SMC

Expertise – Passion – Automation

Safety in focus

SMC Machinery Safety general approach

Stand up to the toughest requirements

At SMC, top priority is given to the development of the highest quality, innovative products that have excellent performance.

Since the introduction of the Machinery Directive 2006/42/EC machinery manufacturers have had to implement safety measures in accordance with the harmonised standards which required more complex solutions than were previously employed. The aim is to thoroughly address the risks posed by machinery in a quantifiable way and to ensure that they are fully met by the applied safety measures.

We have many engineers located around the world in our Technical Centres in Japan, the United States, Europe and China. Quick, clear and detailed responses to customer requests are communicated through our sales group, and our engineers are constantly on the alert for new trends that lead to new world class products and solutions.

From January 2027 the new Machinery Regulations come into force and our products will be checked and certified to the new Regulation and the relevant Harmonized Standards.

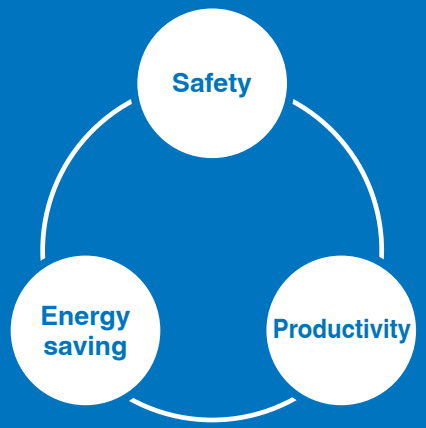
Safety and profitability

Why efficiently engineered safety leads to higher profitability

Machine safety considering process influences, cycle times, energy losses, etc. can increase profitability.

Safety is considered a separate and imposed requirement.

Safety is considered an integral part of the development.



Safety with efficiency

Considering the impact of safety systems on the machine throughput, operational availability, energy consumption etc. will lead to safety with efficiency. SMC has many proven ideas to achieve safety functions for many types of machine in many industrial applications areas. Just switching it all off is not always the only option!

Reducing implementation costs with efficiently engineered safety

By focusing on the actual levels of risk and the matching safety measures, then it means that the safety solutions implemented can just meet the performance levels required and excessively complex and costly solutions can be avoided. Simpler but perfectly adequate solutions generally tend to be far easier to install and easier to maintain during the operational life of the machine. Failure to adequately maintain safety systems is an easily avoidable cause of accidents in many cases.

Reducing operational costs with efficiently engineered safety

As well as securing the safety of the personnel, operators, maintenance and in some cases passers-by, the impact on the performance of the machine needs to be considered during the safety design process. Segregation of zones of risk can mean the need to reduce pressure or vent pressure in the whole machine can be avoided; with the consequent energy wastage, extended re-pressurisation and delayed restart time. SMC has zoned solutions for controlling units and valve manifolds.

Efficient safety solutions

Everyone benefits from an efficient safety solution. The machine builders can minimise the cost of legislative compliance and the machine operator can benefit from the efficiencies in operation in terms of running costs and throughput whilst being assured of the safety of the operators.

Every machine or application is different and requires a specific approach

The way to safety

1. Specific safety functions related to the machine or application must be defined first.
2. Once identified, the required safety level needs to be determined, along with the optimal components necessary to achieve acceptable risk reduction.
3. To confirm that the minimum requirements have been met or exceeded, it is necessary to perform and document verification procedures.

Engineered solutions

Machine safety requires engineered solutions. Of course, we supply suitable and highly reliable (validated) standard products. However, we also provide innovative ideas to create added value and competitive advantages. PneuSAFE, for example, offers a variety of predefined solutions that combine safety with competitive advantages.

Safety and high productivity from and with SMC

It goes without saying: every machine is different and necessitates a specific approach. We are available for our customers through the entire lifecycle of their machine or system and, for all relevant safety issues, we have competent and professional solutions available. From individually designed machines to highly complex systems, we not only meet all requirements for user and operational safety, but also for flexibility and productivity.

Looking at the whole allows for added value

We support you with a comprehensive approach. For example, we undertake directives and standards research, helping to answer your questions on this crucial topic. Importantly, we can also assist in defining the entire safety chain, supporting you in determining all safety functions and conceptualising their implementation in accordance with ISO 13849 (safety-related parts of control systems) and the relevant safety regulations.

From the required safety function to the optimal solution

Comprehensive support to achieve safety & profitability

SMC supports you comprehensively and provides you with the support you need to create your conceptual design, draft and analyse the safety function circuit.

The right products form the basis of the perfect solution

SMC offers a comprehensive range of recommended validated products and safety components that form the functional basis for your specific solution. But together with SMC you can achieve much more: tangible added value and higher profitability.

PneuSAFE as the toolbox

PneuSAFE, SMC´s latest and free of charge online tool with various TÜV verified circuit solutions for the most common safety functions and related applications is the perfect starting point for creating the most suitable solution.

1 Required safety function

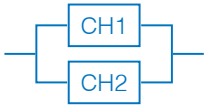
or

Non-machine specific application

2 Required system architecture

Single channel

Dual channel



3 Standardised safety solutions

For immediate application or as a starting point for the development of your application-specific solution together with SMC

PneuSAFE

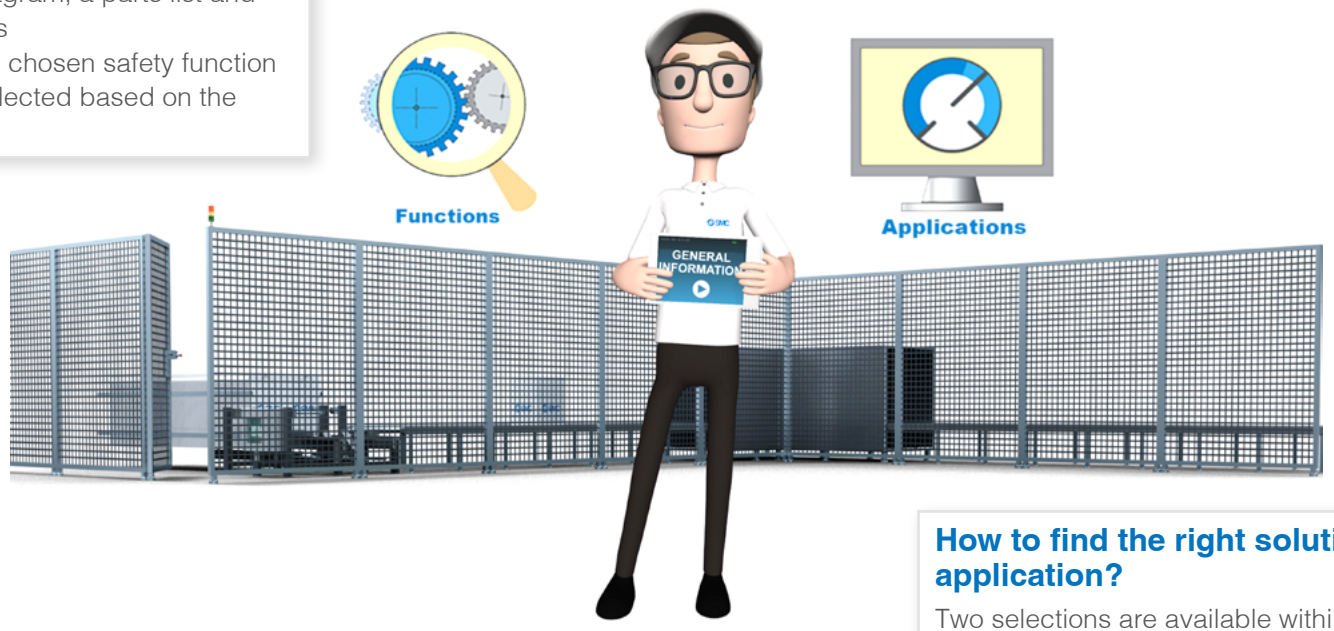
Create a pneumatic safety circuit in minutes with PneuSAFE

What does PneuSAFE offer?

- **PneuSAFE** is the **unique SMC toolbox for safety solutions**, offering **standardised safety** solutions for the first time, each consisting of a TÜV-verified circuit diagram, a parts list and detailed user instructions
- Suitable solutions for the chosen safety function or application can be selected based on the specific descriptions.

What are the essential features of PneuSAFE?

- Different approaches for solving individual safety functions
- All solutions in PneuSAFE have been checked and verified by TÜV Rheinland
- Possibility of individual adaptation of circuit diagrams using SMC's PneuDraw circuit drawing software
- Explanatory animation videos for many solutions
- Each solution consists of a circuit diagram / block diagram / parts list / detailed description.



Discover more on PneuSAFE – your toolbox for safety solution

How to find the right solution for your safety-related application?

Two selections are available within PneuSAFE:

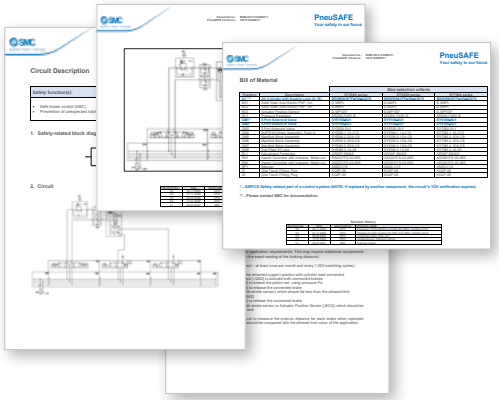
- **Functions**: Find solutions for the twelve most frequently used safety functions
- **Applications**: Included 13 most common and non-machine specific applications requiring safety.

PneuSAFE – Solutions & functionalities

Discover more on PneuSAFE – your toolbox for safety solution

PneuSAFE offers you these benefits

Complete technical information for each SMC solution

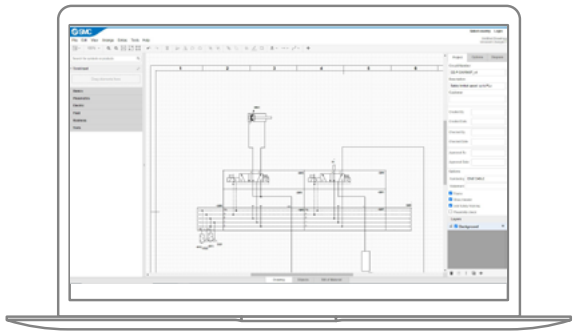


- **Circuit description** – All the safety-related data you require
- **BOM with validated products** – Ready to implement
- **TÜV report** – Verification of the solution by TÜV Rheinland
- **General conditions of use** – Defining relevant procedures and items.

Explanatory animations

- **Requirements and solutions explained** in an easy-to-understand way
- **Learn about the potential dangers** that can occur in applications
- **Recognize the advantages of the SMC solutions.**

Design your individual safety circuit and BOM

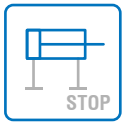


- **No restrictions** – Predefined solutions **can be customised according to your specific requirements**.
- Open the PneuSAFE circuit diagram in **PneuDRAW** and **design your individual solution**.

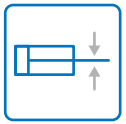
Safety functions – suitable SMC components

Discover our safety components certified according to the Machinery Directive 2006/42/EC together with our recommended validated products suitable for specific safety functions and system architectures.

Choose the safety function you need.

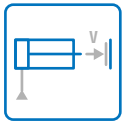


Safe Stopping and Closing (SSC)

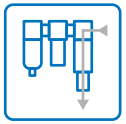


Safe Brake Control (SBC)

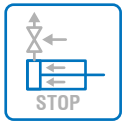
Two Hand Control (THC)



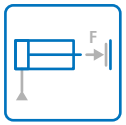
Safely-Limited Speed (SLS)



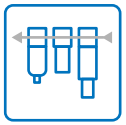
Safe De-Energisation (SDE) or Safe Venting (SVE)



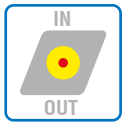
Residual Pressure Release (RPR)



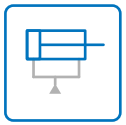
Safely-Limited Torque (SLT) or Safely-Reduced Pressure (SRP)



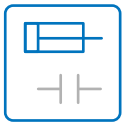
Safe Energisation (SEZ)



Input/Output with PROFIsafe

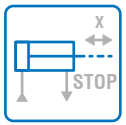


Safe Equilibrium of Torque (SET) or Force (SEF)



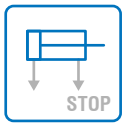
Prevention of Unexpected Start- up (PUS)

Output with PROFIsafe

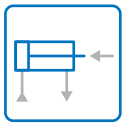


Safe Last Position (SLP)

Safe Pressure Monitor (SPM)



Safe Torque Off (STO)



Safe Direction (SDI)

Safe Valve Position (SVP)

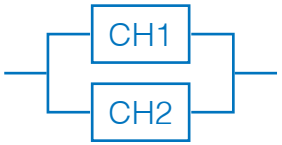
Please note that not every safety function and/or system architecture (single/dual channel) in this overview is also represented in PneuSAFE.

Safe Stopping and Closing (SSC)

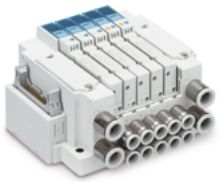
The energy supply or dissipation of at least one chamber of the cylinder is closed. This trapped energy is used to stop the cylinder.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

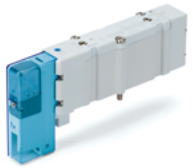


Valve technology | **Flow control equipment** | **Check valves**



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series



5-port solenoid valve with spring return spool
SY□-X350 Series

2-port air operated process valve
VNB-X717 Series

3-port pilot poppet valve
VP300/500/700 Series

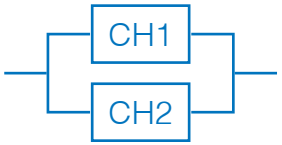
3-port solenoid valve direct operated popped type
VT307/VO307 Series

Safe Stopping and Closing (SSC)

The energy supply or dissipation of at least one chamber of the cylinder is closed. This trapped energy is used to stop the cylinder.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

Speed control valve with pilot check valve
ASP Series

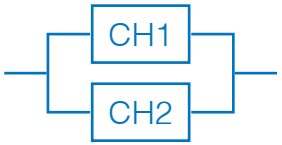
Speed control valve with pilot check valve
New ASP Series

Safe Stopping and Closing (SSC)

The energy supply or dissipation of at least one chamber of the cylinder is closed. This trapped energy is used to stop the cylinder.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Pilot operated check valve with state detection
XT34-303□ Series

Pilot check valve compact type
AKP Series

Pilot check valve
XTO Series

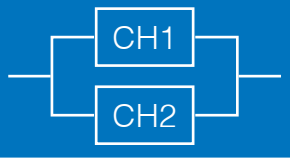
Speed control valve with pilot check valve
New ASP Series

Safe Stopping and Closing (SSC)

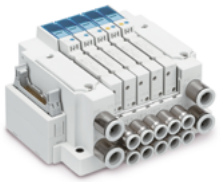
The energy supply or dissipation of at least one chamber of the cylinder is closed. This trapped energy is used to stop the cylinder.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



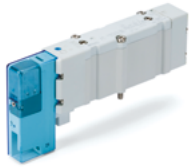
Valve technology | Flow control equipment | Check valves



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series

5-port valve with spool position detection
SY□-X30 Series



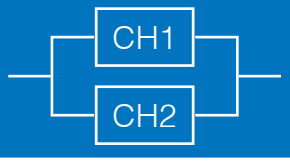
5-port solenoid valve with spring return spool
SY□-X350 Series

Safe Stopping and Closing (SSC)

The energy supply or dissipation of at least one chamber of the cylinder is closed. This trapped energy is used to stop the cylinder.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

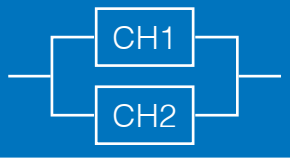
Speed control valve with pilot check valve
New ASP Series

Safe Stopping and Closing (SSC)

The energy supply or dissipation of at least one chamber of the cylinder is closed. This trapped energy is used to stop the cylinder.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Pilot operated check valve with state detection
XT34-303□ Series

Pilot check valve compact type
AKP Series

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Pilot check valve
XTO Series

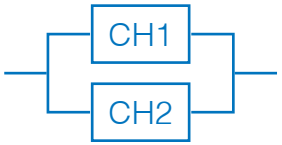
Speed control valve with pilot check valve
New ASP Series

Safely-Limited Speed (SLS)

Prevents the pneumatic cylinder from exceeding the permissible speed.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Airline equipment | **Valve technology** | **Flow control equipment**

Regulator
AR-D Series

⊕

Please check product documentation for back flow option.

Precision regulator
IR-A Series

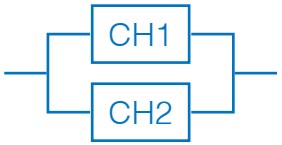
⊕

Safely-Limited Speed (SLS)

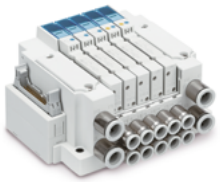
Prevents the pneumatic cylinder from exceeding the permissible speed.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

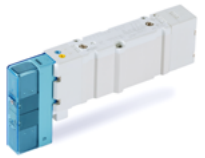


Airline equipment | **Valve technology** | **Flow control equipment**

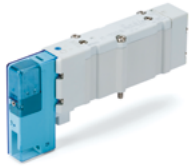


Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series



5-port solenoid valve with detent
SY□-X25 Series



5-port solenoid valve with spring return spool
SY□-X350 Series

3-port pilot poppet valve
VP300/500/700 Series

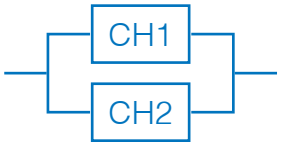
3-port solenoid valve direct operated popped type
VT307/VO307 Series

Safely-Limited Speed (SLS)

Prevents the pneumatic cylinder from exceeding the permissible speed.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Airline equipment | **Valve technology** | **Flow control equipment**

Speed control valve with pilot check valve
ASP Series

Metering valve with silencer
ASN2 Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

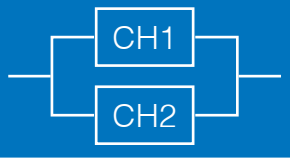
Speed control valve with pilot check valve
New ASP Series

Safely-Limited Speed (SLS)

Prevents the pneumatic cylinder from exceeding the permissible speed.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Airline equipment | **Valve technology** | **Flow control equipment**

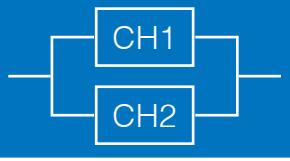
5-port valve with spool position detection
SY□-X30 Series

Safely-Limited Speed (SLS)

Prevents the pneumatic cylinder from exceeding the permissible speed.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Airline equipment | Valve technology | **Flow control equipment**

Speed control valve with pilot check valve
ASP Series

Metering valve with silencer
ASN2 Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

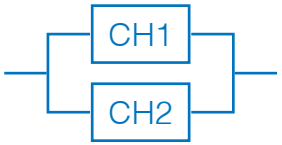
Speed control valve with pilot check valve
New ASP Series

Safely-Limited Torque (SLT) or Safely-Reduced Pressure (SRP)

Prevents the actuator from exceeding the permissible force or torque (e.g., by pressure limitation).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Airline equipment

Regulator
AR-D Series

Please check product documentation for back flow option.

Precision regulator
IR-A Series

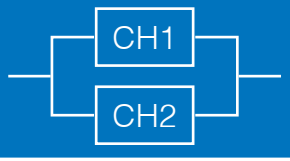
Vacuum regulator
IRV Series

Safely-Limited Torque (SLT) or Safely-Reduced Pressure (SRP)

Prevents the actuator from exceeding the permissible force or torque (e.g., by pressure limitation).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Airline equipment

Regulator
AR-D Series

⊕

Please check product documentation for back flow option.

Precision regulator
IR-A Series

⊕

Vacuum regulator
IRV Series

⊕

Safe Equilibrium of Torque (SET) or Safe Equilibrium of Force (SEF)

Prevents the force (or torque) of a cylinder from deviating from the force (or torque) balance by more than a specified value. (The PneuSAFE function SEF reduces the cylinder force to a safe level).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Airline equipment | **Valve technology** | **Flow control equipment** | **Check valves**

Regulator
AR-D Series

Please check product documentation for back flow option.

Precision regulator
IR-A Series

Safe Equilibrium of Torque (SET) or Safe Equilibrium of Force (SEF)

Prevents the force (or torque) of a cylinder from deviating from the force (or torque) balance by more than a specified value. (The PneuSAFE function SEF reduces the cylinder force to a safe level).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Airline equipment | **Valve technology** | **Flow control equipment** | **Check valves**

3-port pilot poppet valve
VP300/500/700 Series

3-port solenoid valve direct operated popped type
VT307/VO307 Series

Safe Equilibrium of Torque (SET) or Safe Equilibrium of Force (SEF)

Prevents the force (or torque) of a cylinder from deviating from the force (or torque) balance by more than a specified value. (The PneuSAFE function SEF reduces the cylinder force to a safe level).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Airline equipment | **Valve technology** | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Speed control valve with pilot check valve
New ASP Series

Safe Equilibrium of Torque (SET) or Safe Equilibrium of Force (SEF)

Prevents the force (or torque) of a cylinder from deviating from the force (or torque) balance by more than a specified value. (The PneuSAFE function SEF reduces the cylinder force to a safe level).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Airline equipment | **Valve technology** | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Speed control valve with pilot check valve
New ASP Series

Pilot check valve compact type
AKP Series

Pilot check valve
XTO Series

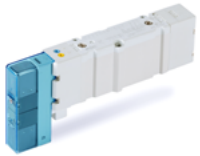
Safe Last Position (SLP)

Prevents the actuator from exceeding the specified position limit(s) (last position of the actuator is safe).
Recommended only for short stroke cylinders.

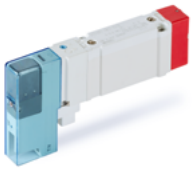
Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Valve technology



5-port solenoid valve with detent
SY☐-X25 Series



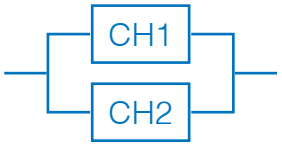
5-port solenoid valve with pressure detection option
SY☐-X310 Series

Safe Direction (SDI)

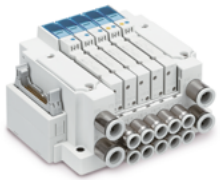
Prevents the cylinder from moving in the dangerous direction.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

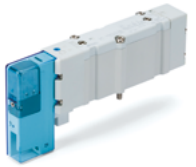


Valve technology | **Flow control equipment** | **Check valves**



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series



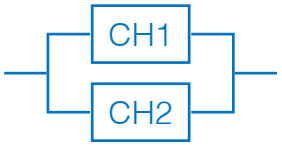
5-port solenoid valve with spring return spool
SY□-X350 Series

Safe Direction (SDI)

Prevents the cylinder from moving in the dangerous direction.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

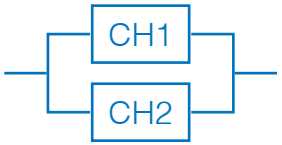
Speed control valve with pilot check valve
New ASP Series

Safe Direction (SDI)

Prevents the cylinder from moving in the dangerous direction.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Bushing type check valve
AKB Series

Check valve with one touch fitting
AKH Series

Pilot check valve
XTO Series

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Speed control valve with pilot check valve
New ASP Series

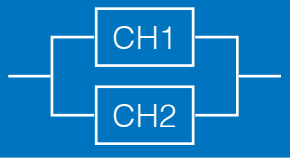
Pilot check valve compact type
AKP Series

Safe Direction (SDI)

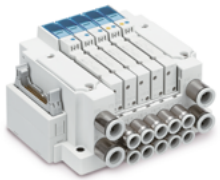
Prevents the cylinder from moving in the dangerous direction.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

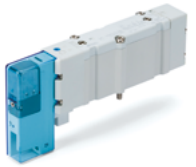


Valve technology | **Flow control equipment** | **Check valves**



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series



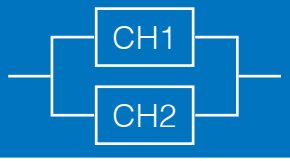
5-port solenoid valve with spring return spool
SY□-X350 Series

Safe Direction (SDI)

Prevents the cylinder from moving in the dangerous direction.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

Speed control valve with pilot check valve
New ASP Series

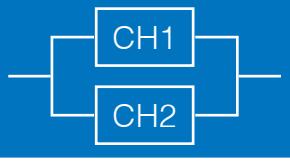
Pilot check valve compact type
AKP Series

Safe Direction (SDI)

Prevents the cylinder from moving in the dangerous direction.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Pilot operated check valve with state detection
XT34-303☐ Series

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP☐-X352 Series

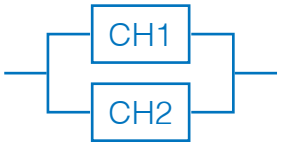
Speed control valve with pilot check valve
New ASP Series

Safe Brake Control (SBC)

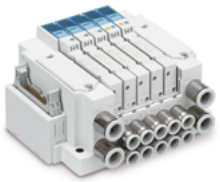
Safe control of piston movement by means of a brake/locking device.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

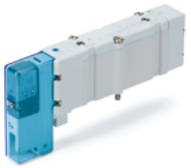


Valve technology | Check valves | **Brake/Lock units**



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series



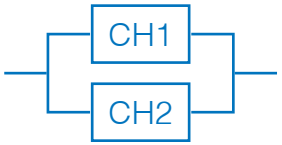
5-port solenoid valve with spring return spool
SY□-X350 Series

Safe Brake Control (SBC)

Safe control of piston movement by means of a brake/locking device.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | Check valves | **Brake/Lock units**

Cylinder with brake/lock unit
C96N-X3075 Series
⊕ Safety component

Cylinder with brake/lock unit
MWB-X3075 Series
⊕ Safety component

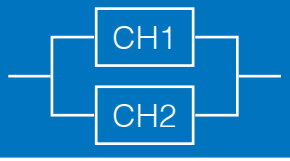
Brake/lock unit
MWB-UT-X3075 Series
⊕ Safety component

Safe Brake Control (SBC)

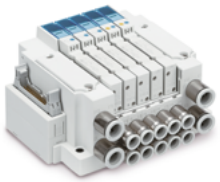
Safe control of piston movement by means of a brake/locking device.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



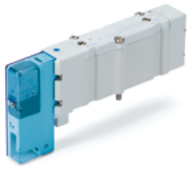
Valve technology | **Check valves** | **Brake/Lock units**



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series

5-port valve with spool position detection
SY□-X30 Series



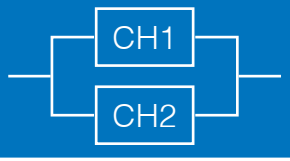
5-port solenoid valve with spring return spool
SY□-X350 Series

Safe Brake Control (SBC)

Safe control of piston movement by means of a brake/locking device.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Check valves** | **Brake/Lock units**

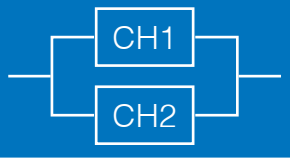
Pilot operated check valve with state detection
XT34-303☐ Series

Safe Brake Control (SBC)

Safe control of piston movement by means of a brake/locking device.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Check valves** | **Brake/Lock units**

Cylinder with brake/lock unit
C96N-X3075 Series
⊕ Safety component

Cylinder with brake/lock unit
MWB-X3075 Series
⊕ Safety component

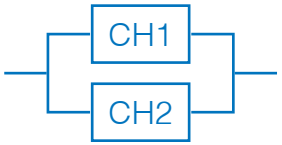
Brake/lock unit
MWB-UT-X3075 Series
⊕ Safety component

Safe De-Energisation (SDE) or Safe Venting (SVE)

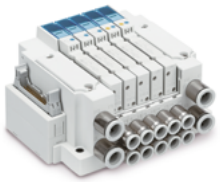
Enables safe de-energisation by venting the relevant part of the system.
Safe venting (SVE) exhausts the downstream pneumatic system to be safely de-energised.

Single channel
Category B, 1 or 2 up to PL c

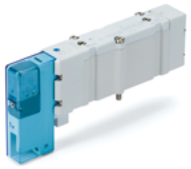
Dual channel
Category 3 or 4PL d and e



Valve technology



Compact 5-port solenoid valve
JSY Series



5-port solenoid valve with spring return spool
SY□-X350 Series

Residual pressure relief valve with direct monitoring
VP-X536 Series
Safety component

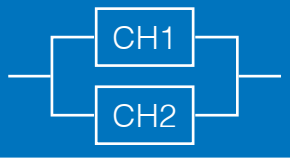
Residual pressure release with direct monitoring, modular connection type
VP□46 Series
Safety component

Safe De-Energisation (SDE) or Safe Venting (SVE)

Enables safe de-energisation by venting the relevant part of the system.
Safe venting (SVE) exhausts the downstream pneumatic system to be safely de-energised.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology

Residual pressure relief valve with direct monitoring
VG-X87 Series
⊕ Safety component

Residual pressure release with direct monitoring, with optional soft start function, modular connection type
VP□46 Series
⊕ Safety component

Residual pressure relief valve with direct monitoring
VP-X538 Series
⊕ Safety component

Residual pressure relief valve with direct monitoring and soft start function
VP-X555 Series
⊕ Safety component

Residual pressure relief valve with direct monitoring and soft start function (1 MPa)
VP-X585 Series
⊕ Safety component

Safe Energisation (SEZ)

The pressure of the supply air is increased in a controlled manner.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Valve technology

Residual pressure relief valve with direct monitoring and soft start function
VP-X555 Series

⊕ Safety component

Residual pressure release with direct monitoring, modular connection type
VP□46 Series

⊕ Safety component

Residual pressure relief valve with direct monitoring and soft start function (1 MPa)
VP-X585 Series

⊕ Safety component

Soft start-up valve
AV-A Series

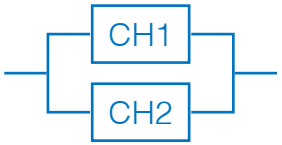
⊕

Prevention of Unexpected Start-up (PUS)

Prevents an unexpected start-up of the system e.g., start of cylinder movement. Function for separate implementation.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | Flow control equipment | Check valves

Pressure relief 3-port valve with locking holes
VHS-D Series ⊕

Residual pressure relief valve with direct monitoring
VP-X536 Series ⊕ Safety component

5-port solenoid valve
SY/JSY Series ⊕
SY□-X25 Series ⊕
SY□-X310 Series ⊕
SY□-X350 Series ⊕
JSY Series ⊕

2-port air operated process valve
VNB-X717 Series ⊕

Soft start-up valve
AV-A Series ⊕

3-port solenoid valve direct operated popped type
VT307/VO307 Series ⊕

3-port valve
VP300/500/700 Series ⊕

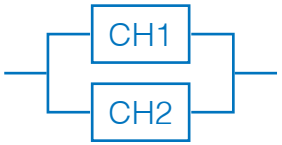
3-port air operated valve
VPA-X665 Series ⊕

Prevention of Unexpected Start-up (PUS)

Prevents an unexpected start-up of the system e.g., start of cylinder movement. Function for separate implementation.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Shuttle valve
VR12□0(F) Series

AND valve
VR1211F Series

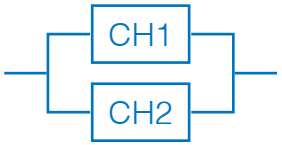
Speed control valve with pilot check valve
New ASP Series

Prevention of Unexpected Start-up (PUS)

Prevents an unexpected start-up of the system e.g., start of cylinder movement. Function for separate implementation.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Pilot check valve
XTO Series

Pilot check valve compact type
AKP Series

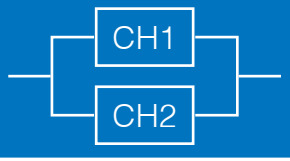
Speed control valve with pilot check valve
New ASP Series

Prevention of Unexpected Start-up (PUS)

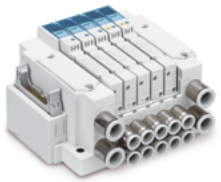
Prevents an unexpected start-up of the system e.g., start of cylinder movement. Function for separate implementation.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



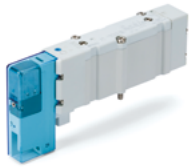
Valve technology | Flow control equipment | Check valves



Compact 5-port solenoid valve
JSY Series

5-port solenoid valve
SY Series

5-port valve with spool position detection
SY□-X30 Series



5-port solenoid valve with spring return spool
SY□-X350 Series

Residual pressure relief valve with direct monitoring
VP-X538 Series
Safety component

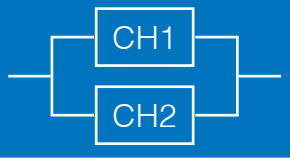
Residual pressure relief valve with direct monitoring
VP-X536 Series
Safety component

Prevention of Unexpected Start-up (PUS)

Prevents an unexpected start-up of the system e.g., start of cylinder movement. Function for separate implementation.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

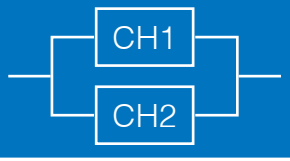
Speed control valve with pilot check valve
New ASP Series

Prevention of Unexpected Start-up (PUS)

Prevents an unexpected start-up of the system e.g., start of cylinder movement. Function for separate implementation.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology | **Flow control equipment** | **Check valves**

Pilot operated check valve with state detection
XT34-303□ Series

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Speed control valve with pilot check valve
New ASP Series

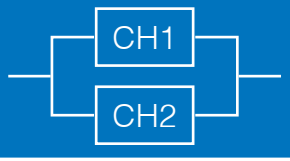
Pilot check valve
XTO Series

Safe Pressure Monitor (SPM)

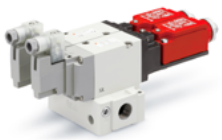
Safe monitoring of the downstream pressure.
A suitable safety sub-function is activated if the pressure is outside the specified range.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Valve technology



Residual pressure relief valve with direct monitoring
VP-X538 Series
⊕ Safety component

Residual pressure release with direct monitoring, with optional soft start function, modular connection type
VP□46 Series
⊕ Safety component

Residual pressure relief valve with direct monitoring
VG-X87 Series
⊕ Safety component

Safe Valve Position (SVP)

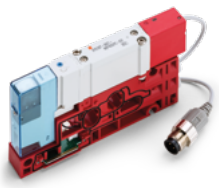
The defined position of the valve´s switching element is monitored. A suitable safety sub-function is activated when the valve´s switching element is not in the required position.

Single channel
Category B, 1 or 2 up to PL c

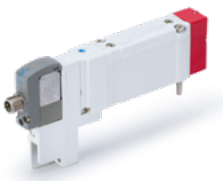
Dual channel
Category 3 or 4PL d and e

Valve technology

5-port valve with spool position detection
SY☐-X30 Series



Pilot air control valve with spool detection
SY☐-X31 Series



5-port solenoid valve with spring return spool and M8 connector
SY☐-X74 Series

Two-Hand Control (THC)

For pneumatic two-hand controls. Simultaneous two-hand operation is required to obtain an output signal.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Two-hand control | Flow control equipment | Valve technology | Check valves

Two-hand control valve
VR51 Series
⊕ Safety component

Two-Hand Control (THC)

For pneumatic two-hand controls. Simultaneous two-hand operation is required to obtain an output signal.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Two-hand control | **Flow control equipment** | **Valve technology** | **Check valves**

Speed control valve with pilot check valve
ASP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Speed control valve with pilot check valve
New ASP Series

Two-Hand Control (THC)

For pneumatic two-hand controls. Simultaneous two-hand operation is required to obtain an output signal.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Two-hand control | **Flow control equipment** | **Valve technology** | **Check valves**

2/3 port mechanical valve
VM100-A/VM200-A Series
⊕

3-port mechanical valve
VM430 Series
⊕

Two-Hand Control (THC)

For pneumatic two-hand controls. Simultaneous two-hand operation is required to obtain an output signal.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e

Two-hand control | **Flow control equipment** | **Valve technology** | **Check valves**

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Pilot check valve compact type
AKP Series

Speed control valve with pilot check valve
New ASP Series

Speed control valve with pilot check valve
ASP Series

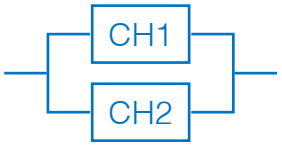
Pilot check valve
XTO Series

Residual Pressure Release (RPR)

Allows the air trapped in the cylinder to be vented manually. RPR function is typically a supplemental safety feature to SSC.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Flow control equipment | **Check valves**

Quick exhaust valve
AQ Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Residual pressure release valve
KE Series

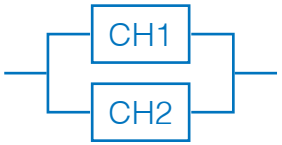
Speed control valve with pilot check valve
New ASP Series

Residual Pressure Release (RPR)

Allows the air trapped in the cylinder to be vented manually. RPR function is typically a supplemental safety feature to SSC.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Flow control equipment | **Check valves**

Pilot check valve compact type
AKP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

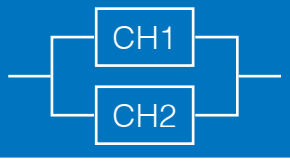
Speed control valve with pilot check valve
New ASP Series

Residual Pressure Release (RPR)

Allows the air trapped in the cylinder to be vented manually. RPR function is typically a supplemental safety feature to SSC.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Flow control equipment | **Check valves**

Quick exhaust valve
AQ Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Residual pressure release valve
KE Series

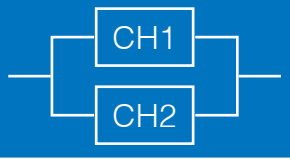
Speed control valve with pilot check valve
New ASP Series

Residual Pressure Release (RPR)

Allows the air trapped in the cylinder to be vented manually. RPR function is typically a supplemental safety feature to SSC.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Flow control equipment

Check valves

Pilot check valve compact type
AKP Series

Speed control valve with manual override pilot check valve
ASP□-X352 Series

Speed control valve with pilot check valve
New ASP Series

Input/Output with PROFIsafe

PROFIsafe is established as an international standard (IEC 61784-3-3).

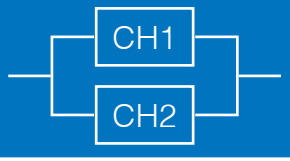
It is a communication protocol that transmits safety-related data by PROFINET communication.

EX245-FPS is certified by a third-party organisation (IEC 61508/IEC 62061 SIL 3 ISO 13849 PL e/Cat. 4)

- Individual control of 3 zones for valves and 1 zone for the output modules
- Single channel (1 out of 1): 8 safety inputs (SIL 2/PL d) or dual channel (1 out of 2): 4 safety inputs (SIL 3/PL e).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Safety I/O

Fieldbus system for input/ output with PROFIsafe

EX245-FPS☐ Series

⊕ Safety component

Output with PROFIsafe

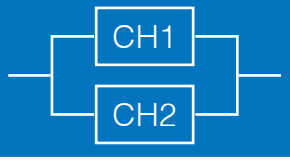
PROFIsafe is established as an international standard (IEC 61784-3-3).

It is a communication protocol that transmits safety-related data by PROFINET communication.

EX260-FPS is certified by a third-party organisation (EN 61508 SIL 3 ISO 13849 Cat. 3/PL e).

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Safety I/O

Compact fieldbus system for output with PROFIsafe
EX260-FPS1 Series

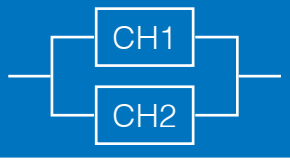
⊕ Safety component

Safe Torque Off (STO)

When the STO signal is input from the safety device, the SS1-t function commences, then at the end of the time period the STO function operates removing the power supply to the motor, in accordance with EN 61800-5-2.

Single channel
Category B, 1 or 2 up to PL c

Dual channel
Category 3 or 4PL d and e



Motor controller

Step motor controller with STO sub-function
JCX□F Series

⊕ Safety component

AC servo motor driver with STO pulse input type
LECSB-T Series

⊕ Safety component

AC servo motor driver with STO for SSCNET III
LECSS-T Series

⊕ Safety component

Safety product range

For safety-related controls (SRP/CS), recommended validated products as well as safety components can be installed as decided by the safety system designer. However, this must be evaluated during the course of the system analysis.

Safety component

According to the Machinery Directive 2006/42/EC, Article 2 (c), a safety component is a component

- Which serves to fulfil a safety function,
- Which is independently placed on the market,
- The failure and/or malfunction of which endangers the safety of persons, and
- Which is not necessary in order for the machinery to function, or for which normal components may be substituted in order for the machinery to function.

A safety component must meet all four characteristics of Article 2(c) in order to be a safety component within the meaning of the Machinery Directive, which may only be placed on the market with a CE marking and an EC declaration of conformity in accordance with Annex II, No. 1 A of the Machinery Directive.

Safety components are placed on the market separately from a machine in which they could theoretically be used.

The reliability of a safety component is of crucial importance, as failure can pose a risk to people.

The machine itself theoretically works without safety components. However, safety is not guaranteed and the health and safety requirements of Annex I are not met.

Recommended validated product

Recommended validated products is a SMC term, which means that the product has been validated to the requirements for a SRP/CS - Safety related part of a control system defined by ISO 13849-1.

Only such products may be used as part of an SRP/CS. Product validation by SMC grants approval in the form of a validation document (ValDoc).

Such products are not covered by the scope of the Machinery Directive.

Validated products are products that do not fulfil a complete, self-contained safety function. In order to implement the intended safety function, the machine manufacturer must first combine several of these products, program the products or parametrize the product.

The machine manufacturer is responsible for the conception of this product combination or for its programming or parametrization, and thus also for compliance with the requirements of the Machinery Directive.

SMC as a product suppliers validates such products according to ISO 13849-2, Annex A, B and D and provides the necessary parameters for evaluating and validating safety circuits using reliability data documents.

Please note that not all products can be validated (e.g., ionizers, products with software or firmware…).

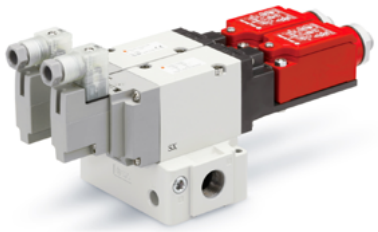
SMC Safety solutions

Residual pressure release valves	**Safety IO (Fieldbus system with PROFIsafe)**	**Two hand control**	**Motor controller (Step motor controller with STO sub-function)**	**Brake/lock units**

Residual pressure release valves | **Safety IO (Fieldbus system with PROFIsafe)** | **Two hand control** | **Motor controller (Step motor controller with STO sub-function)** | **Brake/lock units**

Dual residual pressure relief valve with direct monitoring

VP-X538 Series



- With detection of main valve position
- Modular connection to FRL unit
- Sizes available: 3/8, 1/2
- Versions compatible with secondary batteries available.

Intended use:

To vent a protected system to atmosphere when it is de-energised.

Suitable for:

SDE (SVE) – Safe de-energisation

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- For systems up to category 3 and 4 (PL e) (as defined by EN ISO 13849-1)
- Easy-to-construct redundant system (duplex valve)
- Variety of safety limit switches available
- Highly reliable construction
- Long service life: B10D of 10 million cycles (for standard pressure version).

Residual pressure release with direct monitoring, modular connection type

VP□46 Series

- Single or duplex versions available
- With detection of main valve position
- Modular connection to FRL unit
- Optional soft start-up function
- Sizes available: 1/4, 3/8, 1/2, 3/4 (with piping adapter)

Intended use:

To vent a protected system to atmosphere when it is de-energised.

Suitable for:

SDE (SVE) – Safe de-energisation
SEZ – Safe energisation (with integrated soft start-up function)

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- For systems up to category 4 (duplex valve)
- For systems up to category 2 (single valve)
- Easy-to-construct redundant system (duplex valve)
- Variety of safety limit switches available
- Highly reliable construction
- Long service life: B10D of 10 million cycles (for standard pressure version).

Residual pressure release valves | **Safety IO (Fieldbus system with PROFIsafe)** | **Two hand control** | **Motor controller (Step motor controller with STO sub-function)** | **Brake/lock units**

Residual pressure release valve with detection of main valve position

VG-X87 Series

- With detection of main valve position
- Sizes available: 3/4, 1.

Intended use:

To vent a protected system to atmosphere when it is de-energised

Suitable for:

SDE (SVE) – Safe de-energisation

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- For systems up to category 4 (as defined by EN ISO 13849-1)
- Easy-to-construct redundant system (duplex valve)
- Variety of safety limit switches available
- Highly reliable construction
- Long service life: B10D of 1 million cycles.

Single residual pressure release valve with detection of main valve position

VP-X536 Series

- With detection of main valve position
- Body ported (VP□42□) or base mounted (VP□44□) versions available
- Modular connection to FRL unit (for base mounted version)
- Sizes available: 3/8, 1/2
- Versions compatible with secondary batteries available.

Intended use:

To vent a protected system to atmosphere when it is de-energised.

Suitable for:

SDE (SVE) – Safe de-energisation

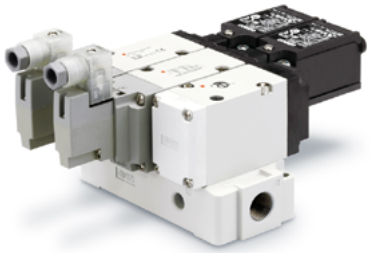
Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- For systems up to category 2 (as defined by EN ISO 13849-1)
- Variety of safety limit switches available
- Highly reliable construction
- Long service life: B10D of 10 million cycles (standard pressure version).

Residual pressure release valves | **Safety IO (Fieldbus system with PROFIsafe)** | **Two hand control** | **Motor controller (Step motor controller with STO sub-function)** | **Brake/lock units**

Dual residual pressure release valve with soft start-up function

VP-X555/585 Series



- With detection of main valve position
- Modular connection to FRL unit
- Versions compatible with Secondary Batteries available
- Standard pressure (X555) or high-pressure (X585) version
- Sizes available: 3/8, 1/2.

Intended use:

To vent a protected system to atmosphere when it is de-energised.

Suitable for:

SDE (SVE) – Safe de-energisation
SEZ – Safe energisation (with integrated soft start-up function)

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- For systems up to category 4 (as defined by EN ISO 13849-1)
- Easy-to-construct redundant system (duplex valve)
- Variety of safety limit switches available
- Highly reliable construction
- Long service life: B10D of 10 million cycles (standard pressure version).

Residual pressure release valves | Safety IO (Fieldbus system with PROFIsafe) | Two hand control | Motor controller (Step motor controller with STO sub-function) | Brake/lock units

Compact fieldbus system for output with PROFIsafe

EX260-FPS1 Series

- PROFIsafe compatible SI unit
- Built-in safety switch
- Number of outputs: 32
- Communication connector: M12
- Applicable valve series: SY, JSY, VQC.

Intended use:

This product is intended to facilitate safe machine and system designing (ISO/IEC standard compliance).

Suitable for:

This product is designed for use up until
- IEC 61508/IEC 62061 SIL 3
- ISO 13849 PL e / Cat. 3.

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- Product certified by a third-party organization
- The safe state is a condition in which the safety output is turned OFF to shut off the supply of power to the valve manifold
- A separate safety output unit is not required.

Fieldbus system for input/output with PROFIsafe

EX245-FPS☐ Series

- PROFIsafe compatible SI unit
- Safety outputs to control 3 zones for valves and 1 zone for output modules individually
- Safety inputs can be loaded in 2 ways:
  - Single channel (1 out of 1): 8 safety inputs (SIL 2/PL d)
  - Dual channel (1 out of 2): 4 safety inputs (SIL 3/PL e).

Intended use:

Designed exclusively for use in a PROFIsafe system and fulfils the PROFINET guidelines as defined by PI (PNO).

Suitable for:

Designed for digital data control by connecting compatible EX245 modules and for use within rugged industrial environments, especially automotive plants. The SI Unit can be used to implement a safety function for the directly connected valves.

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- Product certified by a third-party organization
  - IEC 61508/IEC 62061 SIL 3
  - ISO 13849 PL e / Cat. 4.
- Four separately controlled safe power supplies (3 for valve zones & one for I/O modules).

Residual pressure release valves | Safety IO (Fieldbus system with PROFIsafe) | Two hand control | Motor controller (Step motor controller with STO sub-function) | Brake/lock units

Two hand control valve

VR51 Series

- An output is available only through synchronized, two-handed operation (within 0.5 s)

Intended use:

The intended use of this product is a logic unit for use in two-hand control circuits according to ISO 13851 type IIIA.

Suitable for:

THC – Two-hand control
Compatible for use in systems up to Category 1 (as defined by EN ISO 13849-1)

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- Highly reliable construction
- Long service life: B10D of 2 million cycles
- Unrestricted mounting direction
- Output stops when one of the two air signal inputs stops
- Two simultaneous air signals reset the output.

Residual pressure release valves | Safety IO (Fieldbus system with PROFIsafe) | Two hand control | Motor controller (Step motor controller with STO sub-function) | Brake/lock units

Step motor controller with STO sub-function

JXC□F Series

- Supported protocols: EtherCAT®, EtherNet/IP™, PROFINET, IO-Link
- Compliant with the following standards:
  - EN 61508 up to SIL3/PI e
  - EN 62061 SIL CL3
  - EN ISO 13849-1 Cat3, PI e
  - EN 61800-5-2.

Intended use:

This product is intended to be used in applications requiring the safe stopping and the prevention of unexpected start-up of a 24 VDC stepper motor.

Suitable for:

SS1 – Safe Stop 1
STO – Safe Torque Off

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- The safe state is provided by the Safe Torque Off (STO) sub-function.
- The SS1-t sub-function initiates motor deceleration and performs the Safe Torque Off (STO) sub-function after an application specific delay.
- The STO sub-function prevents force-producing power from being provided to the motor.

Residual pressure release valves | Safety IO (Fieldbus system with PROFIsafe) | Two hand control | Motor controller (Step motor controller with STO sub-function) | Brake/lock units

Cylinder with brake/lock unit

C(P)96N-X3075 Series

- ISO cylinder with single lock mechanism
- Brake/lock function effective in both directions of movement
- Exhaust locking type
- Extended cylinder service life because of replaceable lock unit.

Intended use:

The intended use of lock/brake unit is to be used as an integrated unit onto a C(P)96-C cylinder for intermediate stop, emergency stop and drop prevention.

Suitable for:

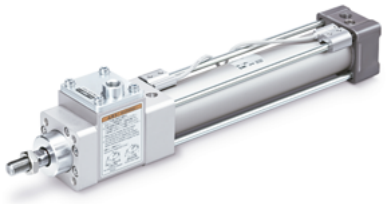
SBC – Safe Brake Control
Compatible with a Category 1 system (as defined by EN ISO 13849-1)

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- Proven and highly reliable design
- Long service life: B10D of 6.60 million locking cycles
- Holding force up to 6080 N
- High stopping accuracy.

Cylinder with brake/lock unit

MWB-X3075 Series



- Cylinder with single lock mechanism
- Brake/lock function effective in both directions of movement
- Exhaust locking type
- Extended cylinder service life because of replaceable lock unit.

Intended use:

The intended use of lock/brake unit is to be used as an integrated unit onto a MWB cylinder for intermediate stop, emergency stop and drop prevention.

Suitable for:

SBC – Safe Brake Control
Compatible with a Category 1 system (as defined by EN ISO 13849-1)

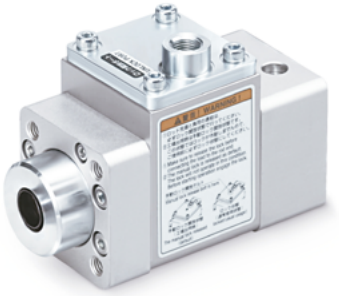
Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- Proven and highly reliable design
- Long service life: B10D of 6.60 million locking cycles
- Holding force up to 6080 N
- High stopping accuracy.

Residual pressure release valves | Safety IO (Fieldbus system with PROFIsafe) | Two hand control | Motor controller (Step motor controller with STO sub-function) | Brake/lock units

Brake/lock unit

MWB-UT-X3075 Series



- Unit with single lock mechanism
- Brake/lock function effective in both directions of movement
- Exhaust locking type.

Intended use:

The intended use of lock unit is to be used as an intermediate stop, emergency stop and drop prevention.

Suitable for:

SBC – Safe Brake Control
Compatible with a Category 1 system (as defined by EN ISO 13849-1)

Safety-related features

- Safety component as defined by the Machinery Directive 2006/42/EC article 2c
- Proven and highly reliable design
- Long service life: B10D of 6.60 million locking cycles
- Holding force up to 6080 N
- High stopping accuracy.

FAQ in safety engineering

1 Is it an operational function, or a safety function?

An operational function is a function that is necessary for the machine or equipment to fulfil its intended purpose. The failure of an operational function does not result in a loss of safety function.

A safety function is one that the failure and/or malfunction of which endangers the safety of persons, but it is not necessary in order for the machine to function.

2 Do pneumatic components require a safety-related assessment?

No, unless they are a safety related part of a control system (SRP/CS). The control system shall be designed to protect the operator, maintenance engineer or anyone else from harm. In order to determine if the safety control system satisfies the required PL r then evaluation of all the components that are SRP/CS must be assessed according to the standard.

3 What does “prevention of unexpected start-up” mean?

The safety function “prevention of unexpected start-up” covers a number of possibilities as are defined in the harmonised standard EN ISO 14118. It requires that machines are provided with manually operated devices for isolation of energy supplies and energy dissipation. For shorter duration shutdowns an automatic device can be provided but it requires manual intervention for re-start, which may need to be accompanied by signalling and warning. The situation where restoration of energy may cause start-up without manual intervention needs shall always be prevented.

4 Can bi-stable valves be used in safety functions?

The list of safety-principles contained in ISO 13849-2 contains the following point: “Safe position”, which must be met by safety-related products and systems. "Safe position" means that a moving element of a component (eg. spool of valve) is mechanically retained in a fixed position. Friction only is not mechanical retention. Normally double solenoid valves with rubber seal are held in the last position only by friction; that’s why this principle is not satisfied. According to safety principles, mechanical retention is required for Category 1 or higher. SMC has corresponding valves with detent in its product range.

5 Is a valve where both the supply voltage and, separately, the pilot air, are interrupted, considered a two-channel solution?

No, a two-channel solution must not lose its safety function due to a single fault. In the case of a valve controlling cylinder movement, a single fault due to the spool of the main valve (e.g. contamination that blocks the spool movement) can lead to a loss of the safety function.

6 Is it possible to safely electrically isolate the supply to valves that are manifold mounted?

There are a number of possible solutions:

- Electrically isolate the power supply to a level of security that is appropriate to the required PL. e.g. EX245, EX250, EX260, EX600.
- Fieldbus system using PROFIsafe protocol is also available e.g. EX260-FPS1. This product provides electrical isolation of the valves in up to three independent zones to EN 61508 SIL 3 ISO 13849 Cat. 3/PL e
- Fieldbus system using PROFIsafe protocol is also available e.g. EX245-FPS□. This range of products provides electrical isolation of the valves in up to three independent zones to EN ISO 13849-1 Cat. 4/PL e EN 62061 SIL CL3 EN 61508 SIL3.

7 Do products used as safety related parts of a control system (SRP/CS) need to be tested or certified by an organization independent of the manufacturer?

No, ISO 13849-2 states that a third-party test is not required providing the validation process is carried out by persons independent of the design of the SRP/CS.

8 A safety-related PLC is very expensive. Can I also carry out my safety functions purely pneumatically?

In principle, it can be said that the safety functions which have electro-pneumatic actuation can also be carried out purely pneumatically. The cost-effectiveness of your own safety PLC depends on the complexity of the desired safety functions and the related operating functions. Special attention is given to the sensor technology required in ISO 13849 for fulfilling the diagnostic coverage level for category 2 and above. To realize this solely with pneumatics would generally be much more expensive.

9 Where can I find the safety-related data of SMC components?

The safety related data covering B10, MTTF evaluation against EN ISO 13849-1/2 and the SISTEMA library is available at https://www.smc.eu/en-eu/sistema

More information on SISTEMA and the software is available at https://www.dguv.de/ifa/praxishilfen/practical-solutions-machine-safety/software-sistema/index.jsp

Glossary – Symbols and abbreviated terms

Symbol or abbreviation	Description
a, b, c, d, e	Denotation of performance levels
B, 1, 2, 3, 4	Denotation of categories
B_{10}	Number of cycles until 10 % of the components fail (for pneumatic and electromechanical components)
B_{10D}	Number of cycles until 10 % of the components fail dangerously (for pneumatic and electromechanical components)
Cat.	Category
CCF	Common cause failure
DC	Diagnostic coverage
DC_{avg}	Average diagnostic coverage
CE	Conformité Européene (European Conformity)
F, F1, F2	Frequency and/or time of exposure to the hazard
I/O	Inputs/Outputs
ISO	International Standards Organization
FMEA	Failure modes and effects analysis

Symbol or abbreviation	Description
MTTF	Mean time to failure
$MTTF_D$	Mean time to dangerous failure
n_{op}	Number of annual operations
P, P1, P2	Possibility of avoiding the hazard
PL	Performance level
PL_r	Required performance level
PLC	Programmable logic controller
S, S1, S2	Severity of injury
SIL	Safety integrity level
SRP/CS	Safety-related part of a control system
TE	Test equipment
T_M	Mission Time
T_{10D}	Mean time until 10 % of the components fail dangerously

Configurators

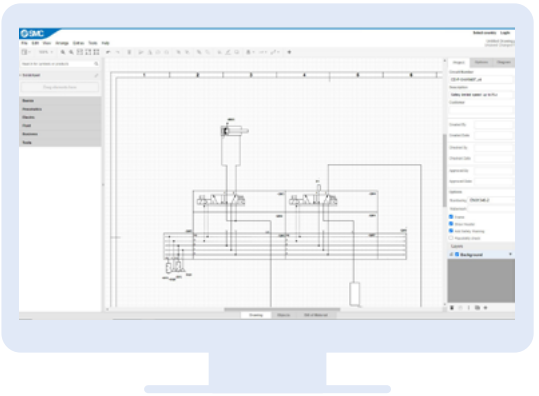
We know that designing a safe machine or application can be a difficult task, SMC's software will save time and prevent mistakes. Among our numerous engineering tools, the following software are of particular support in the area of machine safety.

Valve configurator ⊕

Design the manifold that meets your safety application´s demands with our multi-purpose flexible valve, the SY new series with various options for safety applications.

FRL configurator ⊕

Design your specific F.R.L. unit which not only gets you the exact air quality you need but also provides safety-specific options like residual pressure relief valves, soft start-up valves or pressure sensors used in monitoring systems.

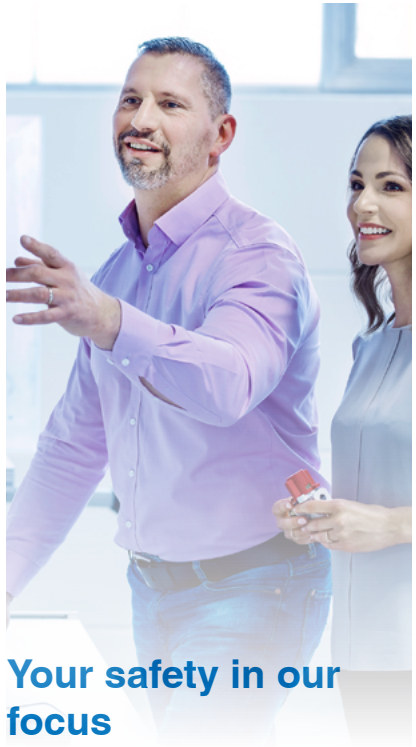


PneuDraw ⊕

Draw your pneumatic circuit in a quick and easy way. All pneumatic symbols included are linked to the current SMC portfolio. For example, you can open a safety-related circuit diagram directly from PneuSAFE and create your customized solution.

We understand your daily needs

Our local teams of highly trained experts are on hand to help you achieve your goals



Your safety in our focus

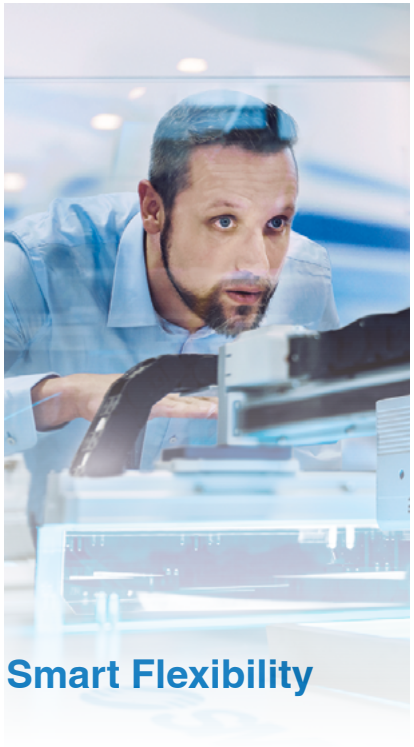
Creating confidence with confidence. SMC is an innovative, reliable and strong partner for pneumatic and electrical automation technology. We accompany our customers throughout the entire life cycle of their plant and, for all relevant safety issues, we have competent and professional solutions at your disposal.

Energise your efficiency

In our 24/7 economy and as governments, industries and consumers battle with in the quest for ever increasing supplies of energy, SMC has always been fully committed to assisting customers in reducing their bills and, of course, in making its modest contribution to global sustainability.

Size & weight optimisation

Nowadays space and weight are at a premium. SMC is on the way to downsizing your machine components, continually re-designing our products so you can achieve more efficient, compact and light machinery.



Smart Flexibility

This is the main concern of the Industry 4.0, Factory of the Future, Smart Factory or Digitalisation, you name it. It is no longer a question of mass production, but to do so in a personalised, cost-effective, fast and sustainable way.

Industrial maintenance

It's no secret that maintenance is the key to the prevention of problems, cost savings and improvement in productivity and that is why it has become a fundamental aspect of the everyday reality of production lines. With the solutions that SMC can provide to achieve successful maintenance actions you will find the best way to improve the efficiency and productivity of your process.

SMC Business Continuity Plan

Discover more on SMC Business Continuity Plan

Sustainable growth also means ensuring uninterrupted operations

We are committed to ensuring that SMC is prepared for any emergency and that our business activities will not stop in the event of such circumstances. SMC aims to fulfil our product supply responsibilities and maintain our customers' trust by contributing to both sustainable growth and the expansion of technological innovations.

SMC, as a comprehensive manufacturer of automatic control equipment that supports automation, is able to promptly provide products that meet our customers' needs anywhere in the world.

Finance BCP

Safe & Solid financial base

In the event of an emergency, SMC can provide a safe and solid financial base (with cash, deposits, and equity capital) that will sufficiently cover the working capital and funds needed to rebuild buildings and the equipment required for business continuity. This is done to provide peace of mind to our customers and workers alike.

Information security BCP

Vital data kept safe

Strengthen information security for protection against computer viruses and cyberattacks, plus the installation of data centres to establish a disaster recovery system. Your information is safe with us.

Sales BCP

Consistent sales support

7,000 sales engineers worldwide ready to recommend the best solution for you.
Over 80 global locations to make sure that wherever you are, we are there too.

Production BCP

Ensure customer order fulfilment

Reliable delivery for you thanks to our 9 global logistic centres and production sites in 38 countries, 10 of which are located in Europe. Moreover, flexibility to rapidly respond to any sudden change in the manufacturing environment.

Aiming to gain your trust
Sustainability through reliability

Engineering BCP

Consistent technical support

2,100 engineers at our 5 technical centres around the globe (2 in Europe – Germany and UK).

Expertise – Passion – Automation