



KOCAELI SANAYİ ODASI
KOCAELI CHAMBER OF INDUSTRY

FUNCTIONAL SAFETY

SIL - Safety Integrity Level

Timo Burket - Solution Developments PA



SIL Applications – Safety Brochure

White paper
 Controlling process valves and considering functional safety (SIL)



Functional safety in the process industry is a topic that has very much increased since the introduction of IEC 61508 some time back. It is frequently also referred to by the alternative SIL. Several excellent SIL articles can be found online (see below).

This white paper provides information on the following topics:

- Introduction to Safety Integrity Levels
- The standards
- Risk analysis
- Certification and functional safety
- Examples of process control in SIL certified plants
- Process performance and availability analysis by using the example of a control valve
- Residual techniques of SIL in the field

[Link to White paper](#)

Functional safety in the process industry



[Link to Safety brochure](#)

What is functional safety?

FESTO

1.1 Definition of safety and functional safety



Target:

With consideration of a dangerous incident to achieve and receive a safe condition of the process

1.5 Who is affected by functional safety

- **Plant Engineering**

- Determine the risk and therefore the security level of a plant
Specifies the requirements for constructors and suppliers

- **Plant constructor**

- Provides the system in terms of safety according to the safety level

- **Suppliers (FESTO)**

- Determine the suitability of products for the safety level (SIL/PL)

- **Insurance and Authorities**

- Claim evidence of conformity from plant constructor, for a sufficient reduction of the residual risk at the plant

FESTO

Continuous Production

Application: Cracker

„low demand“ valve should be open the whole year and should close only in case of failure, test or maintenance (according IEC 61508 - 1 up to 10 cycles/y)

Batch Production

Application: Production for solvent

„high demand“ valves are switching continuously means in case of process industry also more as 2 or 3 cycles/day (according IEC 61508 – more than 1 up to 10 cycle/y)



Relevant Standards

IEC 61508

is an international standard published by the International Electrotechnical Commission of rules applied in industry. It is titled:

Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems (E/E/PE, or E/E/PES).

IEC 61508 is intended to be a basic functional safety standard applicable to all kinds of industry. It defines functional safety as: “part of the overall safety relating to the EUC (Equipment Under Control) and the EUC control system which depends on the correct functioning of the E/E/PE safety-related systems, other technology safety-related systems and external risk reduction facilities.”

IEC 61511

is a technical standard which sets out practices in the engineering of systems that ensure the safety of an industrial process through the use of instrumentation. Such systems are referred to as Safety Instrumented Systems. The title of the standard is **"Functional safety - Safety instrumented systems for the process industry sector"**.

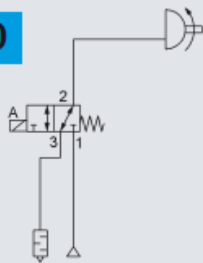
FESTO

HFT

HFT hardware fault tolerance

HFT Defining the Hardware Failure Tolerance

HFT 0

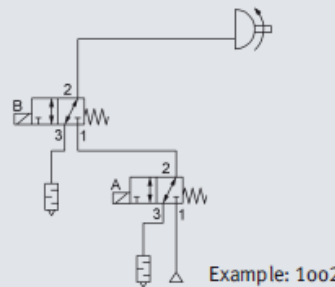


1001 (One out of One)

A single failure can lead to a loss of safety

- **HFT (Hardware Failure Tolerance)**
Ability of a required function to still perform in case of failures and deviations

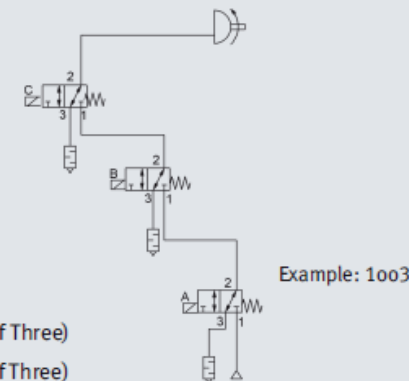
HFT 1



1002 (One out of Two)
2002 (Two out of Two)

At least 2 failures must occur simultaneously to cause a loss of safety

HFT 2



1003 (One out of Three)
2003 (Two out of Three)

At least 3 failures must occur simultaneously to cause a loss of safety

Components for safety-related applications

FESTO

VOFC/VOFD



SIL 2

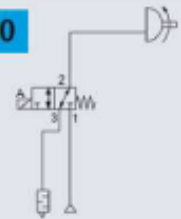


SIL 2

For safety-related systems up to SIL3 in redundant circuits or up to SIL2 in single-channel circuits for low demand, high demand and ESD (Emergency Shut Down) applications.

with TÜV certification

HFT 0



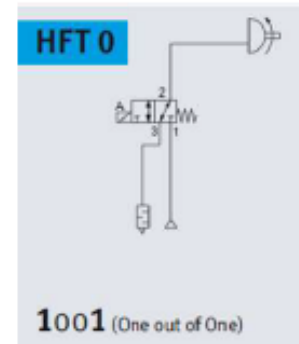
1001 (One out of One)

FESTO

Quarter turn actuator DFPD



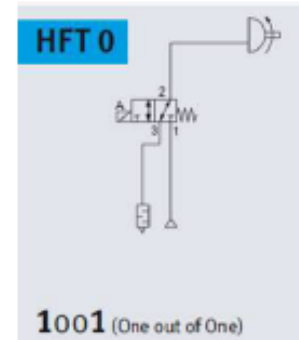
Double- and single-acting for activating process valves in safety-related systems up to SIL3 in a redundant design or to SIL2 in single-channel design in low demand and high demand applications.



Sensor box SRBC / SRBE



Visual position indication and electrical position sensing of automated process valves in safety-related systems up to SIL2 for low-demand and highdemand applications.



Components for safety-related applications

FESTO

Pilot valves VSNC



With changeable seal for 3/2- or 5/2-way function, 5/2-way double solenoid and 5/3-way design.
For safety-related systems up to SIL2.



Pneumatic linear actuator DLP



Double-acting opening/closing linear actuator to activate process valves in safety-related systems up to SIL2.

Pneumatic valve terminal MPA

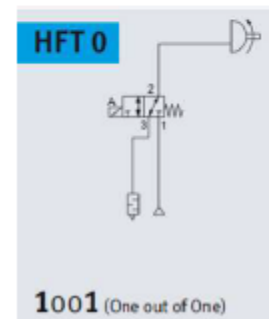


Maximum function integration, many electrical connection options, multi-pin plug, Festo I-Port, fieldbus and a comprehensive diagnostics concept. Suitable for use in safety-related systems up to SIL2.

Pneumatic valve terminal CPV

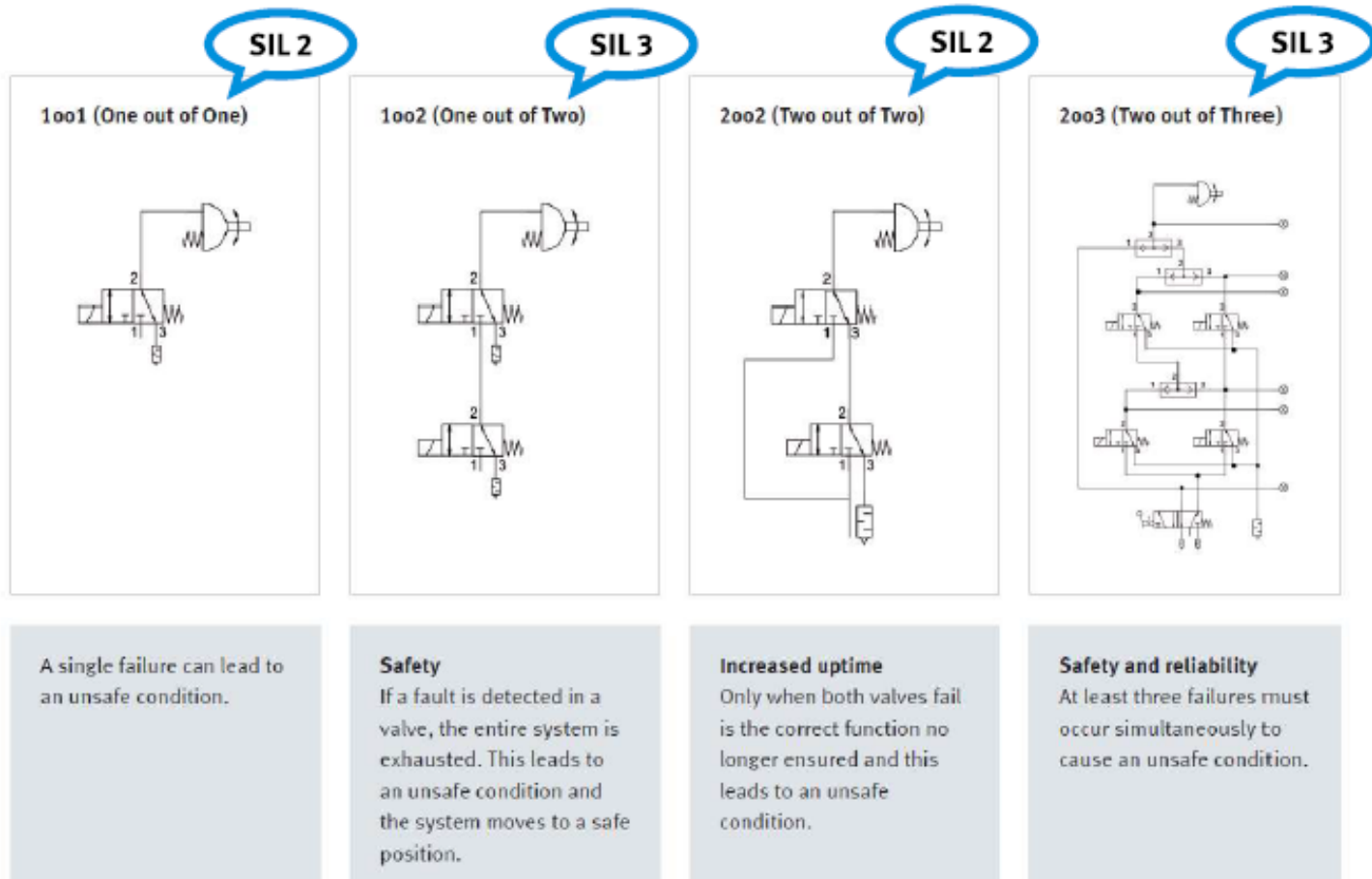


Intrinsically safe valve terminal with pneumatic multiple connector plate with wall through-feed, for use in safety related systems up to SIL2.



Redundant system conditions for safety related applications

FESTO



FESTO

Redundant NAMUR block

SIL 3

Safety (1oo2)

With enhanced safety (1oo2), two valves are connected in series. Both valves are energised during operation. Should a valve or a solenoid fail during operation, the entire system is exhausted in order to protect it from subsequent damage. Media conveyor lines frequently require this higher level of safety.



G1/4: 3580505 VABS-S7-RB-B-G14-V14-A

1/4 NPT: 4727331 VABS-S7-RB-B-N14-V14-A

SIL 2

Increased uptime (2oo2)

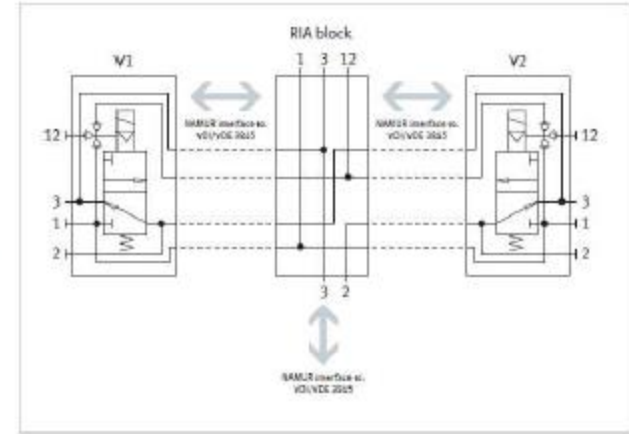
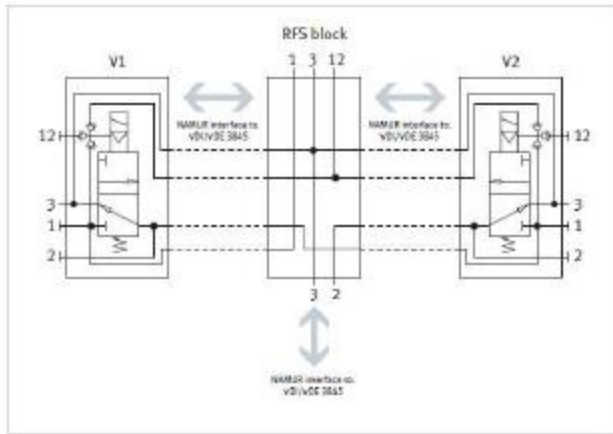
With increased uptime (2oo2), two valves are connected in parallel. Both valves are energised during operation. Should a valve or a solenoid fail during operation, the plant remains active and the entire system continues to work. For example, cooling circuits require this increased uptime.

G1/4: 4914495 (via G1_CS.1495193)

1/4 NPT: n.a.



Redundant NAMUR block

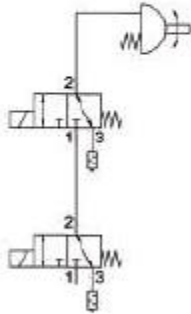


FESTO

Redundant INLINE valves

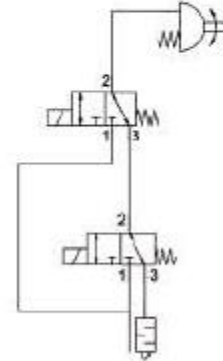
SIL 3

1oo2 (One out of Two)



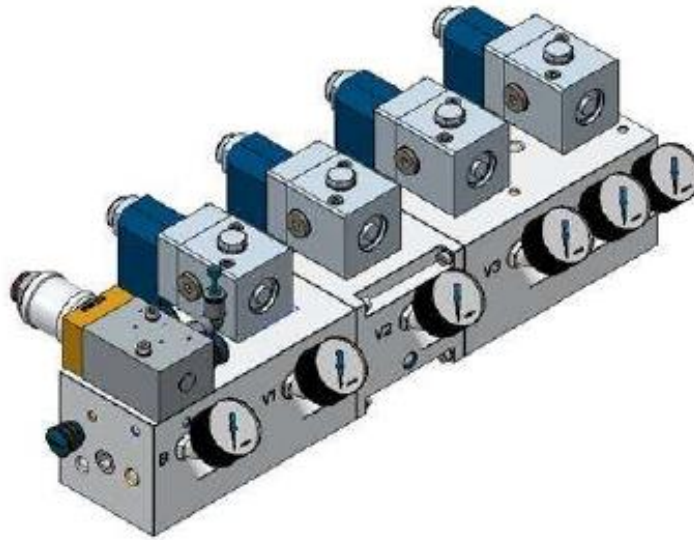
SIL 2

2oo2 (Two out of Two)



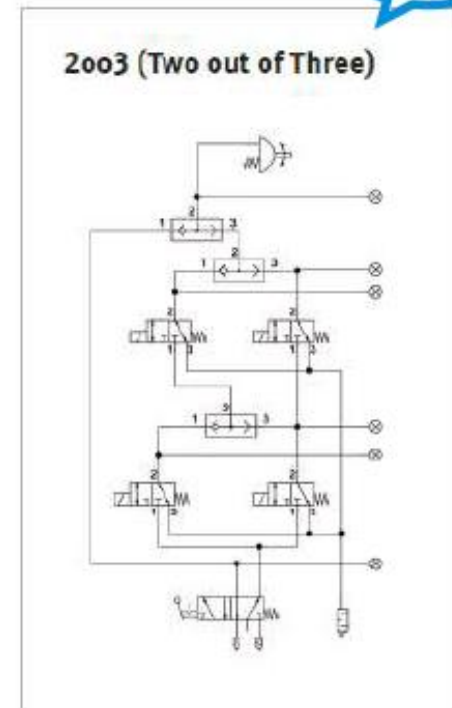
FESTO

2003 Block NAMUR/Inline



SIL 3

2003 (Two out of Three)



FESTO

Actuator units from Festo – ready to install



Complete actuator units, whether single- or double-acting, save you time and money. We will build your ready-to-install and tested actuator unit in accordance with your requirements – including for safety related systems. To do this, we use automated process valves based on certified components with a corresponding SIL manufacturer's declaration.

Panel and control cabinet solutions for safety-related applications

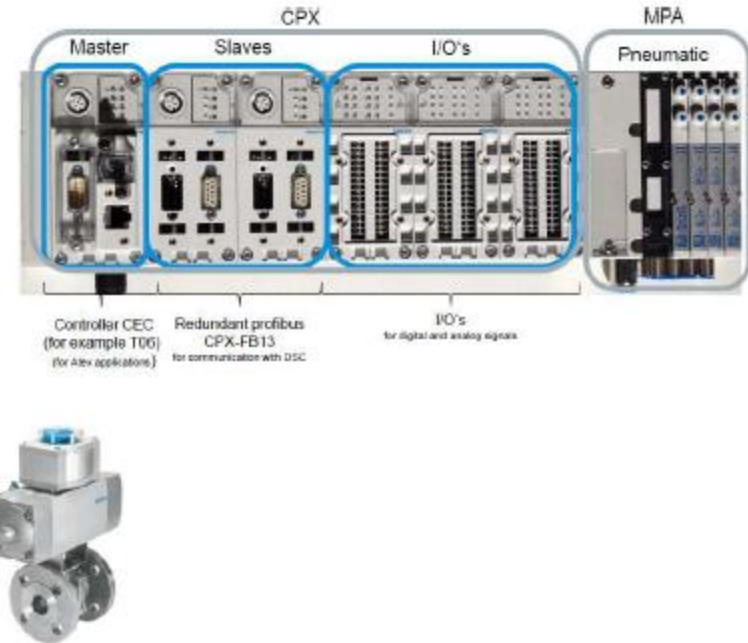
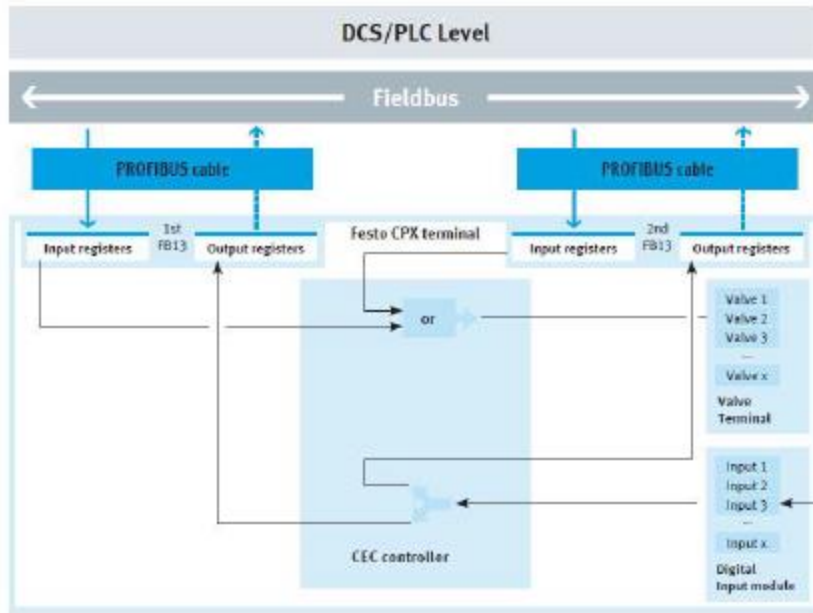


Festo offers a broad spectrum of pneumatic control systems. Our offer encompasses all stages of the value chain, from initial planning and engineering up to assembly, testing and delivery of the ready-to-install panels.

Current solutions for batch processes

FESTO

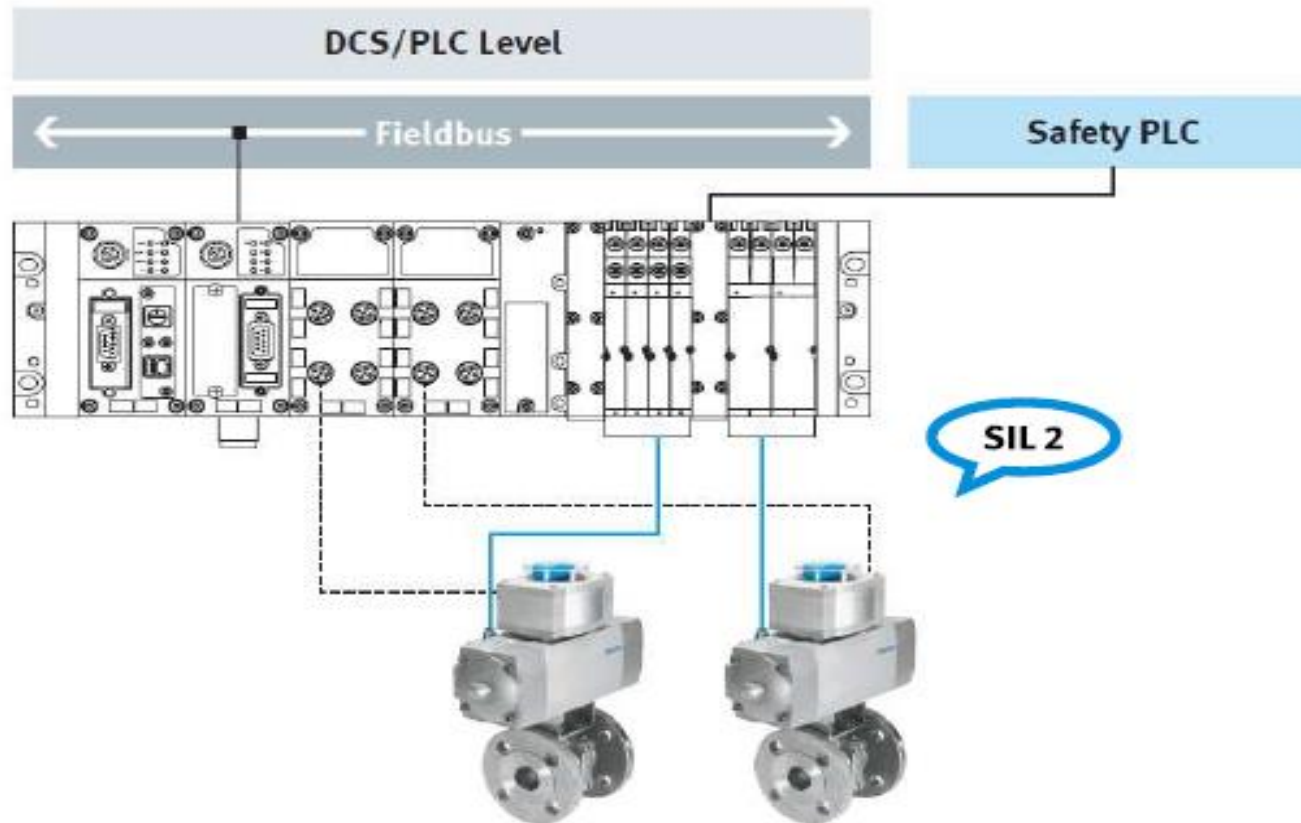
PROFIBUS redundancy



Current solutions for batch processes

FESTO

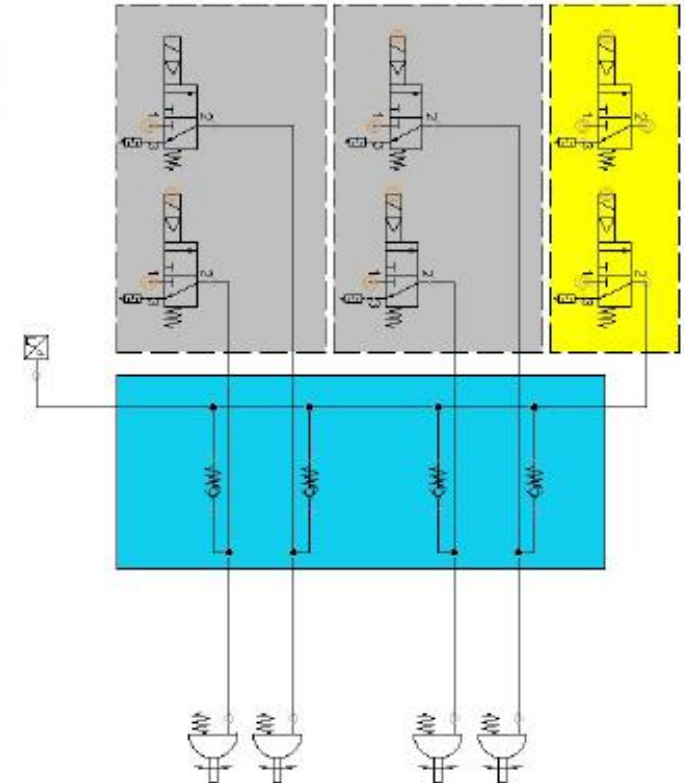
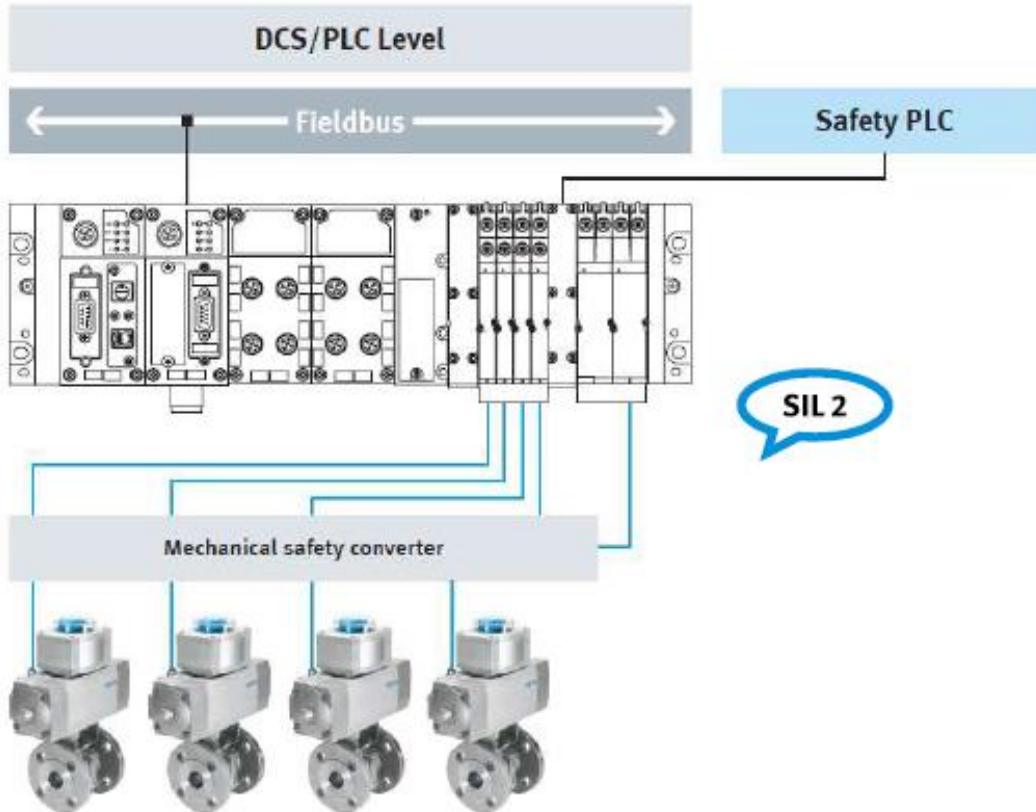
CPX/MPA with safety PLC



Current solutions for batch processes

FESTO

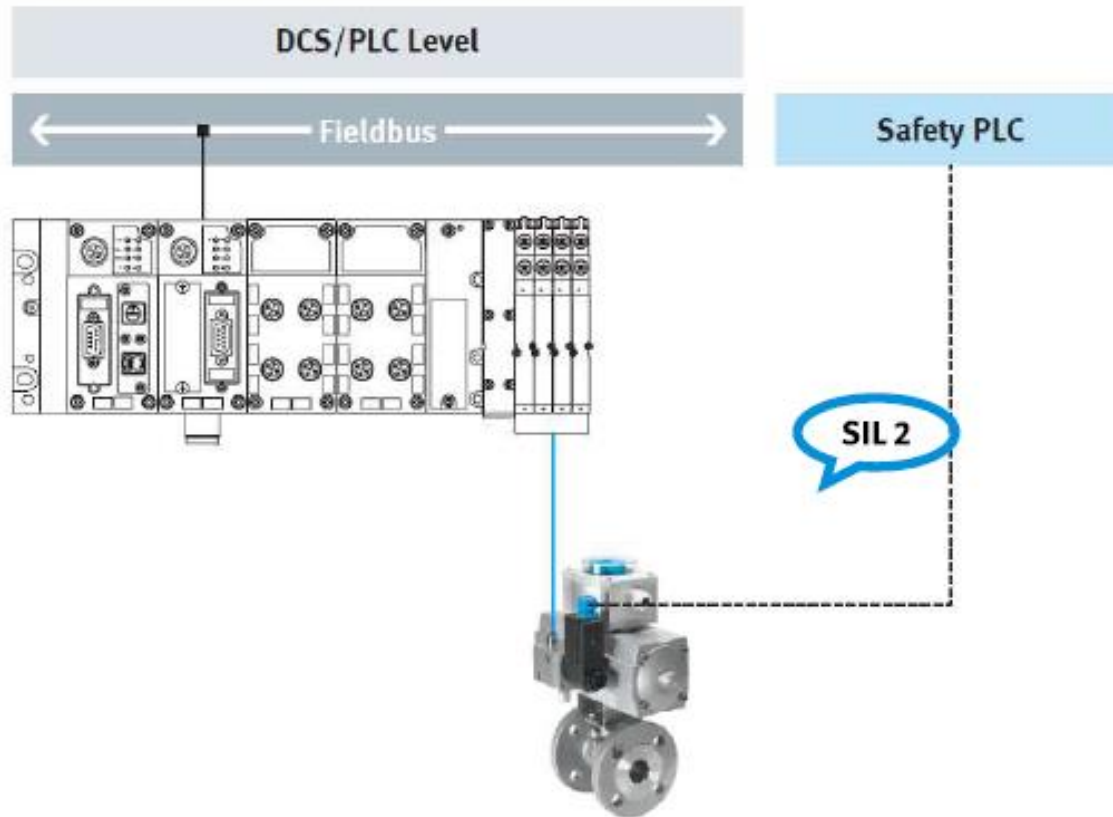
CPX/MPA with safety PLC



Current solutions for batch processes

FESTO

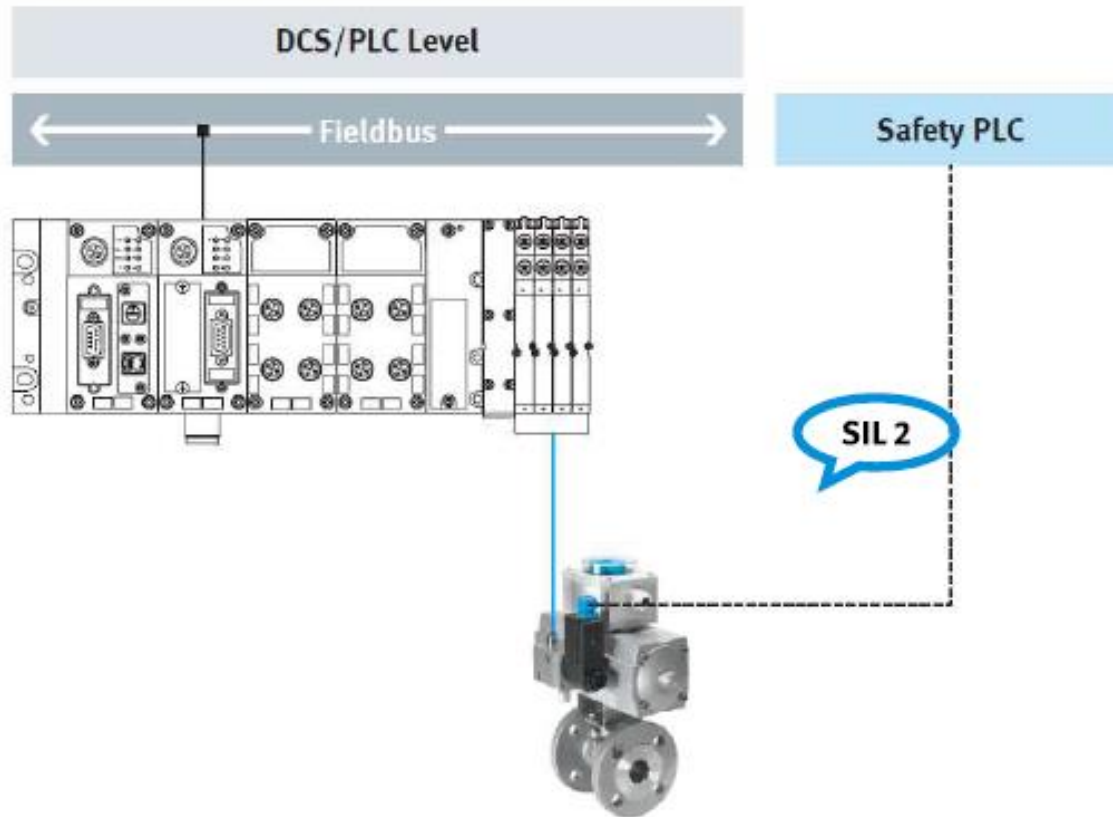
VOFC/D as a safety valve



Current solutions for batch processes

FESTO

VOFC/D as a safety valve



FESTO

спасибо
danke 謝謝
ngiyabonga
teşekkür ederim
dank je
gracias
tapadh leat
hvala
mauruuru
thank you
moichakkeram
dziękuje
sagolun
sukriya
kop khun krap
go raibh maith agat
obrigado
leima kasih
grazie
arigato
takk
dakujem
merci
merci
ευχαριστώ

KOCAELİ SANAYİ ODASI

PROSES
EMNİYETİ SEMPOZYUMU

FESTO

