

## Start – Contents of the Safety Application Notes

Each Safety Application Note examines one aspect of a safety circuit. Therefore, implementing a safety circuit in a specific application usually requires multiple documents, which are linked in the Application Note.

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### Important notes

- Please unzip the zip file and save its contents in a folder. Some programs used may not be able to open files from compressed folders.
- Opening some files requires specific software; see the section “[Recommendations for required software.](#)”

Our Reference  
100382

## Contents of the Application Notes

Typically, each Application Note contains the following files:

- Application Note (PDF)  
Document describing the circuit, required component characteristics, and Festo product recommendations.
- Sistema project (Sistema format and as a Sistema report in PDF)  
Sistema project for evaluating the circuit related to the safety subfunction, according to the block diagram in the Application Note. Usually this covers only the safety-related output of the pneumatic safety circuit. The file is saved in the file format version 3.0.4.
- FluidDraw project (FluidDraw format and PDF)  
FluidDraw project showing the circuit for the safety subfunction as described in the Application Note.
- FluidDraw translation table DE – EN (FluidDraw format)  
The FluidDraw project was created with a translation table so different languages (German and English) can be selected and displayed. For instructions on importing the translation table into a FluidDraw project, see “[Instructions for the FluidDraw translation table.](#)”

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- FluidSim project (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 (MP4)  
The video shows and explains the simulation of the pneumatic portion of the circuit.

## Recommendations for required software

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

- PDF reader  
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).  
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. 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. 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 for the FluidDraw translation table

Load the translation table using these steps:

1. Select the “Manage” menu.
2. Select “Translation tables.”
3. Click the “Open...” button.
4. Select the file “... FluidDraw Translation Table DE – EN.xmltt.”
5. In the “Words” table, the columns TextID, German, and US-English are displayed.
6. Close the “Manage translation tables” window by clicking OK.
7. Select the “Project” menu.
8. Select the “Language” menu item.
9. In the “Translation table” selection list, choose the file “... Translation Table DE – EN.xmltt” (normally the bottom file in the list).
10. In the selection lists “Project / Sheet / Evaluation” and “Translation language,” choose the desired language.

## 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 and Q10 are no longer actuated and go to their normal position. Q1 executes the STO stop function and then PUS when it reaches its normal position. The safety subfunction SDE is executed for the remainder of 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 valves Q1 are no longer actuated and return to their normal position. Q1 executes STO as a stop function and then PUS when the valves are in normal position. To reset, the 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 actuator is functionally stopped.
- S10 - Manual supply valve  
The manual supply 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.
- K10 – Pressure regulator  
The pressure regulator is set to 4 bar in the simulation.
- 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.

- P10, P11 – Pressure gauges  
The pressure gauges can be used to monitor the supply pressure and the regulated working pressure.
- 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 and Q10 are no longer actuated and return to normal position. Q1 executes the STO stop function and then PUS in the valves' normal position. The safety subfunction SDE is executed for the remainder of the pneumatic system.
- X1 – Pneumatic supply  
Compressed-air supply for other parts of a possible pneumatic installation.

## 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 valve Q1 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 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 an solenoid of valve Q1. The valve remains in the then-switched position. Release the “Shift” key.
14. Click the valve to reset the stuck condition.