) button pressed. The normal machine function can then be restarted with S5.
- **S5 – Start**
Pressing the start button S5 executes the normal machine function, i.e., the pneumatic drive M1 continuously extends and retracts.
- **S6 – Stop**
Pressing the S6 button stops the normal machine function, i.e., the pneumatic drive is functionally stopped.
- **P1 - Safety request indicator**
Indicator P1 shows whether a safety request is present. Before normal machine function can be continued, emergency-stop switch S3, door switch S4, and the contact of pressure switch B10 must be closed and the S1 button pressed.
- **S10 - Manual on/off valve**
The manual on/off valve can interrupt the compressed-air supply and exhaust the immediately downstream pneumatic system. This valve can be used to simulate a loss of pressure.
- **P10, P11 – Pressure gauges**
The pressure gauges can be used to monitor the supply pressure and the regulated working pressure.
- **H10 – Filter**
Filter with condensate drain for adequate compressed air quality.
- **K10 – Pressure regulator**
The pressure regulator is set to 4 bar in the simulation.
- **B10 – Pressure switch**
The pressure switch monitors the minimum working pressure required for the application (setting 3 bar). If the set minimum pressure is not reached, valves Q1, Q2, Q10 are no longer actuated and return to normal position. Q1, Q2

execute the STO stop function and then PUS in the valves' normal position. The safety subfunction SDE is executed for the pneumatic system.

- Q10 – Electric on/off valve
The electric on/off valve in the service unit switches the compressed air supply to the downstream pneumatic system (valve Q1, Q2, X1) on when the switch-on conditions (see S1 – ON/Reset) are met.
- X1 – Pneumatic supply
Compressed-air supply for other parts of a possible pneumatic installation.
- Q1, Q2 – Working valves
The working valves carries out the normal machine function, e.g., extending and retracting the pneumatic drive M1. If a safety request is triggered, the valves are no longer actuated, so they returns to their normal position and interrupts and exhausts the compressed air supply to both chambers of the pneumatic drive M1.
- M1 – Pneumatic drive
The drive to be controlled can be any double-acting pneumatic drive, e.g., cylinders with or without piston rod, grippers.

Simulation procedure

1. Press S1: The machine is switched on, i.e., electrical supply valve Q10 is activated and applies working pressure to the pneumatic system.
2. Press S5: Machine function starts, i.e., the drive moves.
3. Activate guard door S4: Actuation of working valves Q1, Q2 stops, i.e., STO is executed.
4. As long as guard door S4 is open, S5 may be pressed freely without causing movement.
5. Close guard door S4: The safety request from the guard door is reset. The S5 button may be pressed freely without starting movement.
6. Press S1: The safety request is acknowledged and the machine function is allowed to start.
7. Press S5: Machine function starts, i.e., the drive moves.
8. Emergency stop S3: Valves Q1, Q2 and Q10 are no longer actuated, i.e., STO for the application and SDE for the pneumatic system are executed.

9. As long as emergency stop S3 is open, S5 may be pressed freely without causing movement.
10. Close emergency stop S3: The safety request caused by the emergency stop is reset. The S5 button may be pressed freely without starting movement.
11. Press S1: The safety request is acknowledged, and the machine function is allowed to start.
12. Press S5: Machine function starts, i.e., the drive moves.
13. A valve sticking can be simulated by holding the “Shift” key and then clicking with the mouse on a solenoid of valve Q1 or Q2. The valve remains in the then-switched position. Release the “Shift” key.
14. Click the valve to reset the stuck condition.