

DESYsmart / TESYsmart steam test unit

Electronic pressure monitoring system for controlling fittings with safety-relevant tasks in accordance with TRD 421, DIN EN ISO4126, AD data sheet A2 and safety concept in accordance with IEC 61508.

The protection of steam boilers and pressurised containers from unacceptable overpressure is increasingly being guaranteed through the use of externally controlled safety fittings. If at the same time these fittings have to perform control tasks, electro-pneumatic or electro-hydraulic actuator systems are used to help them perform these tasks.

To monitor the pressure in the part of the installation to be protected, 3-channel pressure sensing systems are used; these are increasingly being used in a safety concept for the entire installation, and must be considered in accordance with IEC 61508 SIL (SIL = **S**afety **I**ntegrity **L**evel).

This article describes the advantages of customer-specific solutions through the use of the newly developed product by Reineke Meß- und Regeltechnik GmbH from Bochum, Germany.

DESYsmart (pressure sensing system) has been specifically developed for use in controllers for safety valves and safety shut-off valves. It represents the further development of previously used controllers while incorporating the highest safety level.

TESYsmart (temperature sensing system) is an extension of the steam test unit with DESYsmart, which has proved successful over many years. TESYsmart fills the gap between different safety systems for protection from excess temperatures in steam systems in power stations; it is future-proof for the customer and is consistently easy to use.



Subject to technical alterations

Technical data

- Component reference for safety valves TÜV.SV.12-1106 and TÜV.SV.11-710
- Power supply voltage 21.6 - 28.8 V DC
- Reverse polarity protection Supply voltage
- Accuracy class < 0.2 %
- Protection class IP66, NEMA 4x (stainless steel 1.4301)
- Safety Integrity Level SIL 2 (**optional SIL3**)
- Fuse Electronic protection module
- Max. power intake 15 W at 24 V DC
- Permissible load of relay outputs 250V DC/AC, 1 A
(connected coils must be connected to free-wheeling diodes or the like)
- Permissible ambient temperature 0° C to + 55° C
(HMI panel: 0° C to + 50° C)
- Connection 1x20-pole, screw terminal strip 5xM16, 1xM20, 1xM32 for Ethernet
- Weight approx. 5.5 kg
- Dimensions (WxHxD) approx. 400 x 200 x 123 mm
- Vibration resistance/shock Classification as per IEC 721
(fixed location, weather protected)
Part 3-3, Class 3M4
(Transportation) Part 3-2, Class 2M1
- Display 3.8" graphic touch display with 4 function keys
- Adjustable pressure ranges 0 - 600 bar (**DESYsmart**)
- Adjustable temperature ranges Project-specific (**TESYsmart**)
- Connection to the measuring sensors 3 or 4-wire technology
- Reset difference (hysteresis) 0.5 – 10% of switching point setting
- Decoupling of the pressure values to the control room (Optional **DESYsmart**)
- Decoupling of the temperature values to the control room (Optional **TESYsmart**)

Reasons for the development of DESYsmart and TESYsmart

Up until a few years ago, no safety classification of a mechanical or electrical component in accordance with IEC61508 (SIL) was taken into account for sensing the pressure with controlled safety fittings in water-steam circuits.

In future, the requirements of safety systems for new installations will continue to rise, as will costs, since the costs for independent experts' reports for a safety concept for the installations, as well as follow-up certification, are rising constantly.

These problems were the reason for developing a pressure sensing system in accordance with SIL2 and SIL3 classifications. The suitability of safety fittings in accordance with SIL, as defined in DIN EN ISO 4126 and TRD421, was finally certified by TÜV Nord. Since then, many installations in Germany and in other countries have been fitted with products by Reineke Meß- und Regeltechnik GmbH and are providing trouble-free operation.

The results of the integration of different monitoring and measuring systems in one compact unit are DESYsmart and TESYsmart, with addition signal decoupling of pressure and temperature values to the control room of the installation operator, with approval according to IEC61508 (SIL2 and SIL3).

Design and functional operation of a steam test unit including DESYsmart:

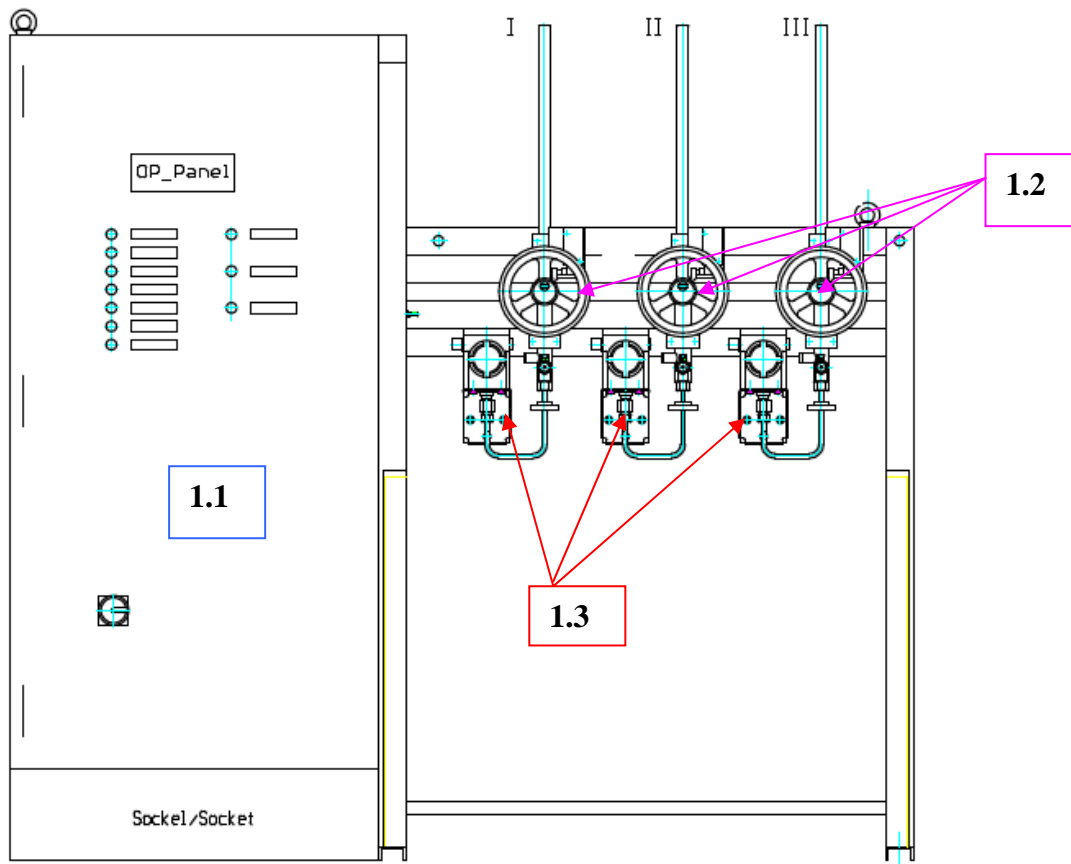


Fig. 1

Subject to technical alterations

The safety equipment (**Fig. 1**) consists of a control cabinet with **DESYsmart** and **TESYsmart (1.1)**. On the frame there are three pressure transducers (**1.3**), each of which is connected individually to the installation part to be monitored by means of a pipeline (**I, II, III**). A mechanical locking system (**1.2**) allows one pressure relief line to be shut off for inspection purposes, while the two other lines remain positively open. This allows the successive inspection and adjustment of each pressure transducer, as well as of the entire downstream safety equipment, during normal operation of the installation.

The **TESYsmart** extension directly monitors three temperature sensors that are installed in the steam line.

Essential parts of the component reference, besides the steam test unit, are also the control units for the safety-oriented pressure relief of the actuating cylinders, which are located directly at the actuator in question.

A distinction is made between pneumatic and hydraulic solutions, which can be used depending on the system operator's specifications.

Hydraulic version

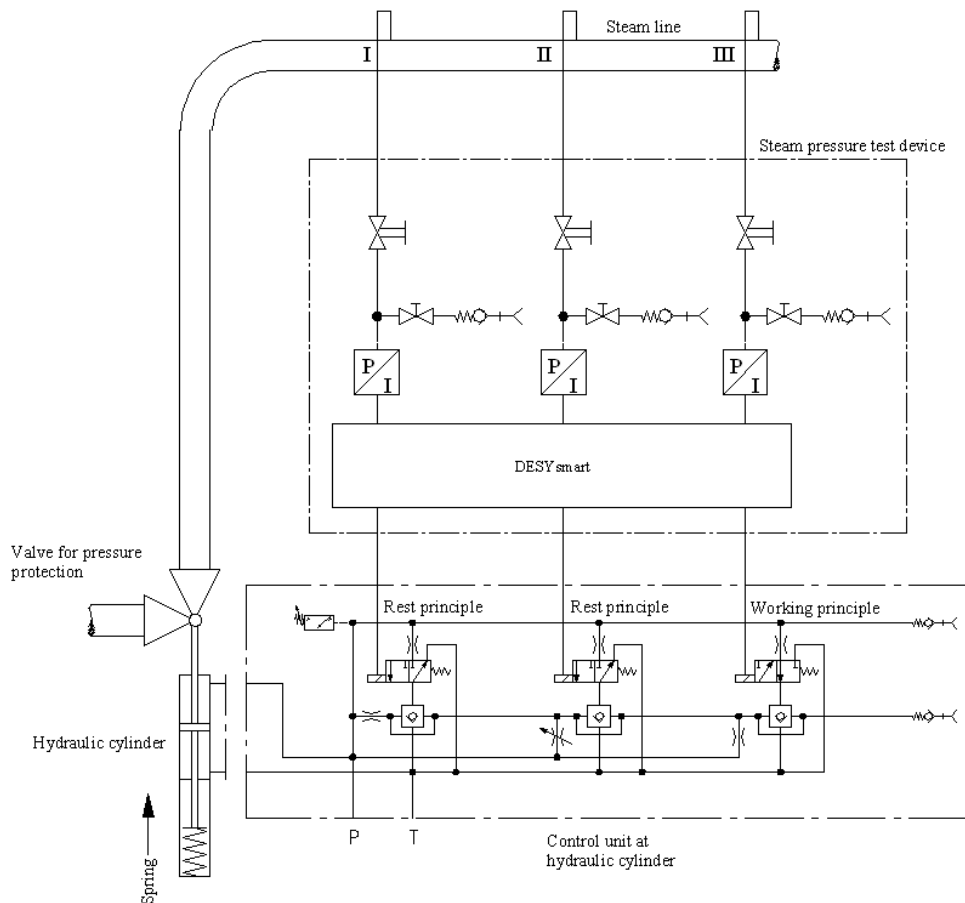


Fig. 2

A pressure transducer in the steam test unit and a solenoid valve in the control unit are assigned to each of the three channels (**Fig. 2**). The safety function is triggered by three independent channels in a "1 out of 3" circuit. If the system pressure rises above the value set as the trigger pressure, the power supply to the solenoid valves is interrupted (rest principle) or power is supplied to the valve (working principle). All three solenoid valves relieve the relevant 2/2-way cartridge valves.

These open and relieve the hydraulic drive system of the safety fitting, so that the latter moves to its safety position regardless of control commands in the queue.

If, after the safety equipment has responded, the pressure in the pressure transducers in the steam test unit falls below the preset return switching point, the fitting returns to the specified control or final position.

Subject to technical alterations

Pneumatic version

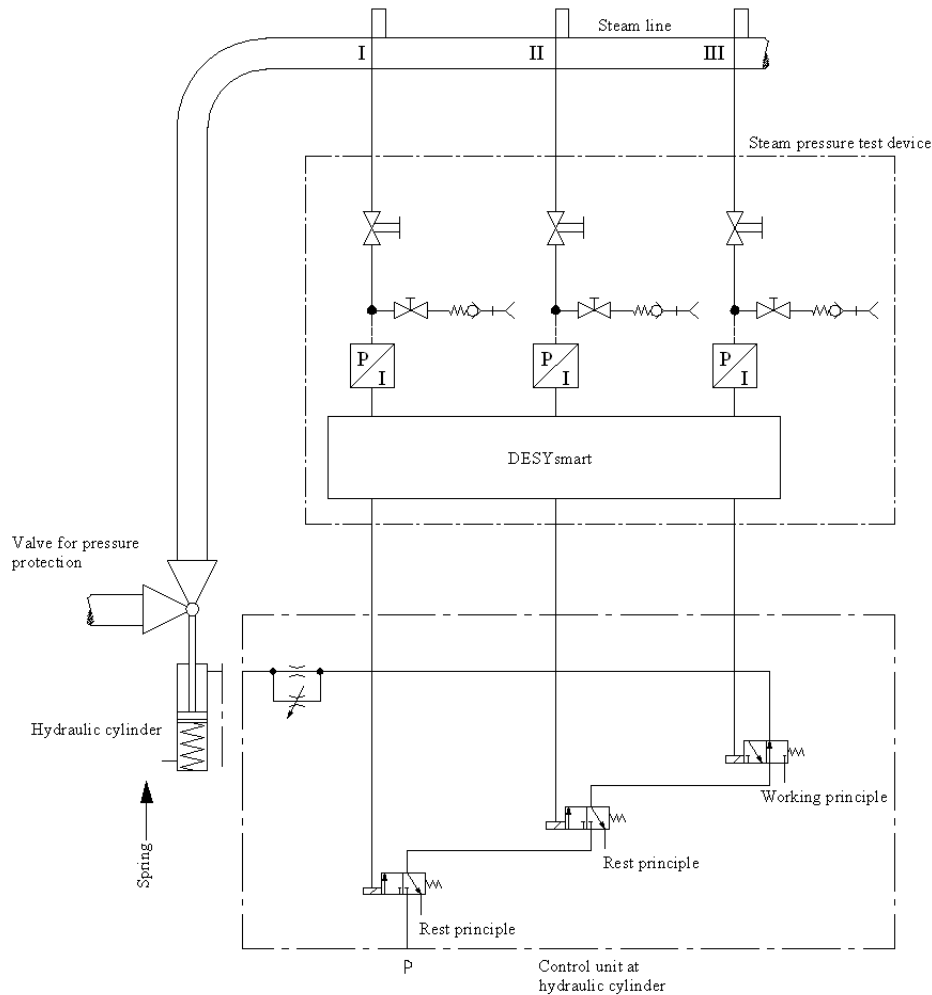


Fig. 3

As in the hydraulic solution, a pressure transducer and a solenoid valve are also assigned to the control unit for each channel in the pneumatic solution (**Fig. 3**). The safety function is triggered by three independent channels in a "1 out of 3" circuit. If the system pressure rises above the value set as the trigger pressure, the power supply to the solenoid valves is interrupted (rest principle) or power is supplied to the valve (working principle).

All three solenoid valves relieve the pneumatic cylinder of the safety fitting, so that the latter moves to its safety position regardless of control commands in the queue.

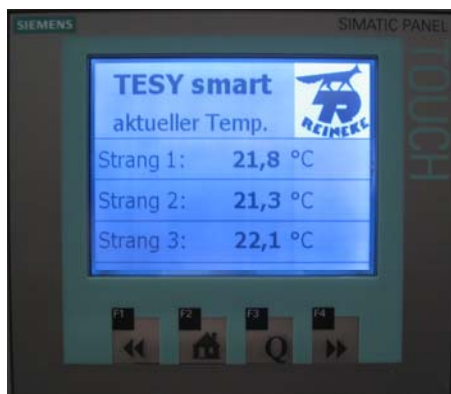
If, after the safety equipment has responded, the pressure in the pressure transducers in the steam test unit falls below the preset return switching point, the fitting returns to the specified control or final position.

Definition of safety event and malfunction

The distinction made between a safety event and a malfunction is described in the following. The term safety event refers to the triggering of a safety relay when the set maximum pressure or temperature is exceeded in at least one channel ("1 out of 3" circuit). The term malfunction is used to denote when the system detects a fault that is not relevant to safety either internally or in the periphery. An independent controller evaluates the malfunctions. Although the malfunction is signalled it does not lead to the safety chain being triggered.

In addition to the greatly reduced susceptibility to mechanical faults, the possibility of detecting malfunctions (self-diagnosis) represents a main advantage of DESYsmart and TESYsmart over other systems.

The independent controller within DESYsmart and TESYsmart monitors the three channels in terms of deviations with respect to each other, shows them on a text display and signals them to a higher-level controller in the system.



For over 100 years now, Reineke Meß- und Regeltechnik GmbH has been supplying you with high-quality products with a high degree of availability and a high level of safety.