More than sensors + automation

JUMO SAFETY PERFORMANCE PL SIL

Functional Safety – Hassle Free!

JUMO Safety Performance

The compact solution for functional safety

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Dear Reader,

In 1976 in Seveso, northern Italy, a dramatic accident involving toxic gas brought about a development, the results of which we know today as the terms "functional safety" or "SIL". At the time, a serious overheating reaction took place in a plant which had neither automatic cooling systems nor warning systems, releasing large amounts of dioxin. As a result of this catastrophe, the laws and regulations regarding the protection of people, living things, and the environment were tightened.

The first result was the standard IEC 61508 "Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems" published in 1998, which has been applied as EN 61508 since 2002. For the first time, this standard comprehensively defined the safety requirements in automation technology. While IEC 61508 is primarily aimed at the manufacturers of components for safety equipment, IEC 61511 "Functional Safety - Safety Instrumented Systems for the Process Industry Sector" applies to the operators and planners of safety equipment. IEC 61511 provides recommendations and guidelines for assessing the risk of damage in plants, and can be used to help select safety-related components. The aim of these standards is to reduce the risk to an acceptable level.

But what do we actually mean when we talk about "functional safety" or "SIL" and "PL"? Functional safety refers to the part of system safety that depends on the correct functioning of safety-related subsystems and external devices to reduce risk.

The term "PL" stands for "Performance Level". It describes a discrete level that defines the ability of safety-related parts of a control and that performs a safety function under unpredictable conditions.

The term "SIL" ("Safety Integrity Level") functions as a measure of the safety-related performance or reliability of an electrical or electronic control system. The primary focus of SIL is on the evaluation of the safety chain, also known as SIF (Safety Instrumented Function). This safety chain typically consists of the safety controller, the actuator, and the sensor. The SIS ("Safety Instrumented System") is made from one or more safety chains.

SIL and PL are gaining more and more importance in the process industry and in mechanical engineering. For this reason JUMO has developed a safety-oriented product portfolio for different measurands under the JUMO Safety Performance brand. This portfolio allows JUMO to now offer different compact solutions for different applications.

Additional information can be found at: **http://jsp-en.jumo.info**.

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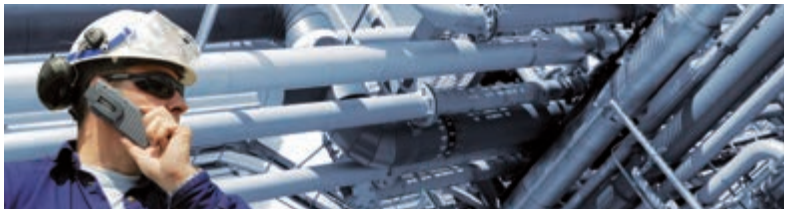

JUMO Safety Performance – the compact solution for functional safety

JUMO Safety Performance is a new brand from JUMO. Products marked with this brand are suitable for safety-related plants. These include devices that are SIL and PL certified, but also passive elements that are suitable for use in SIL and PL measuring chains. These are labeled with "SIL qualified" and "PL qualified".
The configuration of the components that has been especially adjusted to the process is important for a process-reliable application at the customer's site. The JUMO Safety Performance team of experts was created to assist users with all questions about SIL and PL.

JUMO safetyM – compact single-channel safety controller for Ex and non-Ex areas

Functional safety primarily focuses on the evaluation of a safety chain. Such a safety chain typically consists of a control, an actuator, and a sensor. Safety-related solutions are normally made through a safety programmable logic controller. However, complex programming applications are required here and the inputs as well as outputs are coupled with card types and multichannel features. The disadvantage is that each application must be calculated and evaluated separately according to SIL.
The JUMO safetyM STB/STW is an attractive alternative to the safety programmable logic controller. This safety limiter/monitor is equipped with three different functional outputs and enables the simple implementation of a compact one-channel safety controller. Such a solution is especially well suited for smaller applications like special machines or individual applications with low signal density or low number of signals.
Different temperature probes can be directly connected to the JUMO safetyM without transmitters. Other measurands such as pressure, level, or flow can be measured using a normal input signal. Another highlight of the JUMO Safety Performance applications is the possible use of a configured compact solution for an explosion-protected area according to the ATEX directive (see figure page 7).

SIL classifications of the compact solution

Based on decades of experience in temperature measurement technology and safety controllers, JUMO has already developed a safety-related compact solution for the temperature measurand which does not require further verifications or calculations. Here, the one-channel safety controller JUMO safetyM is combined with JUMO RTD temperature probes or thermocouples. The manufacturer's declaration issued by JUMO establishes a certified SIL 3/PL e compact solution.
Compact solutions for the measurands pressure, level, and flow can be designed up to SIL 2 und PL d depending on the choice of sensor technology and actuators. The calculation is done by the user.
The JUMO Safety Performance team of experts supports the user with the calculations for compliance with the specified directives.

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More than sensors + automation

Herstellererklärung
Manufacturer's declaration

Für das folgende Produkt
For the following product

Kommanditgesellschaft, Sitz: 36039 Fulda, Amtsgericht Fulda, HRA 302 · USt.-Id.-Nr. DE 112411234; Persönlich haftende Gesellschafterin: M. K. JUCHHEIM GmbH, Sitz: 36039 Fulda, Amtsgericht Fulda, HRB 17; Geschäftsführer: Dipl.-Ing. Bernhard Juchheim, Dipl.-Kfm. Michael Juchheim

Your benefits in a nutshell:

- Certified measuring chain protection up to SIL 3/PL e possible
- Highest degree of flexibility for the configuration of the SIL components through comprehensive delivery program
- Safe monitoring and shutoff of systems
- Selectable security features (e.g. limiter or monitor function according to DIN 14597)
- Suitable for different measurands such as temperature, pressure, level, and flow
- Variable, manufacturer-independent selection of sensor technology and actuators
- Certified measuring chain individually adaptable to the process requirement
- SIL calculation is no longer necessary by the user when the JUMO safetyM is used in combination with JUMO temperature probes
- Also available as explosion-protected compact solution according to ATEX directive in different ignition protection types such as [Ex i]
- Individual assessment of the safety chain by the experienced Safety Performance team of experts

Safety-related shutdown up to SIL 3

Certified compact system for temperature

JUMO thermocouples/
RTD temperature probes

JUMO safetyM STB/STW
Type 701150

Manufacturer's declaration

Compact system for temperature

JUMO thermocouples/
RTD temperature probes

JUMO dTRANS T07
Type 707800

**Repeater power supply/
input isolating amplifier**
Type 707530

JUMO safetyM STB/STW
Type 701150

Compact system for pressure*

JUMO dTRANS p20
Type 403025

JUMO safetyM STB/STW
Type 701150

Compact system for pressure

JUMO dTRANS p20
Type 403025

Repeater power supply/input isolating amplifier
Type 707530

JUMO safetyM STB/STW
Type 701150

Compact system for flow*

JUMO flowTRANS MAG S01
Type 406012

JUMO safetyM STB/STW
Type 701150

Safety-related shutdown up to SIL 3 in ATEX version

Certified compact system for temperature

JUMO thermocouples/
RTD temperature probes

JUMO safetyM STB/STW Ex
Type 701155

Manufacturer's declaration

Compact system for temperature

JUMO thermocouples/
RTD temperature probes

JUMO dTRANS T07
Type 707800

**Ex-i repeater power supply/
input isolating amplifier**
Type 707530

JUMO safetyM STB/STW
Type 701150

Compact system for pressure

JUMO dTRANS p20
Type 403025

**Ex-i repeater power supply
input isolating amplifier**
Type 707530

JUMO safetyM STB/STW
Type 701150

Compact system for flow*

JUMO flowTRANS MAG S01
Type 406012

JUMO safetyM STB/STW Ex
Type 701155

General comment for the displayed safety-related compact solutions on page 6 and 7:

- The JUMO safetyM STB/STW has an output signal to control the downstreamed safety actuator systems.
- Additional output signal suitable for downstreamed visualization, controlling, and documentation.

* Auxiliary energy for power supply is required separately.

Always one step ahead:

The electronic JUMO Safety Performance products

JUMO safetyM STB/STW and STB/STW Ex

Safety temperature limiter and monitor

- Ignition source monitoring according to EN 50495 SIL 2 and EN 13463 IPL 2
- Intrinsically safe input [Ex ia] and [Ex e]
- 1oo2D structure for high degree of process reliability
- Approvals for DIN EN 14597, SIL 3, PL e, GL, PED
- LCD display with background lighting and plain text display

Analog inputs

RTD temperature probes: Pt100 DIN EN 60751, Pt1000 DIN EN 60751

Thermocouples: Fe-CuNi "L" DIN 43710, Fe-CuNi "J" DIN EN60584, Cu-CuNi "U" DIN 43710, Cu-CuNi "T" DIN EN60584, NiCr-Ni "K" DIN EN60584, NiCrSi-NiSi "N" DIN EN60584, Pt10Rh-Pt "S" DIN EN60584, Pt13Rh-Pt "R" DIN EN60584, Pt30Rh-Pt6Rh "B" DIN EN60584, W3Re-W25Re "D"

Direct current: 4 to 20 mA

Analog inputs: configurable by user

Analog output

Current: 4 to 20 mA, 0 to 20 mA

Voltage: 2 to 10 V, 0 to 10 V

Analog output: can be used as actual value output for main measured value, measured value 1, measured value 2, difference between measured value 1 and measured value 2

Digital input

Connection: one potential-free contact – for unlocking, keyboard lock, level inhibit

Relay outputs

Relay output KV – can be used as a pre-alarm

Relay output – limit value alarm evaluated for temperature limiter

Voltage supply

AC/DC 20 to 30 V, 48 to 63 Hz, AC 110 to 240 V +10 %/-15 %, 48 to 63 Hz

Approvals

ATEX, IECEx, SIL, PL

For further information: data sheet 701150/701155

JUMO dTRANS T06

Multifunctional four-wire transmitter in mounting rail case

- Simple DIN-rail mounting with removable connectors
- Universal input for a large number of sensors
- Comprehensive self and sensor diagnostics
- Highest degree of accuracy and long-term stability
- Intelligent additional functions such drag indicator/service counter
- SIL 2/SIL 3 according to IEC 61508-1/2/3:2010
- Easy-to-use configuration via keys and display or USB interface
- Higher process quality and efficiency
- Increased plant safety and reliability

Analog inputs

RTD temperature probes:
Pt50, Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000, Cu50, Cu100, two/three/four-wire circuit

Thermocouples:
L, J, U, T, K, E, N, S, R, B, C, A1, D, L, Chromel® Alumel®, PLII

Analog output

Current: 0(4) to 20 mA

Voltage: 0(2) to 10 V (invertible)

Installation

Mounting rail/DIN rail 35 × 7.5 mm

Calibration accuracy

± 0.05 %

Voltage supply

AC 110 to 240 V, DC 24 V

Special features

- Universal input for a large number of sensors and standard signals
- Intuitive operation and configuration on the device or through USB interface with setup program
- RS485 interface (Modbus RTU) and relay output limit value (option)
- Intelligent additional functions such as min./max. drag indicator, operating hours counter, and output simulation
- SIL 2/SIL 3 according to DIN EN 61508 and PL c/PL d according to DIN ISO 13849 (option)
- Sensor matching for RTD temperature probes
- Customer-specific linearization
- High galvanic signal separation
- Service and operation hours counter
- Connection diagram retrievable in the display

For further information: data sheet 707071

JUMO dTRANS T07

Two-channel temperature transmitters

- High degree of accuracy as of 0.1 K with Pt100 sensor
- HART® 7 protocol with extension for "secure HART"
- SIL 2/SIL 3 hardware/software according to IEC 61 508:2010
- Reliable measurement operation through sensor monitoring and device hardware error detection

Analog inputs

RTD temperature probes:
Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Cu50, Cu100, two-wire/three-wire/four-wire electrical circuit

Thermocouples:
A, B, C, D, E, J, K, L, N, R, S, T, U

Analog output

Current: 0(4) to 20 mA

Voltage: 0(2) to 10 V (invertible)

Installation

In terminal head form B
or on mounting rail/DIN rail 35 × 7.5 mm

Calibration accuracy

± 0.05 %

Voltage supply

DC 12 to 42 V

Special features

- Two universal measurement inputs (RTD, TC, Ω, mV)
- Output 4 to 20 mA (single channel, loop powered)
- Two enclosure versions (B-head or DIN rail)
- Optional insert display BD7 for B-head device version

For further information: data sheet 707080

Ex-i repeater power supply/ input isolating amplifier

- For operation in intrinsically safe [Ex i] transmitters and mA current sources installed in Ex areas
- HART® capability
- SIL 2 approval
- Universal power supply

Input

0(4) to 20 mA
Supply isolation amplifier operation or input isolating amplifier operation

Output

0(4) to 20 mA
0(1) to 5 V

Installation

On mounting rail/DIN rail 35 × 7.5 mm

Comparison accuracy

± 0.1 %

Voltage supply

AC/DC 24 to 230 V

Special features

- HART® capability
- Active/passive current output
- LED for power status
- Universal power supply

For further information: data sheet 707530

JUMO exTHERM-AT

Explosion-protected surface-mounted thermostat

- Can be directly applied in zones 1 and 2 or 21 and 22
- Switching capacity 16 A as standard, optionally 25 A
- Admissible ambient temperature: -60 to +70 °C
- Thermowell for zone 0 available as an accessory
- Single thermostat and double thermostat
- Approvals according to ATEX, IECEx, and SIL 2

Features

Single thermostat and double thermostat

Versions

- Temperature monitor (TW)
- Temperature limiter (TB)
- Safety temperature monitor (STW)
- Temperature limiter (STB)

Switching element

Flameproof enclosed panel-mounted thermostat

Switching capacity

16 A, 230 V, optionally 25 A, 230 V

Maximum control range/limit value

500 °C

Approvals

ATEX, RTN, EAC, DIN, IECEx

For further information: data sheet 605055

Measuring with safety

The JUMO Safety Performance sensors

Thermocouples and RTD temperature probes

- Over 40 different SIL and PL qualified temperature probes
- Head and cable probe as thermocouple or RTD temperature probe
- Approvals according to ATEX/IECEx

Thermocouples

- For temperatures of up to 1500 °C
- As single or double thermocouple
- Thermocouples J, L, K, S, B*

RTD temperature probes

- For temperatures of up to 700 °C
- Pt100, Pt500, Pt1000
- As single, double, or triple RTD temperature probe

Process connection

- Thread, flange, compression fitting, hygienic process connections

For further information: see data sheet

Thermocouples for types:

901006, 901020, 901030, 901050, 901110, 901120, 901150, 901190, 901210, 901220, 901230, 901240, 901250, 901350, 901820, 901821

RTD temperature probes for types:

902006, 902020, 902023, 902030, 902040, 902044, 902050, 902120, 902123, 902130, 902150, 902153, 902190, 902210, 902220, 902230, 902240, 902250, 902350, 902520, 902524, 902550, 902554, 902810, 902815, 902820, 902821, 902830

*According to DIN 43710, DIN EN 60584, and ANSI MC96.1 or ASTM E230.

JUMO dTRANS p20

Process pressure transmitter

- HART® interface
- Optional explosion protection [Ex ia] according to ATEX
- Linearity 0.05 %
- Turn down 1:50
- Simple operation with rotary knob
- Stainless steel case
- Optional high-temperature version up to 200 °C
- Display scaling with a choice of measuring units
- Display of sensor temperature
- For pressure, differential pressure, and level applications
- Display of minimum and maximum pressures

Input

403025/26: 60 to 600 bar (relative; absolute)
403022/23: 1 mbar to 100 bar DP

Output

4 to 20 mA two-wire, HART®

Accuracy (linearity)

403025/26: 0.05 %
403022/23: 0.07 %

Process connection

403025/26: thread, hygienic connections, JUMO PEKA, diaphragm seals
403022/23: 2x 1/4"-18 NPT; diaphragm seals

Medium temperature

403025/26: -40 to +200 °C
403022/23: -40 to +110 °C

Special features

- Programmable and highly precise
- Stainless steel case
- SIL 2, ATEX

For further information: data sheets 403025/26, 403022/23

JUMO flowTRANS MAG S
Electromagnetic flowmeters

- For the process industry
- Compact as well as remote mount design
- Nominal widths DN 3 to DN 2000
- Nominal pressure up to PN 100
- Temperatures up to 180 °C
- Measuring accuracy up to 0.2 % from the measured value

Input/output
Analog output 4 to 20 mA; HART® digital input, digital output
Nominal width
DN 3 to DN 2000
Accuracy
0.3 % (optional: 0.2 %) of the measured value
Process connection
Flange according to DIN, ASME, JIS
Medium temperature
Maximum 180 °C
Approvals
SIL 2, ATEX, IECEx

For further information: data sheet 406012

Training courses for JUMO Safety Performance products

JUMO offers several opportunities for the perfect introduction to the "functional safety" topic:

- Seminars
- Webinars
- Technical literature

Seminar: Functional safety in Europe pertaining to "Safety Integrity Level" and the "Performance Level" – basic course

Table of contents

The seminar provides an introduction about the simple start into functional safety through application-oriented practical information when dealing with the standards:

- What does functional safety mean?
- Standards, definitions, values
- Differences between SIL and PL
- Manufacturer specifications
- System structures
- Risk assessment and the tools
- Security structures
- Case study of a safety chain
- SIL ratings according to standards
- Certificates and safety manual
- System applications and their different approaches with structures and calculations
- General information and examples for practical use
- Exchange of experience

Objectives

After the seminar the participants will have an overview of functional safety and can:

- Create risk assessments
- Retrace calculations
- Establish SIL structures
- Compile documentations

Target group

Employees who want to get an initial overview of the functional safety requirements in construction and mechanical engineering.

Requirements

Basic technical knowledge

http://campus.jumo-en.info

Webinar:
Application of JUMO safetyM STB/STW safety temperature limiters and monitors

The webinar introduces the JUMO safetyM STB/STW and conveys important information for the implementation of compact safety controllers:

- DIN EN 14597
- Definition temperature monitor and limiter as well as safety temperature monitor and limiter
- Overview of JUMO safetyM
- SIL and SIL certified measuring chains from JUMO
- JUMO safetyM STB/STW hardware and configuration
- Comparison between SIL-classified measuring chains with safety PLC and JUMO safetyM

Target group:

- All employees who are responsible for implementing safety controllers

http://webinars.jumo-en.info

Technical literature:
Functional Safety – Safety Integrity Level (SIL)

This specialist book aims to provide support for the introduction into functional safety. It describes the basic principles of functional safety based on legal principles in an easy to understand manner.

htto://literature.jumo-en.info

General Information

The current date of the seminar and the webinar can be found at http://campus.jumo-en.info.

We would be happy to shape the seminar to your requirements. We can hold the seminar on your company premises or at our training center in Fulda, Germany. Feel free to contact us.

JUMO has been providing seminars "by practitioners for practitioners" for over 20 years: all of our speakers are proven practitioners who have in-depth knowledge, both about their areas of specialization and the JUMO products.

We have set ourselves the goal of providing seminars of the highest quality.

As of this year we offer exclusive webinars online. These generally last for 1 to 2 hours. They give you a compact overview of a topic that is especially tailored for you or that deals with a particular issue.

Your advantage: no travel expenses are necessary so that online training is highly efficient.

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