

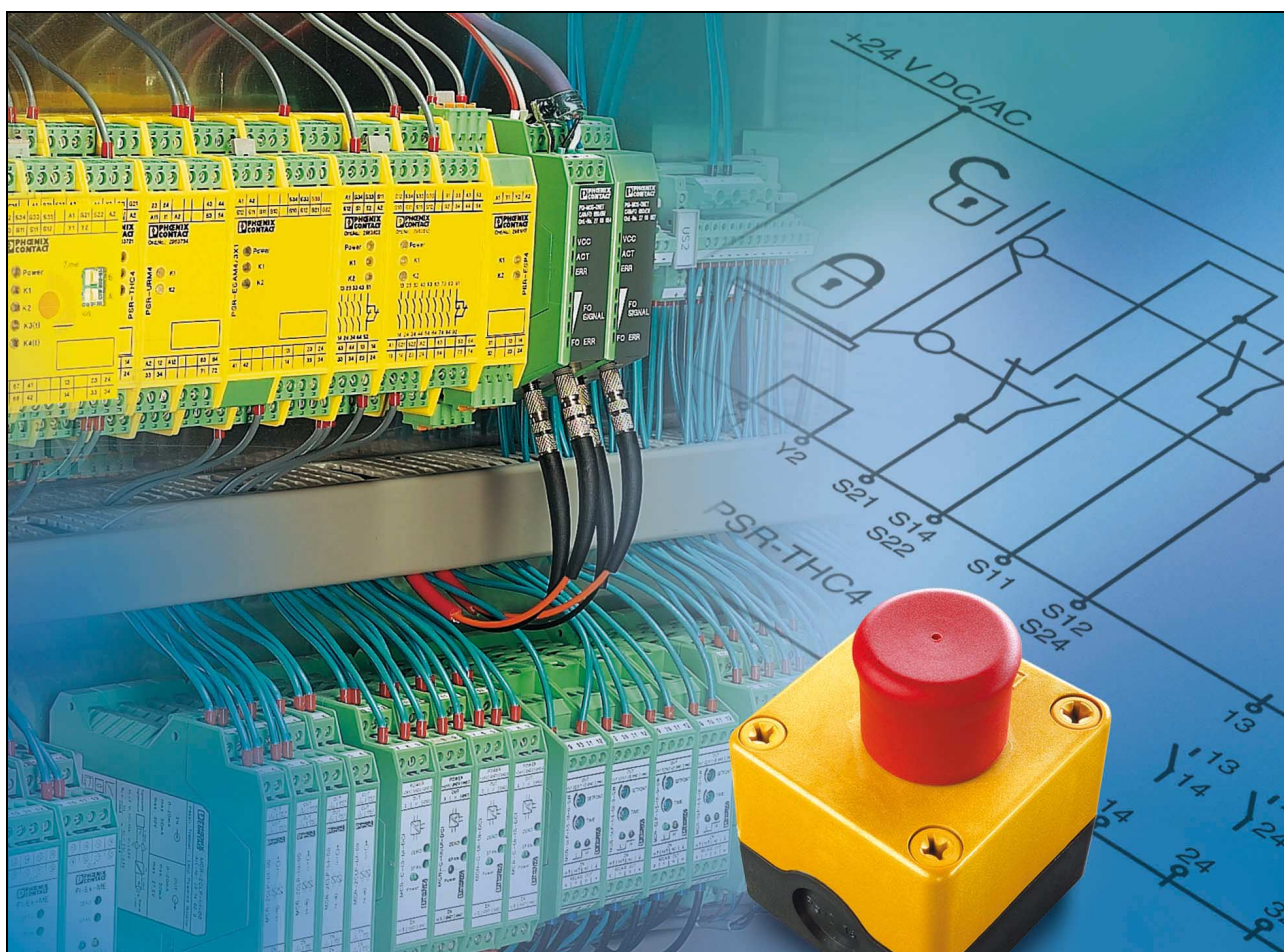
INTERFACE

User Manual

UM EN SAFETY RELAY APPLICATION

Order No.: 2888712

Application Manual
for PSR Safety Relays



INTERFACE

User Manual

Application Manual for PSR Safety Relays

05/2006

Designation: UM EN SAFETY RELAY APPLICATION

Revision: 01

Order No.: 2888712

This user manual is valid for:

All PSR safety relays from Phoenix Contact

Please Observe the Following Notes

In order to ensure the safe use of the product described, we recommend that you read this manual carefully. The following notes provide information on how to use this manual.

User Group of This Manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable national standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Phoenix Contact accepts no liability for erroneous handling or damage to products from Phoenix Contact or third-party products resulting from disregard of information contained in this manual.

Explanation of Symbols Used



The *attention* symbol refers to an operating procedure which, if not carefully followed, could result in damage to hardware and software or personal injury.



The *note* symbol informs you of conditions that must strictly be observed to achieve error-free operation. It also gives you tips and advice on the efficient use of hardware and on software optimization to save you extra work.



The *text* symbol refers to detailed sources of information (manuals, data sheets, literature, etc.) on the subject matter, product, etc. This text also provides helpful information for the orientation in the manual.

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This manual is supplied with a CD-ROM. This CD-ROM contains data sheets and package slips for PSR safety relays in electronic format.

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www.download.phoenixcontact.com/general/7000_en_00.pdf

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1 Introduction

1.1 Phoenix Contact – The Innovative Company

Phoenix Contact is an innovative company in the world of connection technology between wires and PCBs, in the world of automation technology, electrical interface technology, and the world of surge protection. Over 6000 employees work in partnership with customers and business partners to create innovative products for markets across the world. Phoenix Contact subsidiaries and agencies support users globally with their applications on all continents.

Company History

It was "from copper and ideas" that the Phoenix Elektrizitätsgesellschaft H. Knümann & Co. was founded in Essen, Germany in 1923. Intensive cooperation with energy suppliers in Germany led to the development of modular terminal blocks that can be aligned. The Group now has over 30 sales offices worldwide. Phoenix Contact GmbH & Co. KG is based in Blomberg in the East Westphalia region of Germany.



INTERFACE PSR Safety Relays From Phoenix Contact

Simplicity means safety – for people, machines, and the environment

It is a generally accepted fact that the best solutions are often the simplest. This applies in particular to safety technology.

On the one hand machine and system builders are faced with the challenge of meeting applicable safety directives and on the other hand they want to keep the costs and effort required to a minimum.

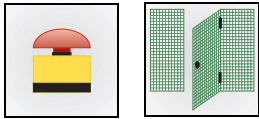
Our products show that future-oriented safety solutions do not necessarily have to be highly complex in their application in order to meet the most demanding safety requirements in machine and system production.

Phoenix Contact safety technology features easy integration and handling combined with a high level of quality.

1.2 Wide Range of Products in Slim Housing

The safety relays from the Phoenix Contact INTERFACE range meet the highest requirements for monitoring emergency stop circuits, safety door circuits, and two-handed controls. Special modules are available for contact extension, process technology (SIL 3), safe time functions, as well as light grid and speed monitoring functions. All connection terminal blocks are pluggable and keyed.

1.2.1 Emergency Stop/Safety Door



PSR safety relays provide up to eight enabling current paths and one signaling current path for monitoring emergency stop and safety door circuits.

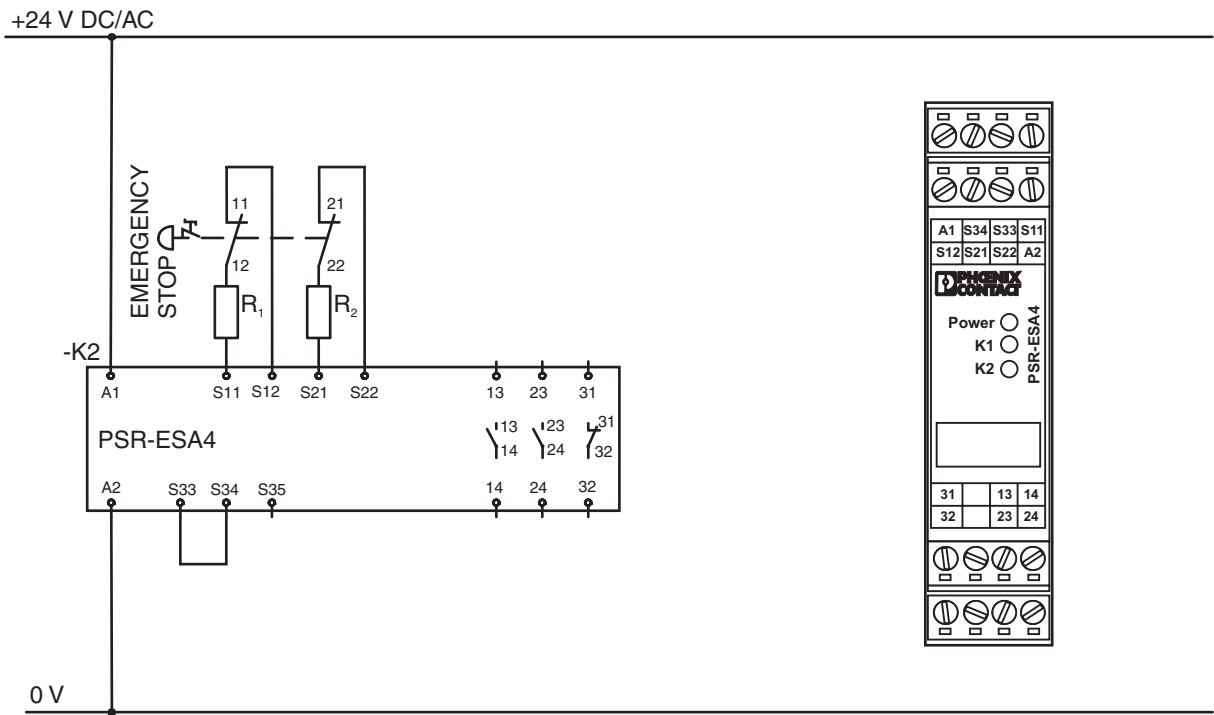
Manually activated modules also check the function of the connected start button, i.e., a malfunction is reliably detected.

Cable Lengths

In many applications, several sensors, such as emergency stop switches, are usually used to monitor safety doors. Depending on the size of the machine or system, a considerable amount of cabling may be required to wire the sensors.



Make sure that the specified cable lengths are not exceeded, so as to ensure error-free operation of the safety requirement.



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Figure 1-1 Cable lengths

Using the example of an emergency stop application with the PSR-ESA4 (see Figure 1-1), the following calculations can be made:

Assumed values:

Cable: $A = 1.5 \text{ mm}^2$

Specific conductivity for Cu: $\kappa = 56 \text{ m}/(\Omega * \text{mm}^2)$ (at 20°C)

Technical data for the safety relay:

Input data:

Maximum voltage drop for S11-S12 and S21-S22: 2 V DC, approximately (corresponds to $22 \Omega = R_L$, approximately)

$$R_L = R1 + R2$$

$$R_L = 22 \Omega$$

Calculated value:

$$l = R_L * A * \kappa$$

$$l = 22 \Omega * 1.5 \text{ mm}^2 * 56 \text{ m}/\Omega * \text{mm}^2$$

$$\underline{l = 1848 \text{ m}}$$

Where:

l Permissible cable length

R_L Cable resistance

A Cable cross section

κ (= Kappa) conductivity

Cu Copper

This refers to the forward and return line for both channels (S11-S12 and S21-S22).



The cable length for S33-S34 must be taken into consideration here, since the application operates with automatic start.

Cross-Circuit Detection

In both category 3 and category 4, a first fault must never lead to danger. This makes it necessary to provide redundancy in the control structure.

In a redundant circuit (e.g., safety grid monitoring with two limit switches according to the wiring example below) it is possible that cross circuits (unintentional, incorrect connection between two redundant circuits) may not be detected, because the limit switches are always actuated or enabled simultaneously by the grid.

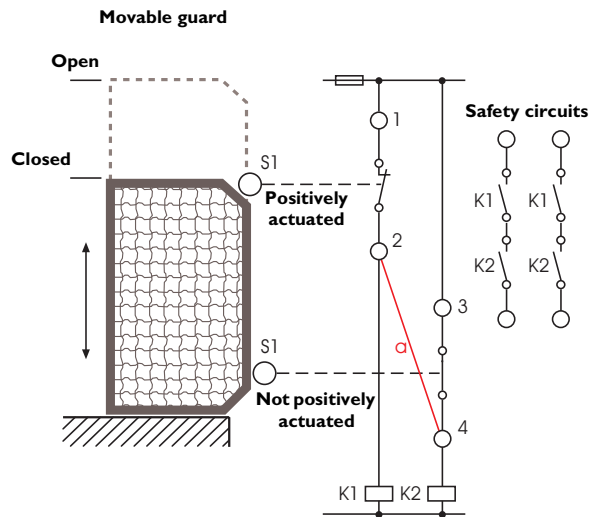


Figure 1-2 Cross-circuit detection in the event of single faults

This type of single fault (cross circuit a) alone does not directly lead to a dangerous situation, but cannot be tolerated in category 3 (see Figure 1-2).

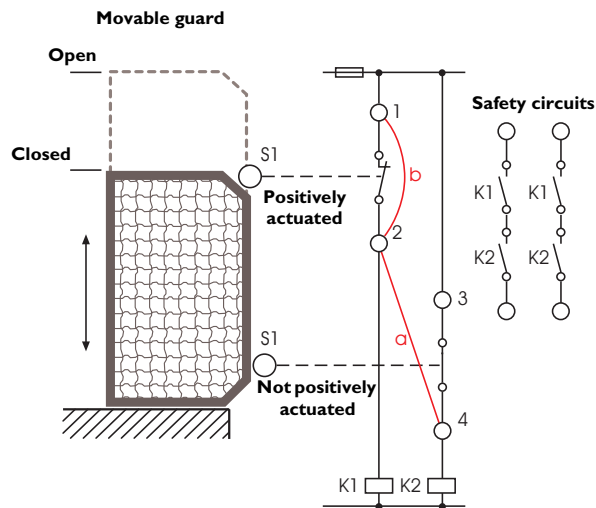


Figure 1-3 Cross-circuit detection in the event of several faults

If another fault (b) then occurs, the safety equipment ceases to be effective. This means that the circuit no longer responds to the opening and closing of the safety grid.

In safety category 4, this fault accumulation following a cross circuit could not be tolerated. A monitoring function is required that can control this fault (see example in Figure 2-16 on page 2-27).

1.2.2 Light Grid (Light Curtain)



Light grids consist of a transmit and receive unit and have a two-dimensional monitoring range. Light grids are electrosensitive protective systems used to protect operating personnel working on or in the vicinity of dangerous machines. Compared to mechanical systems, they offer the advantage of contact-free and therefore wear-free operation.

Please note the following factors when using light grids:

- The light grids must be installed in such a way that it is impossible to access the protected field from above, below or behind. If this is not guaranteed, additional safety equipment must be installed.
 - The machine control system must be capable of being influenced electrically and permit dangerous states to be exited immediately in each operating phase.
 - The environmental conditions must not adversely affect the effectiveness of the light protective system.
- Some application examples**
- Door controls in elevators
 - Detection of small parts and monitoring of parts in packaging machines
 - Paper tear monitoring in printing presses
 - Reliable measurement of grid boxes
 - Profile and height control of pallets in warehouses and conveying technology
 - Looms (e.g., prevention of weft breakage)

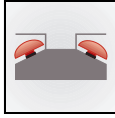
Relevant standards

EN 61496-1, EN 61496-2, IEC 61496-1, IEC 61496-2: Requirements for electrosensitive protective systems

EN 999: Calculation of safety distances

EN 954-1: Safety of machinery - Safety-related parts of control systems

1.2.3 Two-Hand Controls

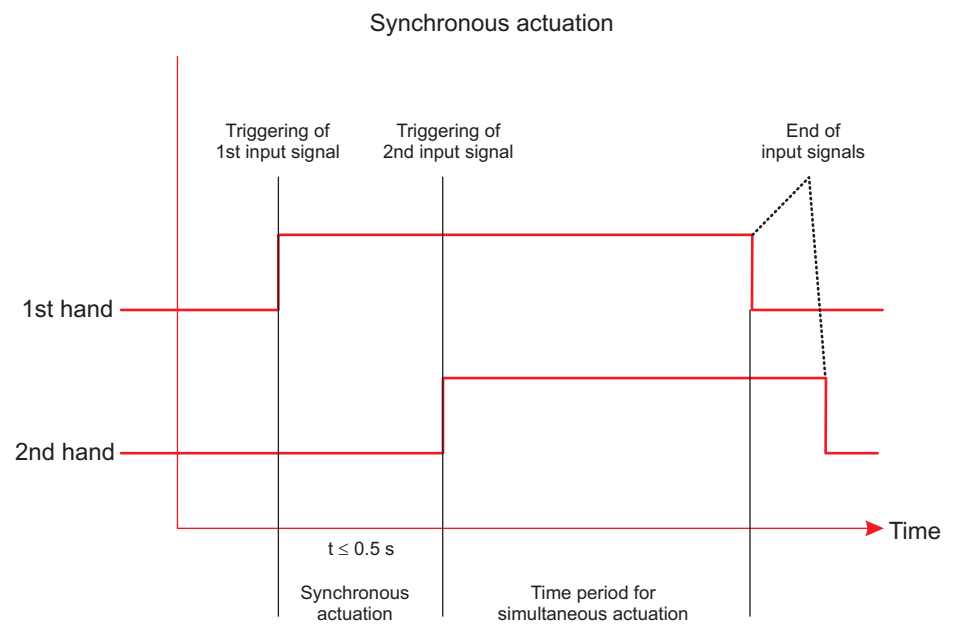
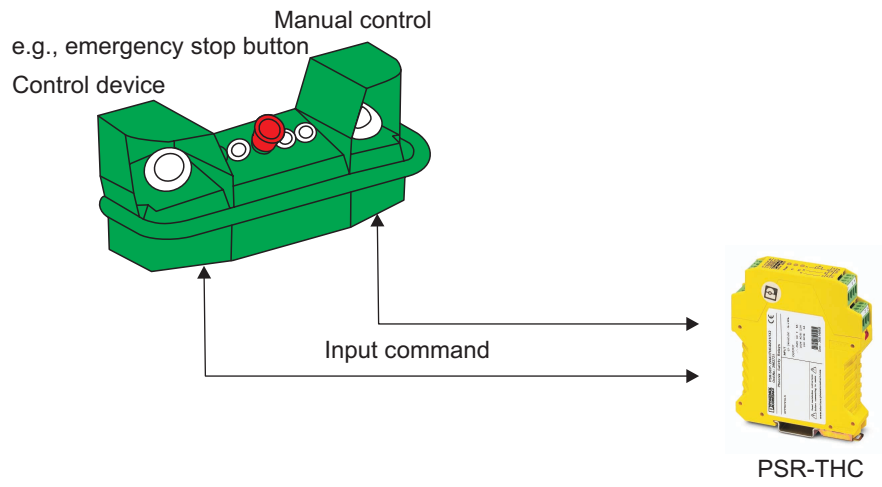


According to DIN 574, the simultaneity of two-hand controls must be monitored to be < 0.5 seconds. The time is reliably checked and evaluated by corresponding category type IIIC modules.

Two-hand controls are localized safety equipment. The operator must keep his/her hands on the control device during dangerous machine movements (see example in Figure 1-4 on page 1-7).

Table 1-1 Requirements according to EN 574

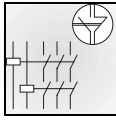
Requirements According to EN 574	Type I	Type II	Type III		
			A	B	C
Use of both hands (simultaneous actuation)					
Relationship between input signals and output signals (only both input signals -> output signal)					
Prevention of accidental operation					
Prevention of defeat					
Re-initiation of an output signal (only once both input signals are finished -> re-initiation of the output signal is possible)					
Synchronous actuation (simultaneous actuation within 0.5 seconds)					
Safety category 1 application, EN 954-1	X		X		
Safety category 3 application, EN 954-1		X		X	
Safety category 4 application, EN 954-1					X



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Figure 1-4 Structure of a two-hand control

1.2.4 Contact Extension/Positively Driven Contacts



Often more contacts are required than are available as a standard. For these applications, positively driven contact extension modules are used. They can be connected as modules as required.

Positively Driven

Standard EN 50205 makes a distinction between two groups of relays with positively driven contacts:

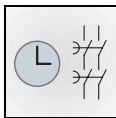
- Application type A: Relay with positively driven set of contacts
- Application type B: Relay with positively driven set of contacts and other not positively driven contacts, as well as a contact set with PDT contacts



The definition "positively driven" was first established in 1972 in the professional association safety regulation "ZH1/457 Control systems for power-driven presses in metal processing" with the wording:

"Positively driven is when the contacts are mechanically connected to one another in such a way that the N/C and N/O contact can never be closed at the same time. It must be guaranteed for the full period of service life, even when destroyed, that the contact spacings are at least 0.5 mm".

1.2.5 Safe Time Function



Using appropriate devices, applications that require time-delayed contacts (e.g., locked protective covers or dynamic processes), are switched reliably and precisely up to safety category 3/4 according to EN 954-1.

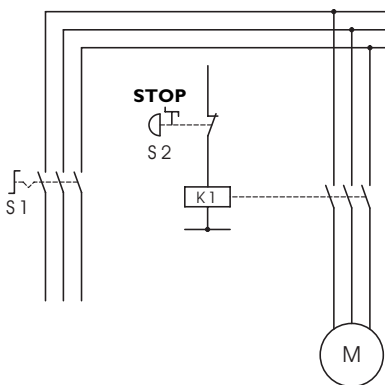
1.2.6 Stop

Stop Categories According to DIN EN 60204-1/VDE 0113-1

Every machine must be equipped with a category 0 stop function. Category 1 and/or 2 stop functions must be provided when this is necessary for the safety and/or functional requirements of the machine.

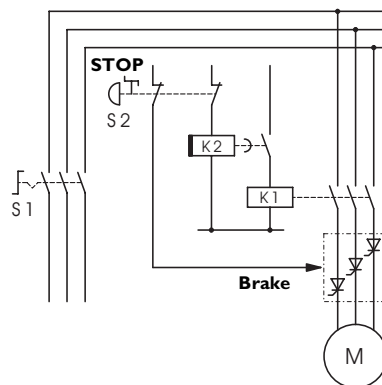
Category 0 and category 1 stops must be able to function independently of the operating mode and a category 0 stop must have priority.

In order to stop a machine, three stop categories are defined in DIN EN 60204-1/VDE 0113-1, which describe the stop control sequence independently of an emergency situation:



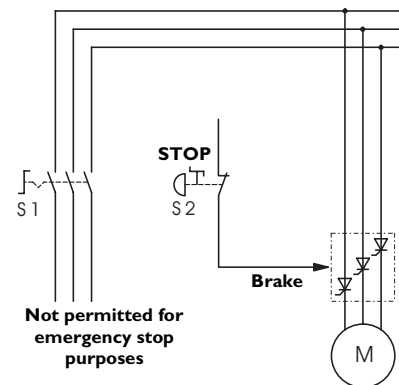
Category 0 Stop

Stopping by immediate removal of power to the machine drives (i.e., an uncontrolled stop).



Category 1 Stop

A controlled stop with power available to the machine drives to achieve the stop and then removal of power when the stop is achieved.



Category 2 Stop

A controlled stop with power left available to the machine drives.

UM EN SAFETY RELAY APPLICATION

Emergency stop

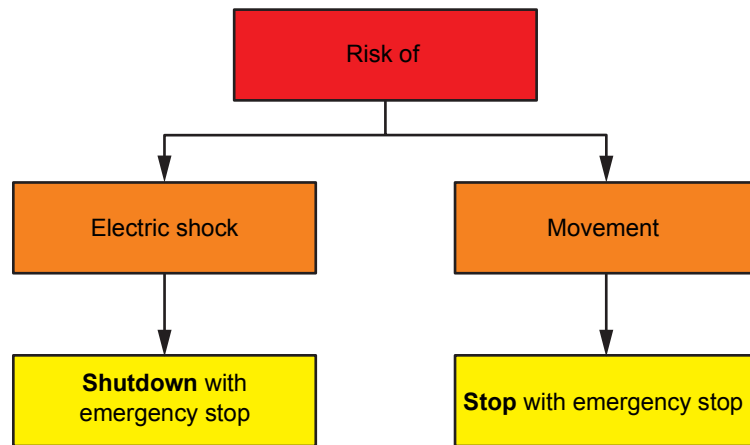
Automatic disconnection of the power supply to an entire installation or part of an installation in the event of an emergency, if there is a risk of electric shock or another risk of electrical origin (the two definitions of emergency stop are often confused).

Emergency stop
(according to ISO 13850,
EN 60204-1, Annex D)



An emergency operation intended to stop a process or a movement that would become hazardous (stop).

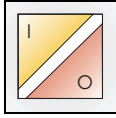
The emergency stop function is triggered by a single operator operation. This function must be available and operational at all times according to ISO 13849-1 (EN 954-1). In this case, the operating mode is not taken into consideration.



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Figure 1-5 Emergency stop

1.2.7 Safe Isolation



Depending on the version, the modules have safe isolation between the input and output, and between the contacts. Applications with 230 V low voltage can be connected reliably and safely.

Isolation Between Input and Output

PSR modules provide safe isolation, reinforced insulation, and 6 kV between the input circuit and the enabling current paths. In EN 50178, safe isolation is required if SELV and PELV are switched together or led directly next to one another in a device. Due to the internal structure and the insulation properties between the input and the contacts in Phoenix Contact PSR modules, 230 V AC, for example, can be switched without any limitations. Depending on the type, the output contacts (13-14, 23-24, etc.) are isolated from one another using basic insulation or reinforced insulation.

Basic insulation between circuits

(4 kV impulse voltage withstand level)

According to the standard, a mixture of SELV and PELV is strictly prohibited. Only switch 230 V AC at one of the two contacts if the adjacent contact carries the same potential.

Reinforced insulation between the circuits

(6 kV impulse voltage withstand level)

Reinforced insulation (e.g., larger clearance between tracks) is designed for a higher surge category than basic insulation. Therefore, SELV circuits $U \leq 25 \text{ V AC}$ or $U \leq 60 \text{ V DC}$ and circuits with higher voltages can be mixed.

1.2.8 Process Technology

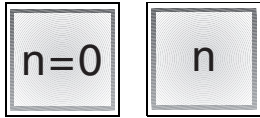


Phoenix Contact is setting new standards in safety technology; the PSR safety relay modules are some of the first safety products to be approved for process technology according to SIL 3/IEC 61508.

Conventional safety relay modules often have a very high inrush current, which control systems interpret as a short circuit. PSR-ESP safety relays provide optimized switch-on behavior and have two separate isolated redundant N/O contacts as well as one N/C contact with a design width of 22.5 mm that can switch up to 250 V AC/6 A. They are used to safely electrically isolate the field application from the control system or to adjust the voltage or power.

The international standard IEC 61508 applies to electrical and electronic applications, in particular in process technology, such as chemical processing, and mechanical engineering. Along with safety-related controllers or control systems, compact safety relays are also an integral part of the safety chain.

1.2.9 Speed and Downtime Monitoring

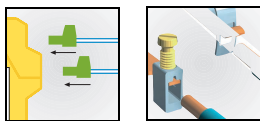


Monitoring modules for detecting downtimes and speeds in setup mode and in special operating modes with safety doors open on machines and systems.

Advantages:

- Can be configured
- SIL approval
- With cable adapter or initiators
- Compact design

1.2.10 Connection Terminal Blocks



Keyed plug-in connection terminal blocks ensure that there are no faults in the fixed wiring should servicing be required. It is no longer possible to mix up the cables.

Screw connection and spring-cage connection versions are available.

1.3 Documentation



Make sure you always use the latest documentation. Changes or additions to this document can be found on the Internet at www.download.phoenixcontact.com.

When working with the PSR safety relays, you must always keep this user manual and other items of product documentation to hand and observe the information therein.

SAFETY INTRO UM E (Order No. 2699202)

Introduction to safety technology and overview of standards

INF EN DE PSR/IL SAFE (Order No. 5148802)

Safety technology basics

FLY EN DE SAFETY RELAY (Order No. 5106873)

Overview of the Phoenix Contact safety relay range

2 Safety Technology

2.1 Accidents at Work

Accident at work

An accident at work is understood to be a personal injury to an employee that:

- Occurs during the course of his/her operational activities
- Occurs in connection with his/her operational activities
- Forms the basis for a claim against statutory accident insurance

All operational activities, which are defined as being in the interests of the company, are insured.

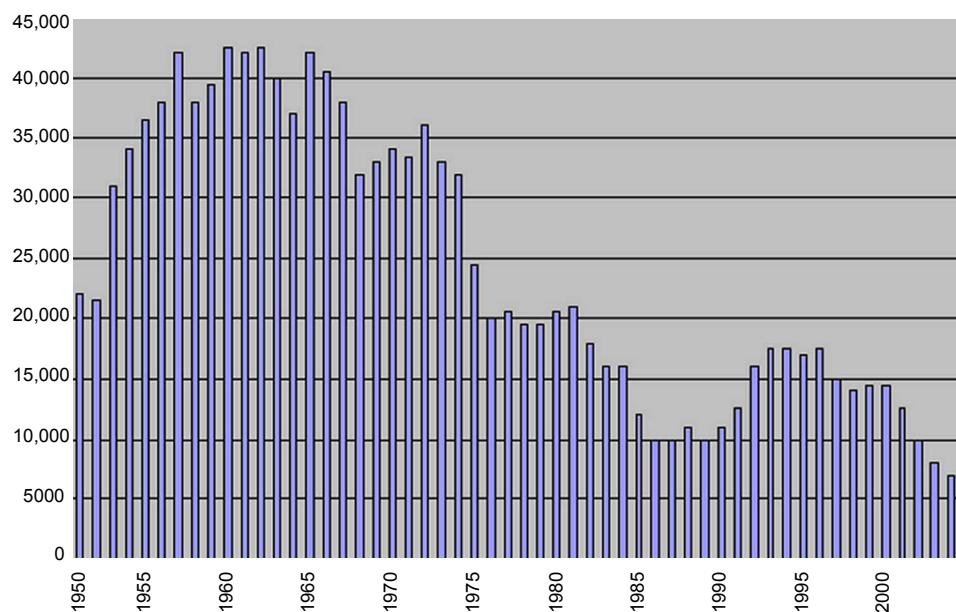


Figure 2-1 Notifiable accidents at work since 1950

The number of accidents at work has fallen to a record low. Even travel accidents and occupational diseases have decreased considerably in recent years, as reported by the Hauptverband der gewerblichen Berufsgenossenschaften (HVBG, German Federation of Institutions for Statutory Accident Insurance and Prevention) in Berlin, Germany. This decrease is due to the success of preventive measures. However, the rate of contribution rose slightly due to economic development and fewer people being employed.

In 2003, 10.5% fewer cases of accidents at work were recorded than in the previous year. In addition, the risk of injury in the workplace also decreased considerably; the accident rate fell by 4%. The number of fatal injuries fell by 4.9% compared to the previous year.

Every year around 15% of all the accidents at work, which occur in the member companies of our occupational safety and liability associations, are related to metal machining and processing machines.

These include presses, cutters, lathes, drilling, milling, and grinding machines, saws, and special machinery and systems. These accidents often result in serious injuries.

For machines that are built according to the EC Machinery Directive (98/37/EC), the manufacturer is obliged to perform a hazard assessment to determine all the hazards linked to the machine. The manufacturer must then design and build the machine in accordance with this analysis. However, the extent to which machines are really safe and whether all the hazards and risks have been estimated correctly is often only determined in practice. Therefore, following any accidents it is essential that their exact cause be determined and evaluated.

Evaluation of Accident Investigation Reports

For the following diagrams, 132 accident investigation reports from 1998 to 2000 were evaluated. Although the investigation carried out is insufficient for a statistical evaluation due to its limited scope, abnormalities could nevertheless be detected.

The following criteria were considered:

- Injured party-related characteristics
- Machine-related characteristics
- Technical causes
- Behavior-based causes
- Organizational causes

Machine Type

The evaluation of the accident investigation reports showed that accidents at work involving presses were the most common at around 34%, followed by accidents involving lathes and saws.

In the majority of cases the accidents occurred on old machines without CE marking.

The free exchange of machines in the European Economic Area demands the improved assignment of machine accidents to machine-related characteristics. As a result, more detailed information about the manufacturer, country of origin, type, year of manufacture, CE marking, EC declaration of conformity, EC-type examination, etc. is required.

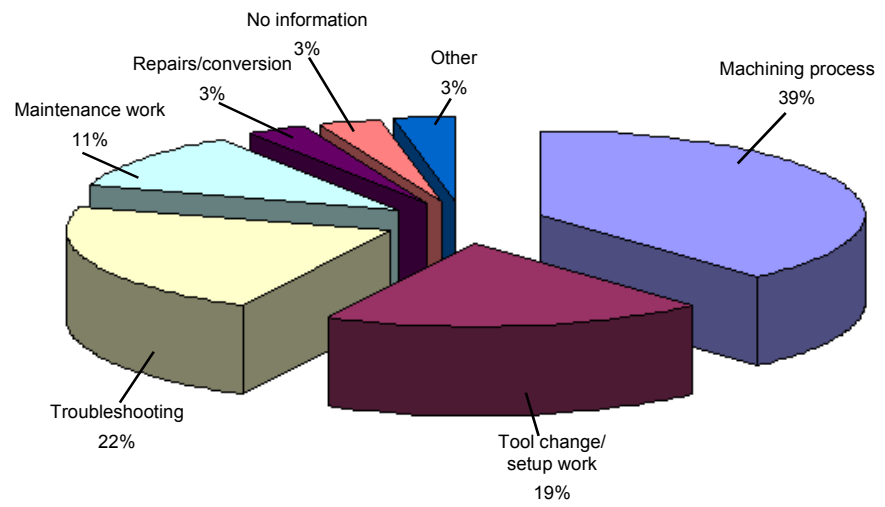


Figure 2-2 Activity performed by the injured party at the time of the accident

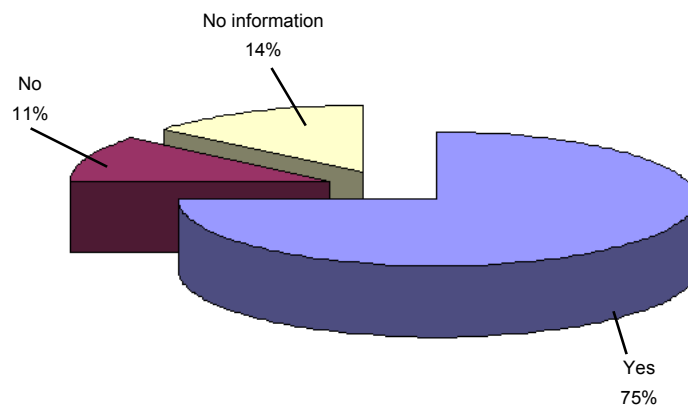


Figure 2-3 Incorrect operation of the machine

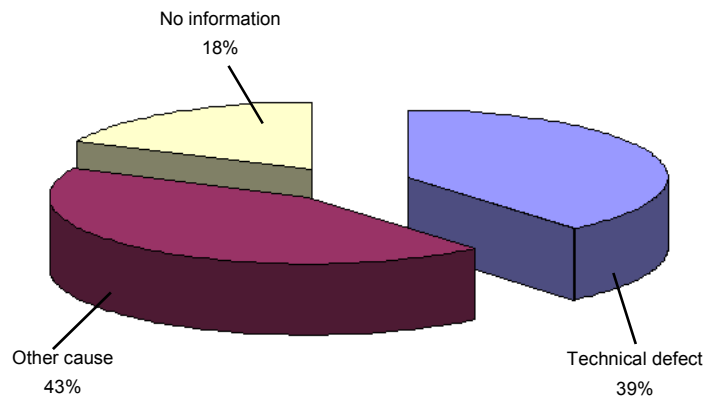


Figure 2-4 Cause of accident: Technical defect

Causes of Accidents at Work

There are often various causes for accidents at work. For example, the bypassing or manipulation of safety equipment can result from the following:

- Unsuitable safety equipment, which leads to manipulation or bypassing, e.g., due to:
 - An incorrect safety concept
 - Poor visibility
 - Faulty ergonomic design
 - Complex operation of the machine
- Convenience or inexperience of the operator

(Source: BGIA (Professional Institute for Safety at Work))

Organizational Causes

Operating errors represent a major percentage of the causes of accidents. There are numerous reasons for this. In addition to the reasons previously mentioned, which result in manipulation, insufficient knowledge of the following points can lead to incorrect behavior:

- Correct operation of the machine
- Imminent dangers during use
- Suitable safety equipment

In addition, existing technical defects on machines often result in the use of prohibited operating procedures.

In order to prevent accidents at work, it must be determined on the basis of individual cases whether, in addition to the technical requirements, correct operating instructions and training are provided for each operation and that they are also understood and observed by employees.

Summary and Outlook

Accidents at work involving metal machining and processing machines represent a high percentage of the total number of accidents. It is therefore important to investigate their cause and determine their main aspects so that effective safety equipment can be used.

The number and severity of accidents highlight the importance accorded to machine safety and that intensive accident prevention work is still required.

2.2 Strategies for Preventing Accidents at Work

Aims of Safety Technology

- Prevention of accidents at work that may be caused as a result of machine failure, the incorrect behavior of employees or the bypassing of safety equipment.
- Preventive health and safety protection for people in the workplace, e.g., to protect against heat, radiation, flying parts, etc.
- Prevention of costs, which result directly or indirectly from machine failure or the incorrect behavior of employees, e.g., production failure, damage to expensive machine parts and tools, liability for quality defects, compensation for injured persons, etc.
- Prevention of distortion of competition as a result of different safety requirements in international trade.

Safety Equipment

Figure 2-5 on page 2-6 provides a selection of safety equipment, from which the safety expert can select suitable solutions for his/her application following a risk assessment.

(Source: Maschinenbau BG, Professional Association for Mechanical Engineering)

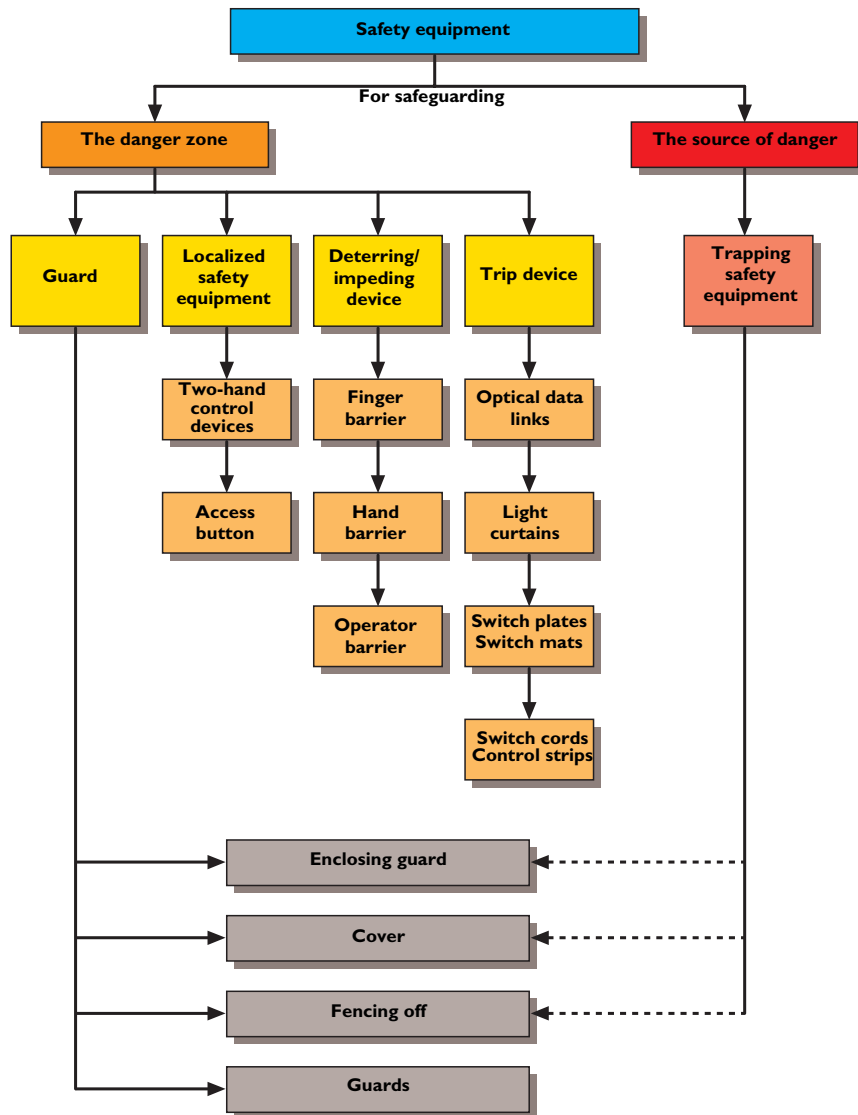


Figure 2-5 Safety equipment

Establishing Machine Safety

Strategies for improving machine and system safety are described in generic standard EN 292.

It is first necessary to exploit all options where accidents can be prevented by design:

- Measures relating to the ergonomics of operating desks and the like to suit the individual
- Avoiding sharp corners and edges in the operating environment
- Selecting suitable materials for the construction of the machine
- Isolation of conductive parts to prevent contact
- Protection against hydraulic and compressed air lines or hoses that may burst

- Provision of diverse redundancy in control systems to ensure single-fault tolerance as a minimum

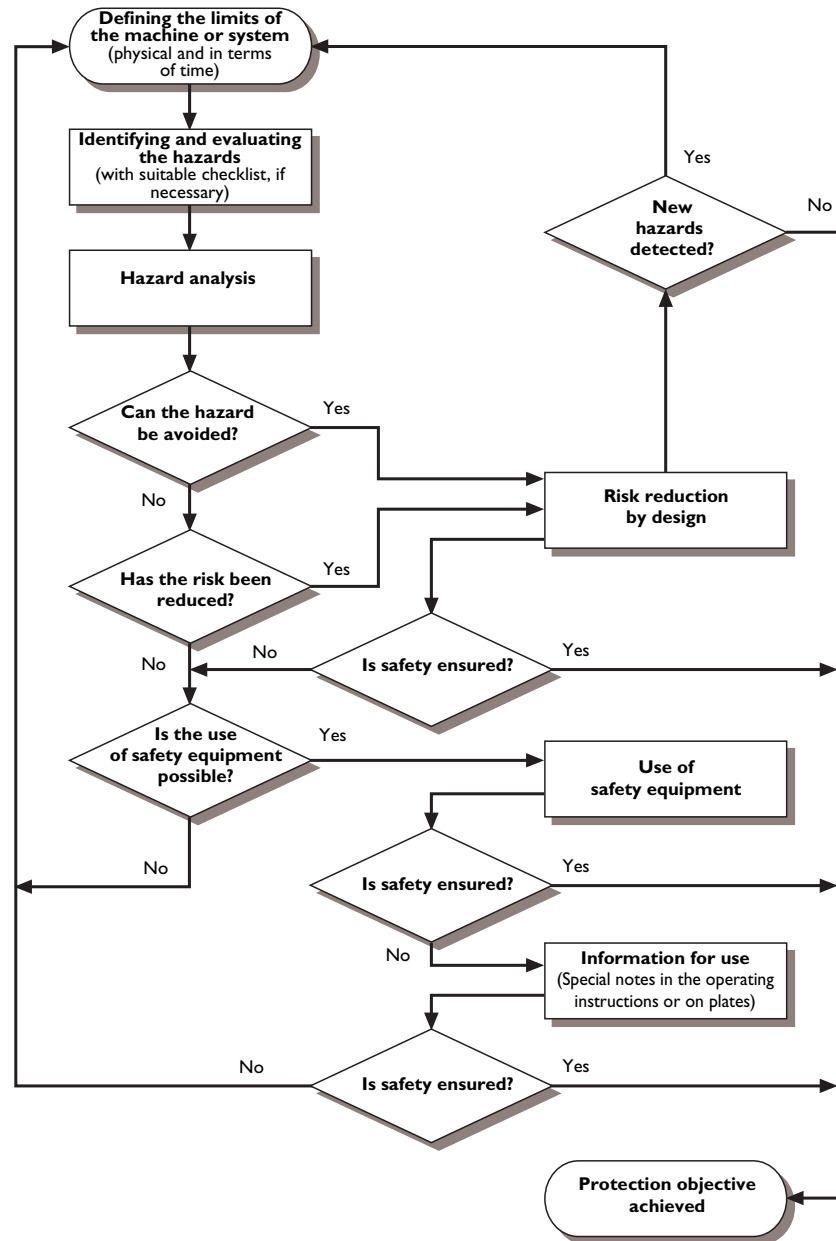


Figure 2-6 Strategy diagram

2.3 Standards and Directives

European Standards

Legal requirements

The single European market, opened up in 1993, was established under the Single European Act and is an area without internal borders. Within this area, the free movement of goods, persons, services, and capital is ensured under the Act.

Currently, 25 countries belong to the European Economic Area (EEA). Each member state of the EEA is obliged to adopt the single market guidelines in national legislation without any alterations. These guidelines are then valid in particular for manufacturers.

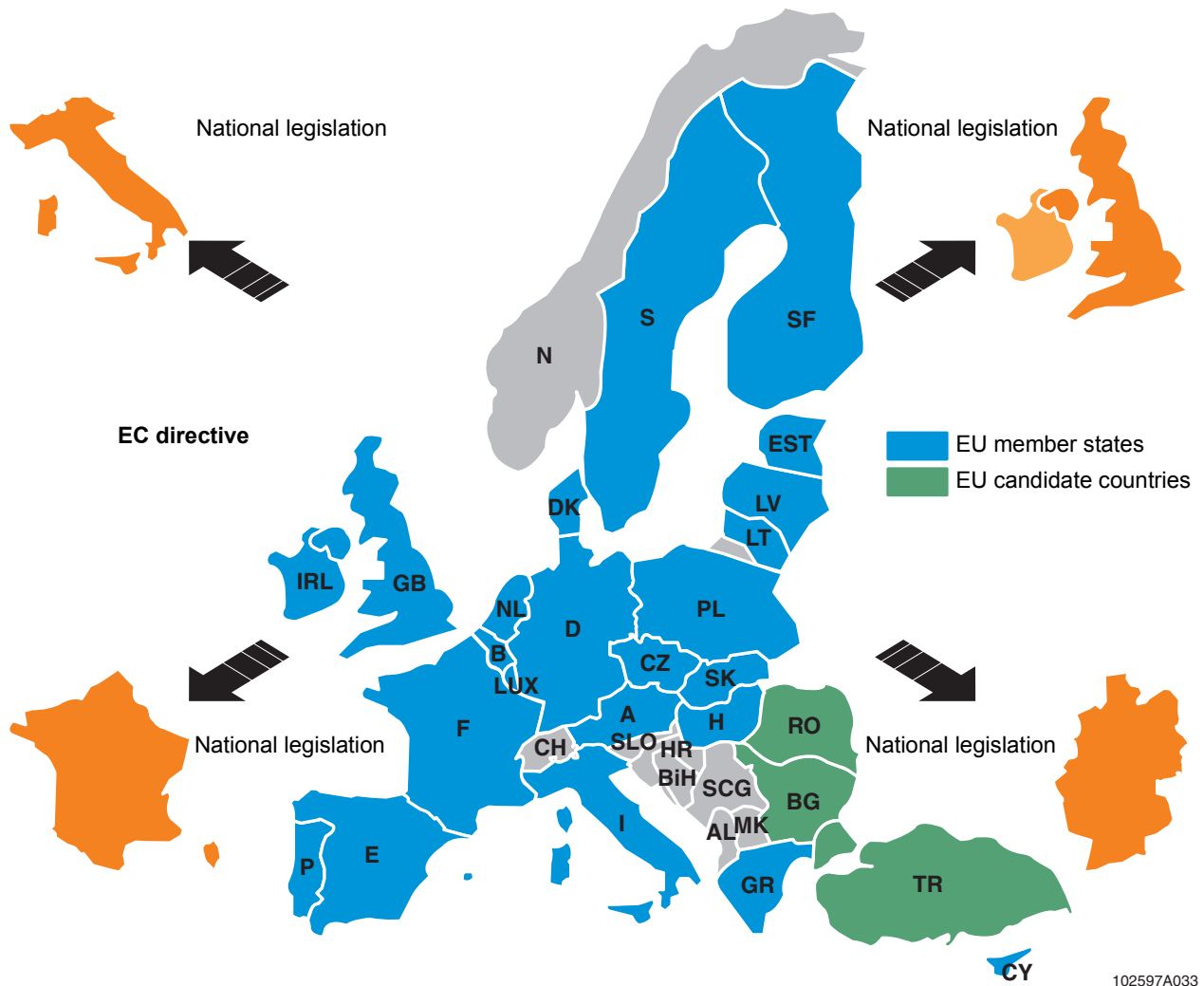


Figure 2-7 European Economic Area (EEA)

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Meaning As standards are no longer set at national level since the integration of the EU (EEA), interested EU member states can form their own standards committees, which work together to draw up international standards. Operators who design or build their machines according to the specifications in these standards can assume that they are meeting the requirements of EU directives or national legislation regarding machinery directives. This assumption gains particular weight if there is a question of guilt following an accident at work. Even if not required by law, it is always advisable to observe the standards.

Classification In order to implement the EU directives, it was first necessary to create uniform standards for all of Europe. To cope with this enormous task without delay, the standards were divided up into different types, which enabled work to be done on different levels at the same time. Type A, B, and C standards were created in this way (see Table 2-1).

Table 2-1 Typical examples of standards

Standard Type	Designation	Typical Examples	
Type A	Basic safety standards	EN 1050 (1996-11)	Safety of machinery - Principles for risk assessment
		EN ISO 12100-1 (2003-11)	Safety of machinery - Basic concepts, general principles for design
Type B1		EN 294 (1992-06)	Safety distances
		EN 349 (1993-04)	Minimum distances
Type B2	Group safety standards	EN 418 (1992-10)	Emergency stop equipment
		EN 574 (1996-11)	Two-hand control devices
		EN 842 (1996-06)	Visual danger signals
		EN 953 (1997-10)	Guards
		EN 954-1 (1996-12)	Safety-related parts of control systems
		EN 1037 (1995-12)	Power supply/reduction
		EN 1088 (1995-12)	Interlocking devices associated with guards
		EN ISO 13849-1 (2004-05)	Safety-related parts of control systems - General principles for design (intended as a replacement for EN 954-1)
		EN ISO 13849-2 (2003-08)	Safety-related parts of control systems - Validation
		prEN ISO 13850 (2005-01)	Emergency stop equipment (intended as a replacement for EN 418)
		EN 60204-11 (2000-11)	Electrical equipment of machines
		EN 61496-1 (2004-05)	Electrosensitive protective equipment
Type C	Productsafety standards	EN 201 (1997-02)	Injection molding machines
		EN 692 (1996-06)	Mechanical presses
		EN 693 (2001-01)	Hydraulic presses
		EN 775 (1992-10)	Industrial robots



This table contains only a few examples and is not complete.

2.3.1 Useful Addresses for Information About Standards and Regulations

Sources of Reference for Technical Regulations in Germany

For everything about standards, regulations, and directives

DIN Deutsches Institut für Normung e. V. (German Institute for Standardization)
10772 Berlin, Germany

Phone: +49 - 30 - 26 01 0
Fax: +49 - 30 - 26 01 12 60
Website: <http://www2.din.de>

EC directives, laws, and decrees

Bundesanzeiger Verlagsgesellschaft mbH (Federal Official Gazette)
Amsterdamer Straße 192
50735 Cologne, Germany

Phone: +49 - 221 - 97 66 80
Fax: +49 - 221 - 97 66 82 88
Website: <http://www.bundesanzeiger.de>

DIN standards, ISO standards, VDI directives

Beuth Verlag GmbH
Burggrafenstraße 6
10787 Berlin, Germany

Phone: +49 - 30 - 26 01 0
Fax: +49 - 30 - 26 01 12 60
Website: <http://www2.beuth.de>

VDE regulations, IEC standards

VDE-Verlag GmbH
Bismarckstr. 33
10625 Berlin, Germany

Phone: +49 - 30 - 34 80 01 0
Fax: +49 - 30 - 34 17 09 3
Website: <http://www.vde-verlag.de>

Gerätesicherheitsgesetz (Device Safety Law), accident prevention regulations, ZH-1-Schriften der Berufsgenossenschaften (ZH-1 regulations of German occupational safety and liability associations)

Carl Heymanns Verlag
Luxemburger Straße 449
50939 Cologne, Germany

Phone: +49 - 221 - 94 37 30
Fax: +49 - 221 - 94 37 39 01
Website: <http://www.heymanns.com>

2.3.2 Interesting Links on the Internet

The following table provides interesting links to topics covered in this manual. The links were active at the time of going to print. However, as the information displayed and thus also the links change relatively quickly on the Internet, it cannot be guaranteed that the links still work.

Table 2-2 Interesting links on the Internet

Link	Holder of Web Page/Content
http://www2.din.de	DIN: Deutsches Institut für Normung e.V. (German Institute for Standardization)
http://www.cenorm.be Direct link: http://www.newapproach.org	European Committee for Standardization (CEN) Overview of the latest applicable standards and regulations
http://www.normapme.com/German/normapme-de.htm	European Office of Crafts, Trades and Small and Medium-Sized Enterprises for Standardization Information about standards and an overview of standards for various sectors
http://www.stmwvt.bayern.de	Bayrisches Staatsministerium für Wirtschaft, Verkehr und Technologie (The Bavarian Ministry of Economic Affairs, Transport, and Technology) Law and law formation in the EU Brief information about EU directives
http://gps.sozialnetz.de/	Product and device safety
http://www.lfas.bayern.de	Bayrisches Landesamt für Arbeitsschutz, Arbeitsmedizin und Sicherheitstechnik (The Bavarian Authority for Occupational Health and Occupational Medicine, and Safety Technology)
http://europa.eu.int	Information about the European Union
http://www.dke.de	DKE: The German organization responsible for the elaboration of standards and safety specifications covering the area of electrical engineering, electronic, and information technologies. Information about standards, links to website addresses of national and international organizations
http://www.ce-richtlinien.de	VDI news Information about CE marking, links to the most important European authorities and institutes
http://www.vti-bochum.de	Verlag Technik & Information Information about various technology sectors, (e.g., occupational health and safety, machinery) with references for further reading.
http://kan.de	Commission for Occupational Health and Safety and Standardization Information about occupational health and safety and standards; links to websites with information about basic laws, occupational health and safety, standardization organizations, etc. in Germany, Europe, and around the world.
http://www.osha.gov	OSHA Statutory requirements and standards for safety in the workplace in North America

2.3.3 Standards in the USA (OSHA)

Safe Machine Design

"Control Reliability" is a design strategy that is used to ensure that a machine will remain safe when a failure is encountered. Achieving Control Reliability is not as simple as implementing redundancy. Monitoring must also be integrated into the safety function. Clause 12 of the American National Standards Institute (ANSI) B11.19-2003, Complementary Equipment, lists equipment that can be used in conjunction with safety guards to in effect design a control reliable system. Here safety relays are defined. Safety relays are used to provide the monitoring and additional functionality required to achieve Control Reliability.

Understanding the requirements of relevant standards is the key to designing an accepted, safe, and control reliable machine. Vital information on Control Reliability can be found in ANSI B11 and the Occupational Safety and Health Administration (OSHA) 1910 standards.

ANSI B11.19-2003 defines the concept of "Control Reliability" as follows:

In Clause 3.14 of ANSI B11.19-2003: "The capability of the machine control system, the safeguarding, other control components and related interfacing to achieve a safe state in the event of a failure within their safety related functions." Clause 6.1 is also very important. This clause states the actual requirements for the design strategy commonly called "Control Reliability".

Also important to note is that in Annex C of ANSI B11.19 it is stated that the "requirements of control reliability are not directly comparable to the safety categories of ISO 13849-1 (EN 954-1) and exceed the safety requirements of category 2". With this understanding, it is commonly accepted that a safety category 3 or 4 "IEC" installation must be implemented to achieve control reliability.

The OSHA 1910.217 defines Control Reliability as follows:

"The control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system."

Standardization

In the United States, machine safety is governed by three main areas of competency. Guidance from these areas must be used as the basis for a safe machine design. However, machine users/designers may need to further investigate specific national, state, and local requirements.

These main competency areas are as follows:

1. Occupational Safety and Health Administration (OSHA)
2. Industrial organizations that are referenced by OSHA as consensus standards organizations. These organizations include:
 - American National Standards Institute (ANSI)
 - National Fire Protection Association (NFPA)
 - Robotics Industries Association (RIA)
3. Corporate developed regulations



Note:

Companies/corporations buying industrial machines will expect that the machine builders are following OSHA and consensus organizations' standards. However, according to OSHA, the ultimate responsibility to protect employees lies with the user.

Occupational Safety and Health Administration (OSHA)

Introduction to the OSHA

The hierarchy of machine safety standards starts at federal level with the Occupational Safety and Health Administration (OSHA). OSHA is an agency of the U.S. Department of Labor, which extends to state level (not all states). OSHA standards and regulations have the ultimate legal priority. Consensus standards that are referenced as requirements by OSHA standards are expected to follow soon. If a specific area of safety is not covered by an OSHA standard, the related consensus standard(s) must be observed. Figure 2-8 on page 2-14 illustrates the relationship between OSHA and the consensus standards.

The mission of the Occupational Safety and Health Administration (OSHA) is to save lives, prevent injuries, and protect the health of America's workers. To accomplish this, federal and state governments must work in partnership with more than 100 million working men and women and their six and a half million employers, who are covered by the Occupational Safety and Health Act of 1970.

To carry out this mission, OSHA uses three basic strategies:

1. Strong, fair, and effective enforcement (safety inspections of the workplace)
2. Outreach, education, and compliance assistance
3. Partnerships and other cooperative programs

UM EN SAFETY RELAY APPLICATION

OSHA issues standards to be followed by employers for a wide variety of workplace hazards, including:

- Toxic substances
- Machine hazards
- Harmful physical agents
- Dangerous atmospheres
- Electrical hazards
- Fire and explosion hazards
- Fall hazards
- Infectious diseases
- Trenching hazards
- Hazardous waste

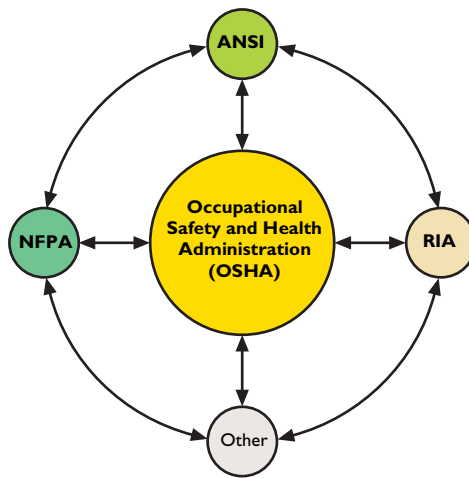


Figure 2-8 Relationship between OSHA and consensus standards

OSHA machine safety standards

OSHA's machine guarding safety standards, including those from the Code of Federal Regulations, Title 29, OSHA 1910, Subpart O (Machinery and Machine Guarding), are listed in Table 2-3.

Table 2-3 OSHA machinery and machine guarding standards

OSHA Standard	Designation
1910.212	General requirements for all machines
1910.213	Woodworking machinery requirements
1910.214	Cooperage machinery
1910.215	Abrasive wheel machinery
1910.216	Mills and calendars in the rubber and plastics industries
1910.217	Mechanical power presses
1910.218	Forging machines
1910.219	Mechanical power-transmission apparatus
3067	Concepts & Techniques of Machine Safeguarding



Important note:
 Standards from other organizations which are incorporated by reference have the same force and effect as the OSHA standard itself.
 Only the mandatory provisions (i.e., provisions containing the word "shall" or other mandatory language) of standards incorporated by reference are adopted.

American National Standards Institute (ANSI)

The American National Standards Institute (ANSI) is a private, non-profit organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. It facilitates the development of American National Standards (ANS) by accrediting the procedures of standards developing organizations. These groups work cooperatively to develop voluntary national consensus standards.

The Institute's mission is to enhance both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity.

UM EN SAFETY RELAY APPLICATION

ANSI B11-19-2003 Performance Criteria for Safeguarding

The B11.19 standard provides performance requirements for the design, construction, installation, operation, and maintenance of safeguards when applied to machine tools. ANSI B11.19 includes general requirements for safeguarding and does not provide application specifics. Special requirements can be found in B11 standards:

Table 2-4 ANSI B11 standards

ANSI Standard	Designation
B11.1-2001	Mechanical Power Presses
B11.2-1995	Hydraulic Power Presses
B11.3-2002	Power Press Brakes
B11.4-2003	Shears
B11.5-1988	Iron Workers
B11.6-2001	Lathes
B11.7-1995	Cold Headers and Cold Formers
B11.8-2001	Manual Milling, Drilling and Boring
B11.9-1975	Grinding
B11.10-2003	Metal Sawing
B11.11-2001	Gear and Spline Cutting
B11.12-1996	Roll Forming and Roll Bending
B11.13-1992	Automatic Screw/Bar and Chucking Machine
B11.14-1996	Coil Slitting
B11.15-2001	Pipe, Tube and Shape Bending
B11.17-1996	Horizontal Hydraulic Extrusion Presses
B11.18-1997	Coil Processing Systems
B11.19-2003	Performance Criteria for Safeguarding
B11.20-1991	Manufacturing Systems/Cells
B11.21-1997	Machine Tools Using Lasers
B11.22-2002	Numerically Controlled Turning
B11.23-2002	Machining Centers
B11.24-2002	Transfer
B11.TR3-2000	Risk Assessment and Risk Reduction

Other areas covered by ANSI standards

Below is a partial list of industrial machinery covered by ANSI standards:

- Machine tools
- Packaging
- Power transmission
- Housing
- Compressors
- Copper connections
- Injection molding
- Forging
- Printing ink vertical post mixers
- Rubber hoses/belts
- Commercial laundry/dry cleaning
- Overhead hoists
- Foundry
- Plastics
- Refuse collection/compacting
- Casting
- Automotive lifts
- Scrap metal processing

National Fire Protection Association (NFPA)

NFPA is an international non-profit membership organization founded in 1896 as the National Fire Protection Association. NFPA develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks. Virtually every building, process, service, design, and installation in society today is affected by NFPA documents.

The mission statement is to reduce the worldwide burden of fire and other hazards on the quality of life

by developing and advocating scientifically based consensus codes and standards, research, training, and education.

The scope of NFPA 70 involves the installation of electric conductors and equipment. The following installations are governed by NFPA 70:

- Public, private, floating, and utility buildings or other structures
- Mobile homes and recreational vehicles
- Premises such as yards, carnivals, parking, and other lots
- Industrial substations

The provisions of NFPA 79 standards apply to the electrical/electronic equipment, apparatus or systems of industrial machines operating with a rated voltage of 600 V or less, and commencing at the point of connection of the supply cable to the electrical equipment of the machine.

With regard to safety, the following NFPA 79 areas are of interest:

- Electric shock protection
- Closed-loop control circuits and control functions
- Emergency stop devices
- Cabling practices
- Marking and safety marks

2.3.4 Functional Safety

In order to achieve the functional safety of a machine or system, it is essential for the safety-related parts of the safety equipment and control devices to operate correctly and, in the event of failure, for the system to remain in the safe state or enter a safe state. The requirements for achieving functional safety are based on the following objectives:

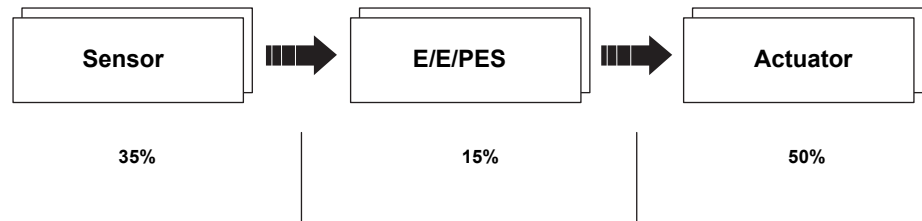
- Avoidance of systematic faults
- Control of systematic faults
- Control of random faults or failures

Functional safety is defined in IEC 61508. This standard is ratified in Europe, has no assumed effect, and is not listed in the machinery directive.

Structure of EN 61508

- Part 1: General requirements
 - Part 2: Hardware requirements
 - Part 3: Software requirements
 - Part 4: Definitions and abbreviations
 - Part 5: Examples of methods for the determination of SILs
 - Part 6: Guidelines on the application of Part 2 and Part 3
 - Part 7: Explanation of techniques, methods, and measures
 - Validity:
 - Parts 1 to 4 are normative
 - Parts 4 to 7 are informative
- However, this distinction has no legal basis.

Application of EN 61508



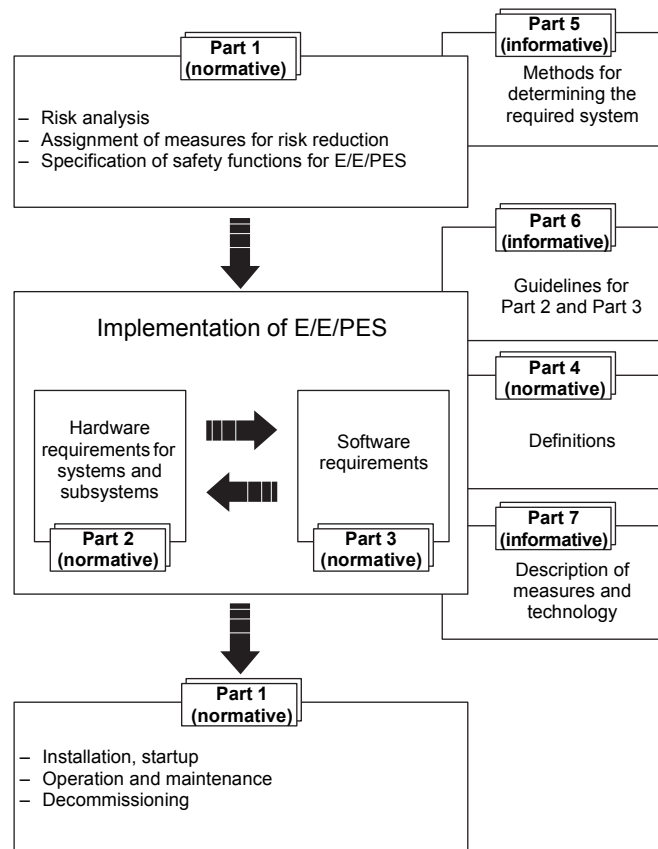
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Figure 2-9 Functional safety of electrical/electronic/programmable electronic safety-related systems (E/E/PES)

IEC: Safety-related function

DIN/VDE: Components

Structure of EN 61508



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Figure 2-10 Structure of EN 61508

The general safety-related requirements and tests for plants and systems are defined in Part 1.

Definitions and Abbreviations

Table 2-5 Definitions and abbreviations

Abbreviation	Term	Description
SIL	Safety Integrity Level	The safety performance of an electrical or electronic control device is defined in IEC 61508. The standard defines four discrete levels (SIL 1 to SIL 4). The higher the Safety Integrity Level of safety-related systems, the lower the probability that they do not perform the required safety functions.
FSM	Function Safety Management	Document for the management of functional safety
FMEA	Failure Modes & Effects Analysis	Possible fault and effects analysis (risk analysis). Possible faults are considered at product level and their possible effects are evaluated.
E/E/PE(S)	Electrical/Electronic/Programmable Electronic (Safety-Related System)	Electrical, electronic and/or programmable electronic (system)
DC	Diagnostic Coverage	Capacity of the safety-related part of a control system to detect faults
CCF	Common Cause Failure Management	Also referred to as β factor. Ability to handle errors with a common cause
MTTFd	Mean Time To Failure dangerous	Time available to perform a safety function on demand (time to failure)
MTBF	Mean Time Between Failure	Time available between two faults (mean time between two failures)
SFF	Safe Failure Fraction	Proportion of harmless failures. All safe and dangerous faults that are detected
PL	Performance Level	Benchmark for the probability of failure for executing risk reducing functions: from PL(a) (highest failure probability) to PL(e) (lowest failure probability)
PFD (avg)	Average Probability of Failure on Demand	Average probability of dangerous failure on demand of a safety function
PFD	Probability of Failure on Demand	Average probability of failure on demand of a function – probability that a safety system does not perform its function on demand
PFH	Probability of dangerous Failure per Hour	Probability of a dangerous failure per hour
Lambda	Rate of failure	Failure in the event of safe (s) and dangerous (d) faults
TI	Test Interval (experiment test)	Interval between protective function tests

Risk Graph According to EN ISO 13849-1

The revision of EN 954-1 will become EN ISO 13849 and represents a practical bridge to the purely mathematical, statistical approach of IEC 61508. A brief overview:

- IEC 61508 (light)
- International standard
- Reliability and availability are taken into account
- 5 additional "performance levels" (a - e)
- Probabilistic approach (probability of a fault)

It includes the parameters "DC (Diagnostic Coverage)", "MTTF_d (Mean Time To Failure dangerous)", and "CCF (Common Cause Failure)". A "PDF value" (Probability of a Dangerous Failure per hour) is obtained as a measurable result. Certain ranges of "PDF values" then result in "performance level" a to e, which is no longer directly comparable with the former categories.

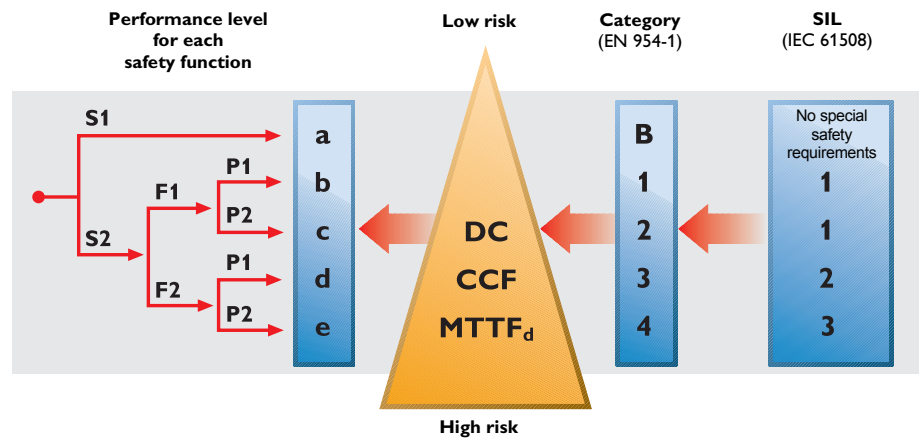


Figure 2-11 Relationship between risk graph according to EN 954-1 and IEC 61508

- MTTF_d** **Mean Time To Failure dangerous** - time available to perform a safety function on demand.
- CCF** **Common Cause Failure Management** - also known as β factor. Ability to handle errors with a common cause.
- DC** **Diagnostic Coverage** - capacity of the safety-related part of a control system to detect faults.

2.3.5 Safety Categories According to DIN EN 954-1

2.3.5.1 Risk Graph According to DIN EN 954-1

The risk graph is only a selection tool for determining the safety category in cases where there have so far been no relevant C standards or where the standards do not list any safety category for the application in question.

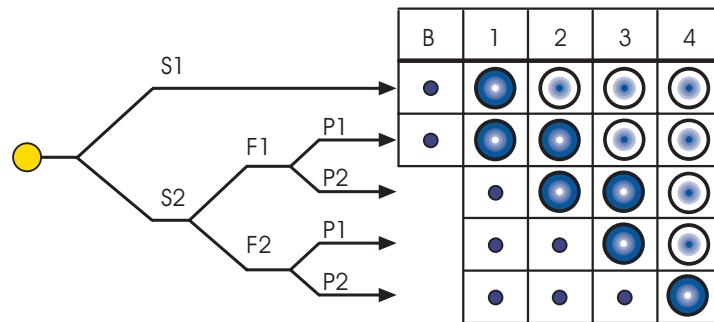


Figure 2-12 Selection of category B, 1, 2, 3, and 4 for safety-related parts of control systems

- S Severity of injury**
 - S1 Slight (normally reversible) injury
 - S2 Serious (normally irreversible) injury
 - F Frequency and/or exposure time to the hazard**
 - F1 Seldom to quite often and/or the exposure time is short
 - F2 Frequent to continuous and/or the exposure time is long
 - P Possibility of avoiding the hazard**
 - P1 Possibility under specific conditions
 - P2 Scarcely possible
- Preferred categories for reference points
- Possible categories which can require additional measures
- Measures which can be over dimensioned for the relevant risk

2.3.5.2 Safety Categories

The safety categories determine the required behavior of the safety-related parts of a control system in respect of their resistance to faults on the basis of the step-by-step design procedure. They are equally valid for electrical, hydraulic, pneumatic, and mechanical control systems, irrespective of the form of power. When a safety function is performed by several safety-related parts, e.g., sensor link, monitoring modules, control devices in the load circuit, these parts may belong to one category and/or a combination of different categories.

In order to be able to make a better comparison, safety categories 1 to 4 are explained below using the example of "safety grid monitoring".

Safety Category B

The safety-related parts of control systems and/or their safety equipment, as well as their components must be designed, built, selected, assembled, and combined in accordance with the relevant standards so that they can withstand the following:

- Expected operational stress (e.g., reliability with regard to switching capacity and switching frequency)
- Influence in the work process of materials used (e.g., detergents in a washing machine)
- Other relevant external influences (e.g., mechanical vibrations, external fields, power supply interrupts or malfunctions)



Note:

For parts that meet safety category B, no special safety measures are used.

Safety category B is thus restricted mainly to the correct selection of the suitable parts for the construction of a control system, i.e.:

- Safety classes
- Protection types
- Safety equipment
- Conductor type and insulation
- Conductor colors
- Conductor cross sections
- Colors for control or signaling devices
- Utilization categories of drives
- Measures to prevent environmental influences
- Dimensioning of switching devices and drives

System behavior in the event of a fault

The occurrence of a fault can lead to the loss of the safety functions.

Safety Category 1 (Single-Channel Control)

The requirements of category B must be met. Proven components and proven safety principles must be used.

System behavior in the event of a fault

The occurrence of a fault can lead to the loss of the safety functions, but the probability of the fault occurring is lower than in category B.

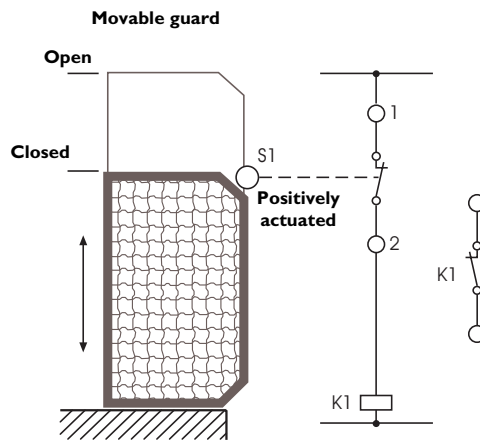


Figure 2-13 Safety category 1

Safety Category 2 (Single-Channel Control and Testing)

The requirements of category B and the use of proven safety principles must be met. The safety function must be tested at suitable intervals by the machine control system.

Testing of the safety function, whether initiated manually or automatically, must generate a starting point for the initiation of suitable control measures if a fault is present.

If it is not possible to achieve a safe shutdown, the output must provide for a warning of the hazard.

System behavior in the event of a fault

- The occurrence of a fault can lead to the loss of the safety function between the test intervals.
- The loss of the safety function is detected by the test.

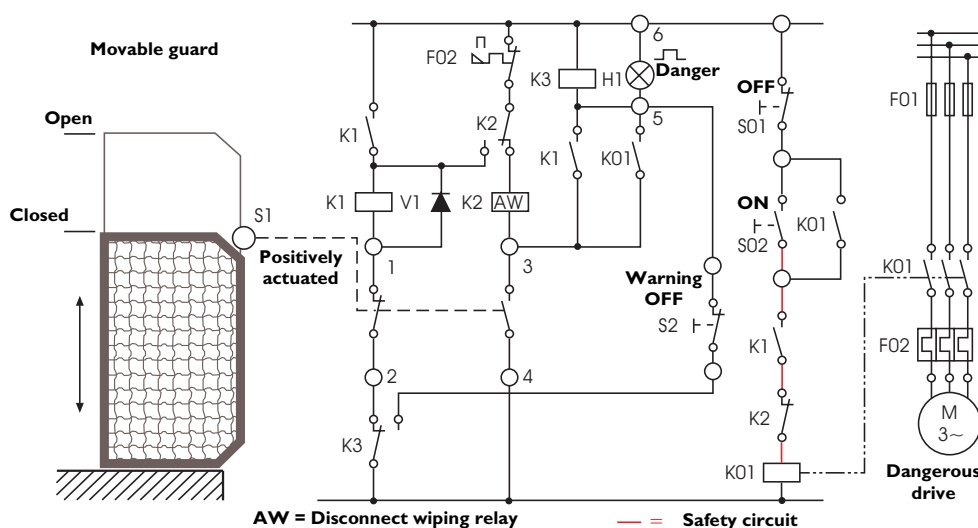


Figure 2-14 Safety category 2

Function of the circuit for safety category 2

When the safety grid is opened, disconnect wiping relay K2 is supplied with power. When the safety grid is closed, K2 picks up for a brief period and switches K1 on, remaining locked in. The safety circuit is enabled.

If K1 does not drop out when the safety grid is opened, relay K3 picks up and triggers an alarm that remains on even when the safety grid is closed again.

Safety Category 3 (Single-Channel Control (Redundant))

The requirements of category B and the use of proven safety principles must be met.

Safety-related parts must be designed so that:

- A single fault in one of these parts does not lead to the loss of the safety function
- Whenever feasibly possible, the single fault is detected on or before the next demand of the safety function

System behavior in the event of a fault

- When the single fault occurs, the safety function is always performed.
- Some but not all faults are detected.
- An accumulation of undetected faults can lead to the loss of the safety function.

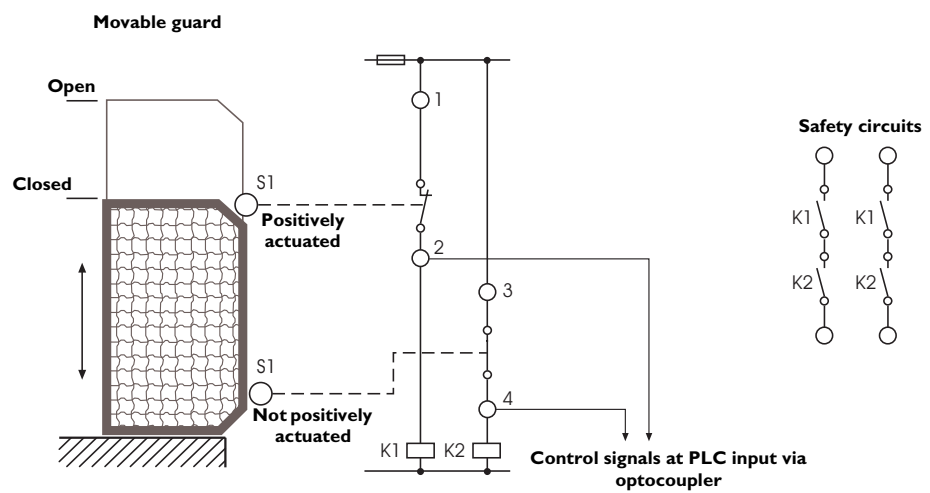


Figure 2-15 Safety category 3

Safety Category 4 (Single-Channel Control (Redundant) and Testing)

The requirements of category B and the use of proven safety principles must be met.

Safety-related parts of the control system must be designed so that:

- A single fault in any of these parts does not lead to the loss of the safety function
 - The single fault is detected on or before the next demand of the safety function. If this is not possible, then an accumulation of faults must not lead to the loss of the safety function.
- System behavior in the event of a fault**
- When faults occur, the safety function is always performed.
 - The faults will be detected in time to prevent the loss of the safety function.

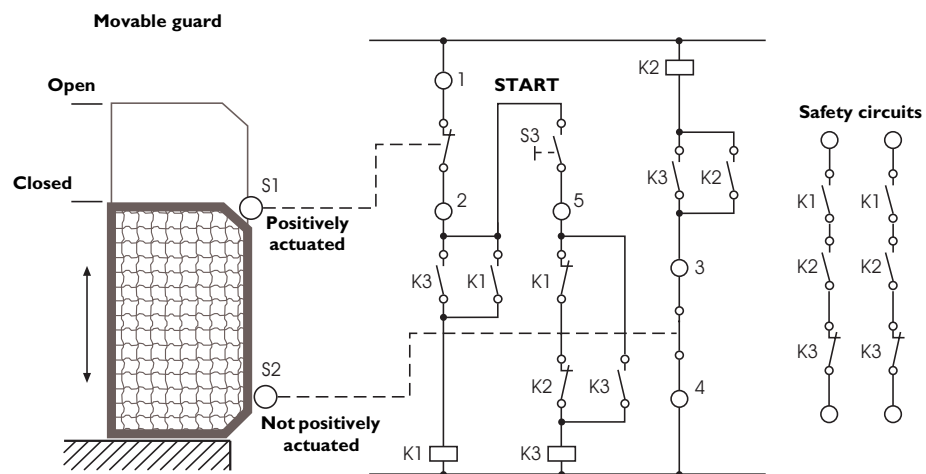


Figure 2-16 Safety category 4

3 Wiring Examples

This section contains application examples for PSR safety relays. In some of the examples, faults are illustrated, such as cross circuits, short circuits or wiring faults, which can occur in the circuit. A description of the fault monitoring is provided after the relevant application example.

3.1 PSR-ESA4: Emergency Stop Applications Without Start Button Monitoring

3.1.1 PSR-ESA4: Application Example 1 With Fault Monitoring

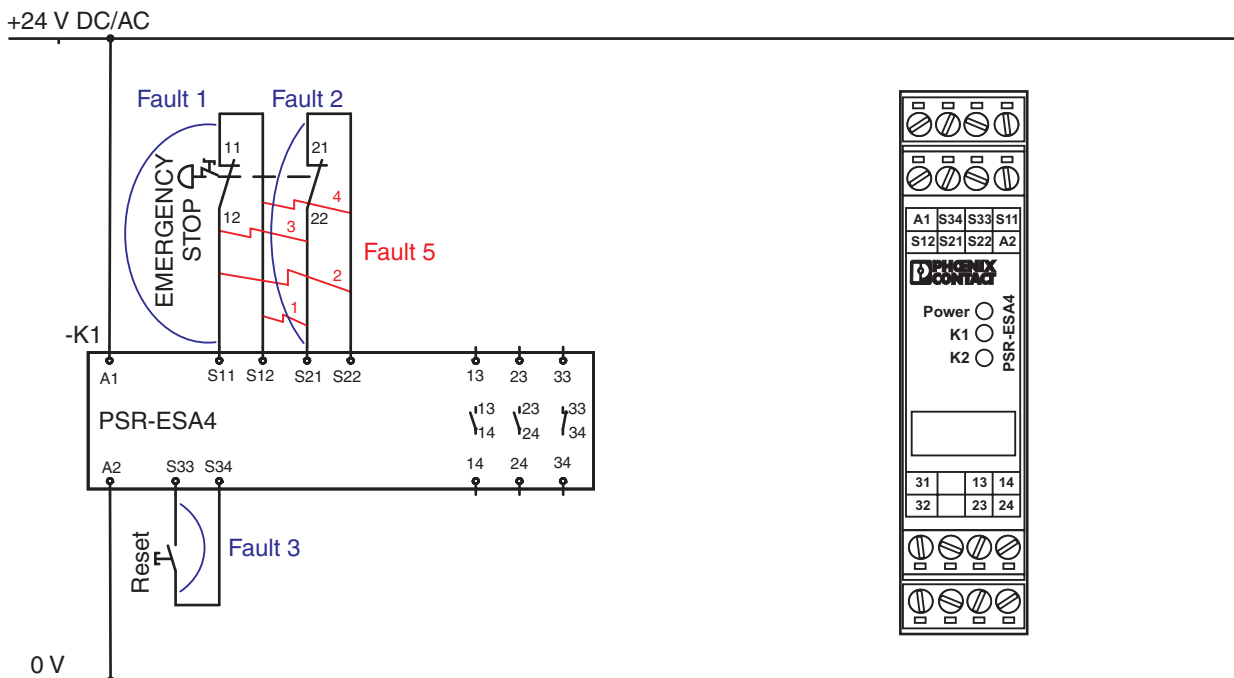
PSR-ESA4

Application

Emergency stop monitoring
Up to safety category 4, EN 954-1

Features

Two-channel (S11-S12, S21-S22)
2 N/O contacts, 1 N/C contact
Cross-circuit detection (S11-S12; S21-S22)
 $U_S = 24\text{ V DC/AC}$
Manual activation (S33-S34)
Stop category 0



102597A001

Figure 3-1 PSR-ESA4: Application example 1

Fault Monitoring

- **Fault 1:** If an emergency stop button contact does not open or is bypassed, the fault remains undetected until it is actuated. The safety function is no longer available (for single-channel circuit, both channels must be connected or bridged).
Power ON
K1 OFF
K2 ON
- **Fault 2:** As for fault 1
Power ON
K1 ON
K2 OFF
- **Fault 3:** No fault detection on initial start. After releasing the emergency stop, as for automatic start. Reset button without function.
Power ON
K1 ON
K2 ON
- **Fault 4:** Recovery time not reached. Remove fault through voltage reset.
Power ON
K1 OFF
K2 ON
- **Fault 5:** Cross circuit between the two emergency stop channels. Conductive connection between the two emergency stop channels.
Power OFF
K1 OFF
K2 OFF

3.1.2 PSR-ESA4: Application Example 2

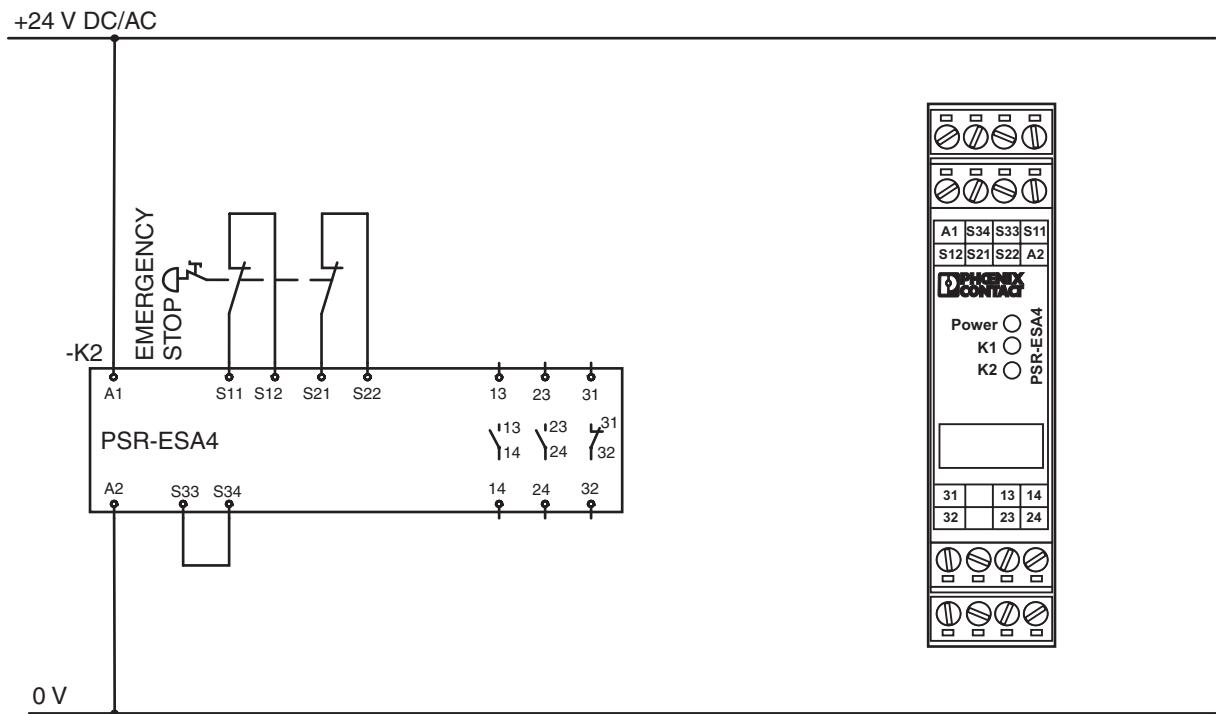
PSR-ESA4

Application

Emergency stop monitoring
Up to safety category 4, EN 954-1

Features

Two-channel (S11-S12, S21-S22)
2 N/O contacts, 1 N/C contact
Cross-circuit detection (S11-S12; S21-S22)
 $U_S = 24\text{ V DC/AC}$
Automatic activation (bridge S33-S34)
Stop category 0



102597A002

Figure 3-2 PSR-ESA4: Application example 2

3.1.3 PSR-ESA4: Application Example 3

PSR-ESA4

Application

Emergency stop monitoring

Up to safety category 2, EN 954-1

Features

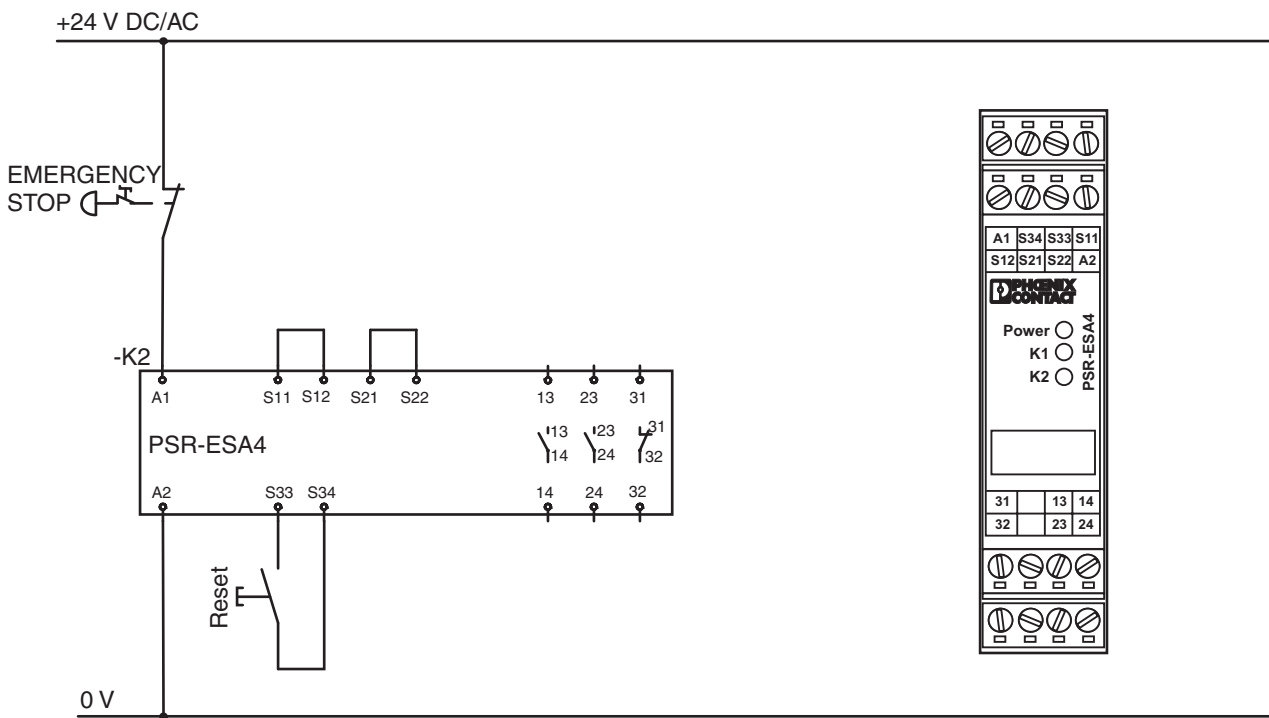
Single-channel (in circuit A1, bridge S11-S12, S21-S22)

2 N/O contacts, 1 N/C contact

$U_S = 24\text{ V DC/AC}$

Manual activation (S33-S34)

Stop category 0



102597A003

Figure 3-3 PSR-ESA4: Application example 3

3.2 PSR-ESM4: Emergency Stop Applications With Start Button Monitoring

3.2.1 PSR-ESM4: Application Example 1 With Fault Monitoring

PSR-ESM4

Application

Emergency stop monitoring

Up to safety category 2, EN 954-1

Features

Single-channel (in circuit A1, bridge S11-S12, S21-S22)

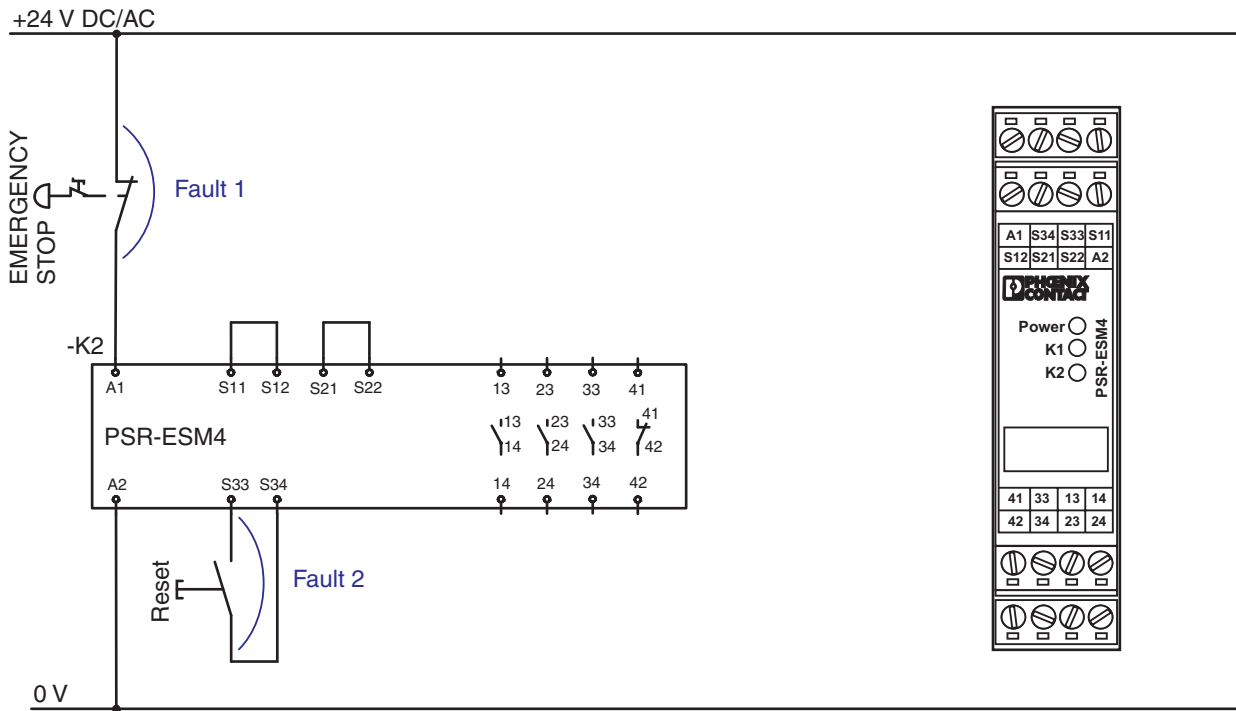
3 N/O contacts, 1 N/C contact

$U_S = 24\text{ V DC/AC}$

Manual activation (S33-S34)

Monitored start

Stop category 0



102597A004

Figure 3-4 PSR-ESM4: Application example 1

Fault Monitoring

- **Fault 1:** Short circuit does not occur until it is actuated. The safety function is no longer available, i.e., the emergency stop button also ceases to be effective. The fault is only detected when regular maintenance is performed on the machine.
Power ON
K1 ON
K2 ON
- **Fault 2:** The module cannot be switched on again after releasing the emergency stop. The module can only be switched on again once the relevant fault has been removed.
Power ON
K1 ON
K2 OFF

3.2.2 PSR-ESM4: Application Example 2

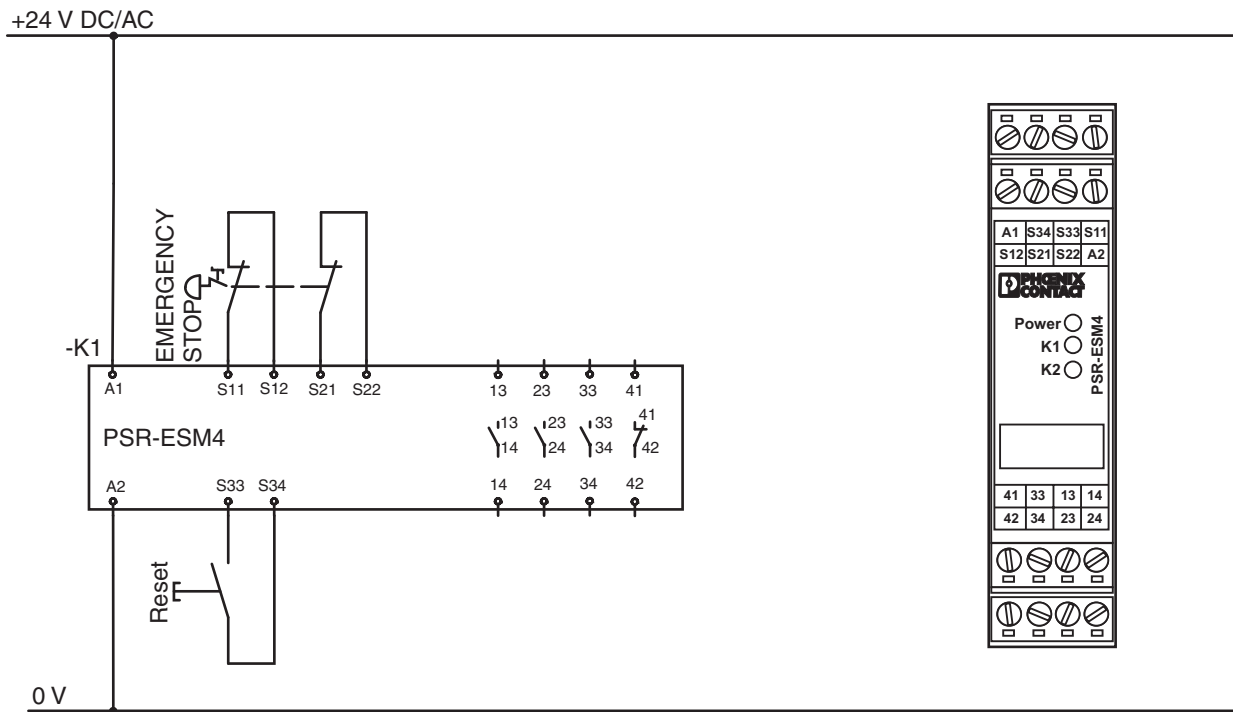
PSR-ESM4

Application

Emergency stop monitoring
Up to safety category 4, EN 954-1

Features

Two-channel (S11-S12, S21-S22)
3 N/O contacts, 1 N/C contact
Cross-circuit detection (S11-S12; S21-S22)
 $U_S = 24\text{ V DC/AC}$
Manual activation (S33-S34)
Monitored start
Stop category 0



102597A005

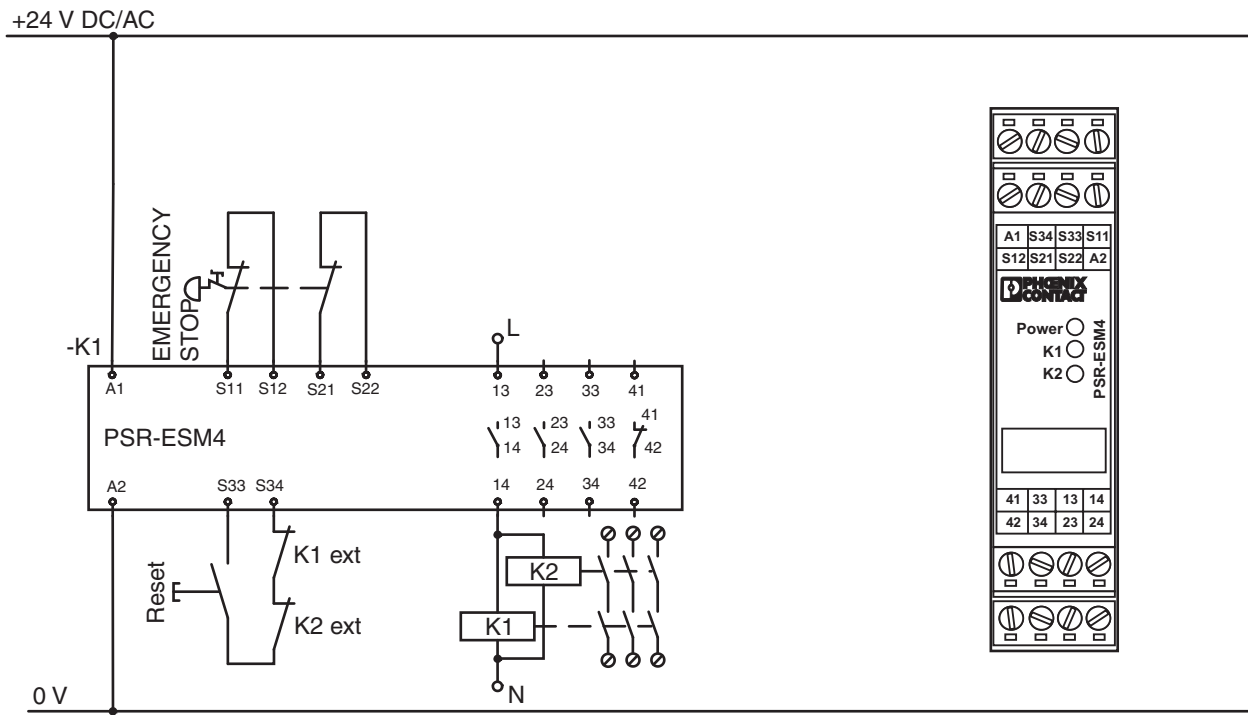
Figure 3-5 PSR-ESM4: Application example 2

3.2.3 PSR-ESM4: Application Example 3

PSR-ESM4

Application
 Emergency stop monitoring
 Up to safety category 4, EN 954-1

Features
 Two-channel (S11-S12, S21-S22)
 3 N/O contacts, 1 N/C contact
 Cross-circuit detection (S11-S12; S21-S22)
 $U_S = 24\text{ V DC/AC}$
 Manual activation (S33-S34)
 Monitored start
 Monitored contact extension
 Stop category 0



102597A006

Figure 3-6 PSR-ESM4: Application example 3

3.3 PSR-ESAM4: Emergency Stop Applications With Start Button Monitoring

3.3.1 PSR-ESAM4: Application Example 1 With Fault Monitoring

PSR-ESAM4

Application

Emergency stop monitoring

Up to safety category 4, EN 954-1

Features

Two-channel (S11-S12, S21-S22), bridge S10-S11

8 N/O contacts, 1 N/C contact

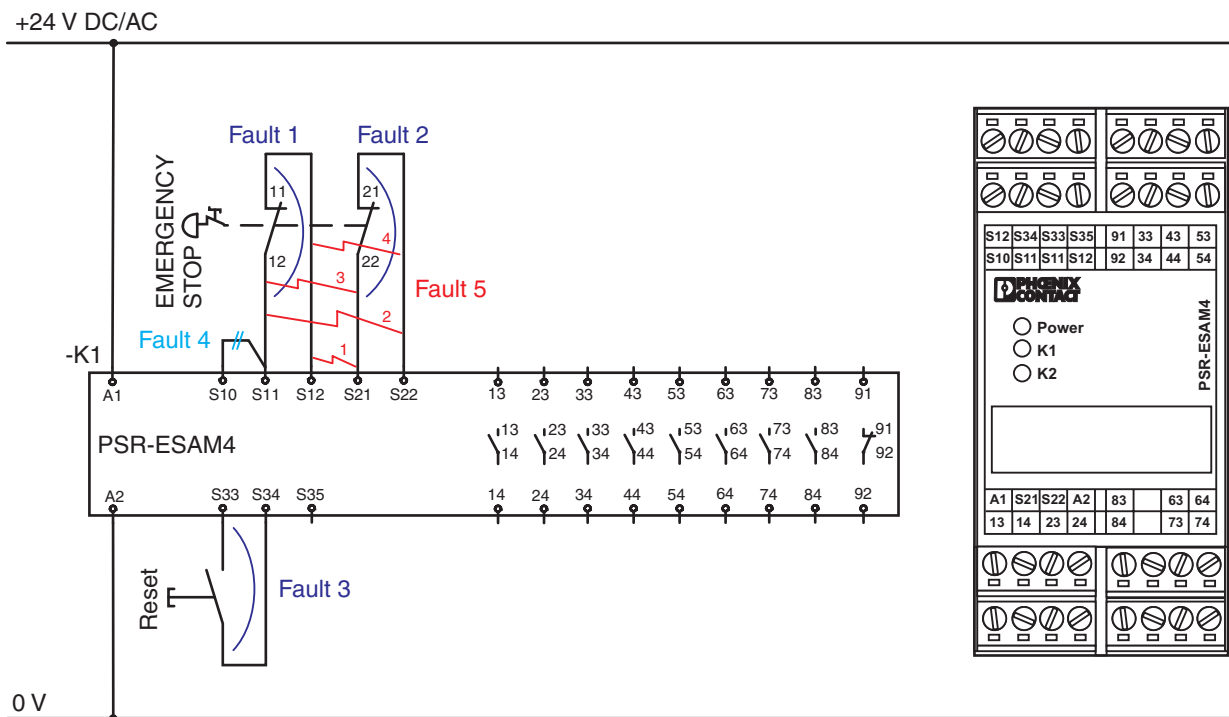
Cross-circuit detection (S11-S12; S21-S22)

$U_S = 24\text{ V DC/AC}$

Manual activation (S33-S34)

Monitored start

Stop category 0



102597A007

Figure 3-7 PSR-ESMA4: Application example 1

Fault Monitoring

- **Fault 1:** Short circuit S11-S12
Power ON
K1 ON
K2 OFF
- **Fault 2:** Short circuit S21-S22
Power ON
K1 OFF
K2 ON
- **Fault 3:** Restart not possible following initial emergency stop actuation.
Emergency stop safety function provided.
Power ON
K1 OFF
K2 ON
- **Fault 4:** No bridge or interrupt
Power ON
K1 OFF
K2 OFF
- **Fault 5:** Cross circuit between the two emergency stop channels.
Conductive connection between the two emergency stop channels.
Power OFF
K1 OFF
K2 OFF

3.3.2 PSR-ESAM4: Application Example 2

PSR-ESAM4

Application

Emergency stop monitoring

Up to safety category 4, EN 954-1

Features

Two-channel (S11-S12, S21-S22, bridge S10-S11)

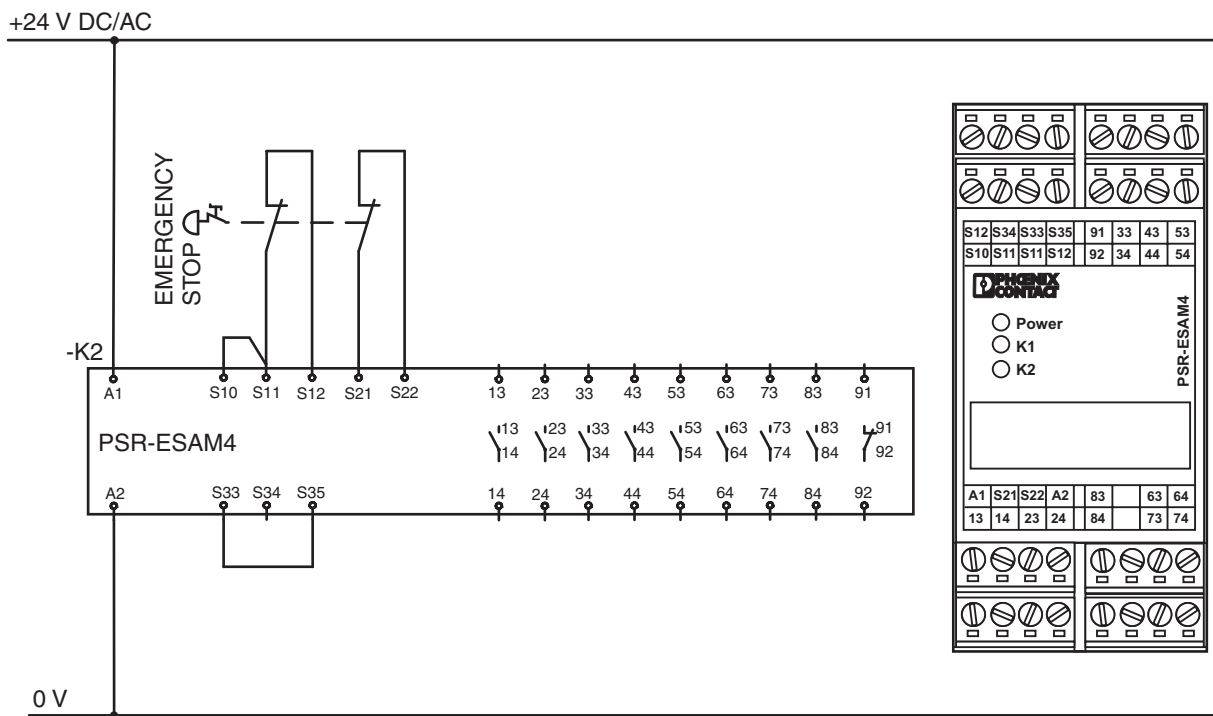
8 N/O contacts, 1 N/C contact

Cross-circuit detection (S11-S12; S21-S22)

$U_S = 24\text{ V DC/AC}$

Automatic activation (bridge S33-S35)

Stop category 0



102597A008

Figure 3-8 PSR-ESMA4: Application example 2

3.3.3 PSR-ESAM4: Application Example 3

PSR-ESAM4

Application

Emergency stop monitoring

Up to safety category 2, EN 954-1

Features

Single-channel (S11-S12, bridge S10-S12, S21-S22)

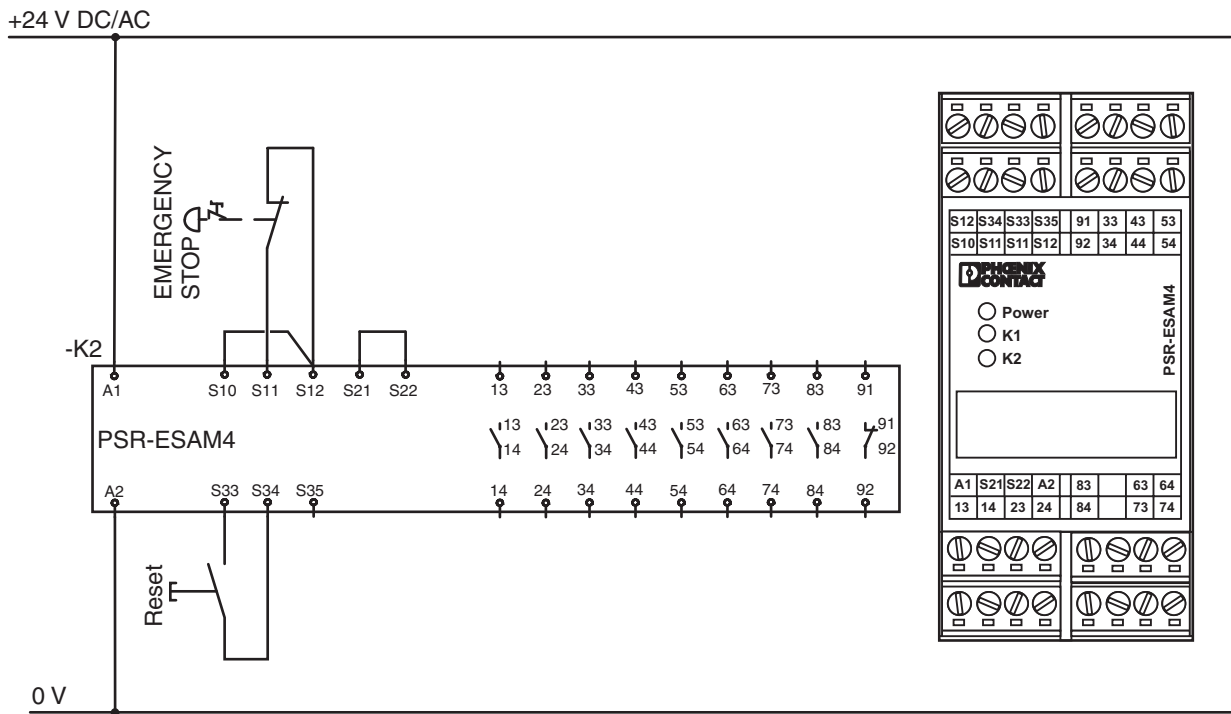
8 N/O contacts, 1 N/C contact

$U_S = 24\text{ V DC/AC}$

Manual activation (S33-S34)

Monitored start

Stop category 0



102597A009

Figure 3-9 PSR-ESMA4: Application example 3

3.3.4 PSR-ESAM4/3X1: Application Example 1 With Fault Monitoring

PSR-ESAM4/3X1

Application

Emergency stop monitoring

Up to safety category 4, EN 954-1

According to EN 61508 SIL 3
(SIL data on request)

Features

Two-channel (S11-S12, S21-S22, bridge S10-S11)

3 N/O contacts, 1 N/C contact

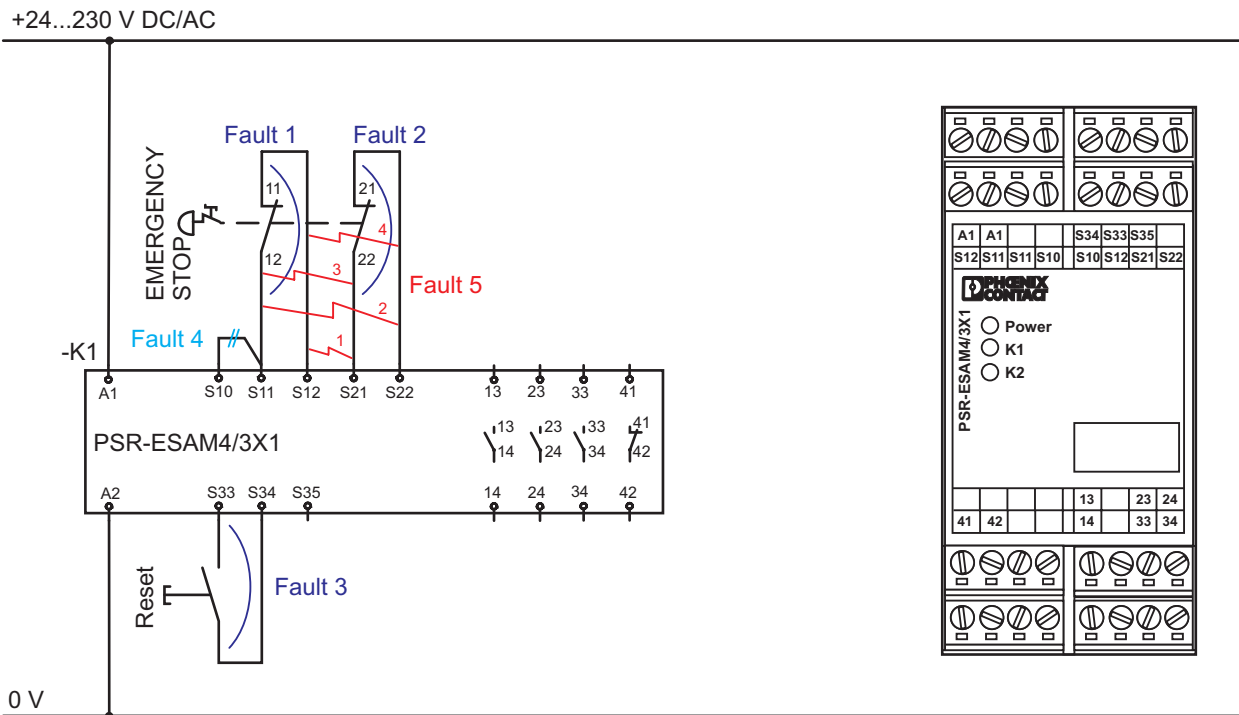
Cross-circuit detection
(S11-S12; S21-S22)

$U_S = 24 \dots 230 \text{ V DC/AC}$

Manual activation (S33-S34)

Monitored start

Stop category 0



102597B038

Figure 3-10 PSR-ESMA4/3X1: Application example 1

Fault Monitoring

- **Fault 1:** Short circuit S11-S12
Power ON
K1 ON
K2 OFF
- **Fault 2:** Short circuit S21-S22
Power ON
K1 OFF
K2 ON
- **Fault 3:** Restart not possible following initial emergency stop actuation.
Emergency stop safety function provided.
Power ON
K1 OFF
K2 ON
- **Fault 4:** No bridge or interrupt
Power ON
K1 OFF
K2 OFF
- **Fault 5:** Cross circuit between the two emergency stop channels.
Conductive connection between the two emergency stop channels.
Power OFF
K1 OFF
K2 OFF

3.3.5 PSR-ESAM4/3X1: Application Example 2

PSR-ESAM4/3X1

Application

Emergency stop monitoring

Up to safety category 4, EN 954-1

According to EN 61508 SIL 3
(SIL data on request)

Features

Two-channel (S11-S12, S21-S22,
bridge S10-S11)

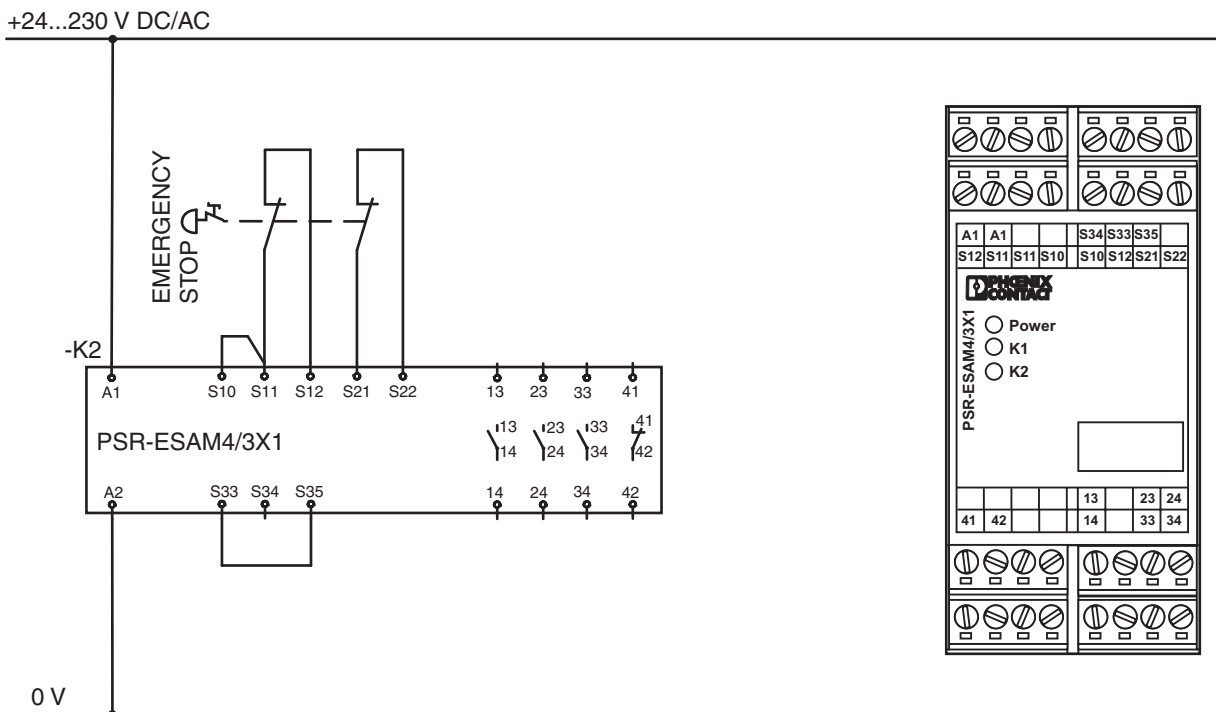
3 N/O contacts, 1 N/C contact

Cross-circuit detection
(S11-S12; S21-S22)

$U_S = 24 \dots 230 \text{ V DC/AC}$

Automatic activation (S33-S35)

Stop category 0



102597A039

Figure 3-11 PSR-ESMA4/3X1: Application example 2

3.3.6 PSR-ESAM4/3X1: Application Example 3

PSR-ESAM4/3X1

Application

Emergency stop monitoring

Up to safety category 2, EN 954-1

According to EN 61508 SIL 3
(SIL data on request)

Features

Single-channel (S11-S12,
bridge S21-S22, S10-S12)

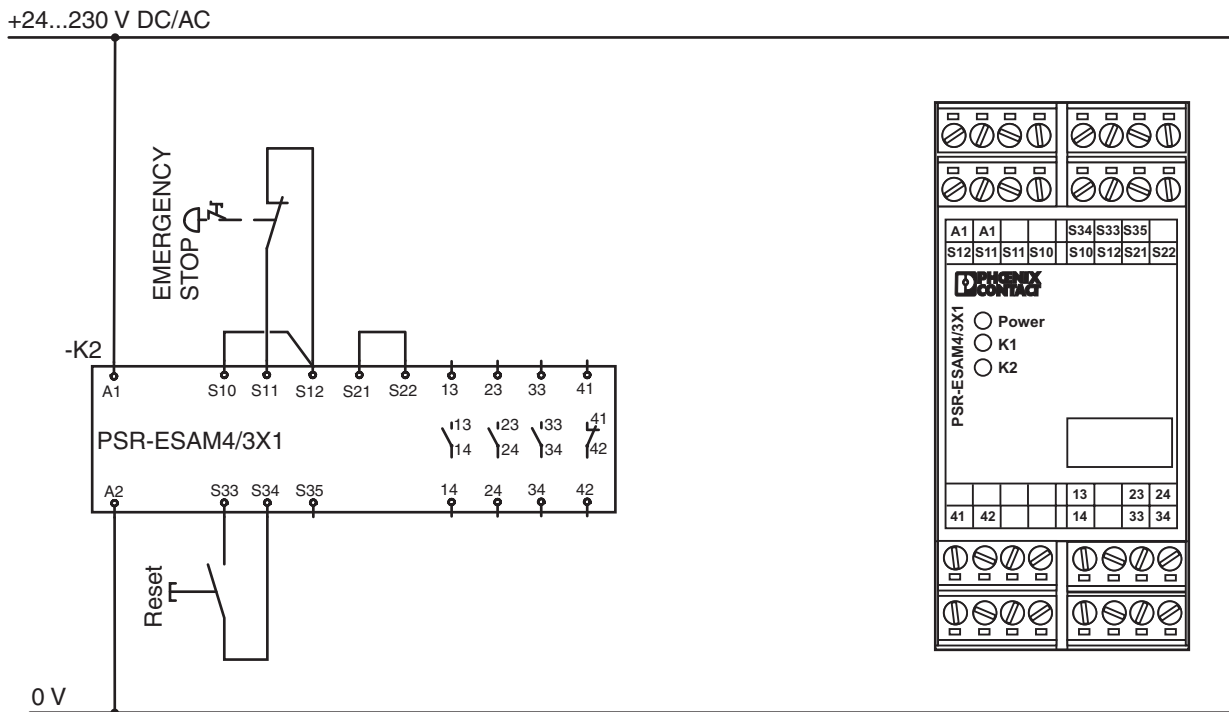
3 N/O contacts, 1 N/C contact

$U_S = 24 \dots 230 \text{ V DC/AC}$

Manual activation (S33-S34)

Monitored start

Stop category 0



102597A040

Figure 3-12 PSR-ESMA4/3X1: Application example 3

3.4 PSR-THC4: Two-Hand Controls

3.4.1 PSR-THC4: Application Example 1 With Fault Monitoring

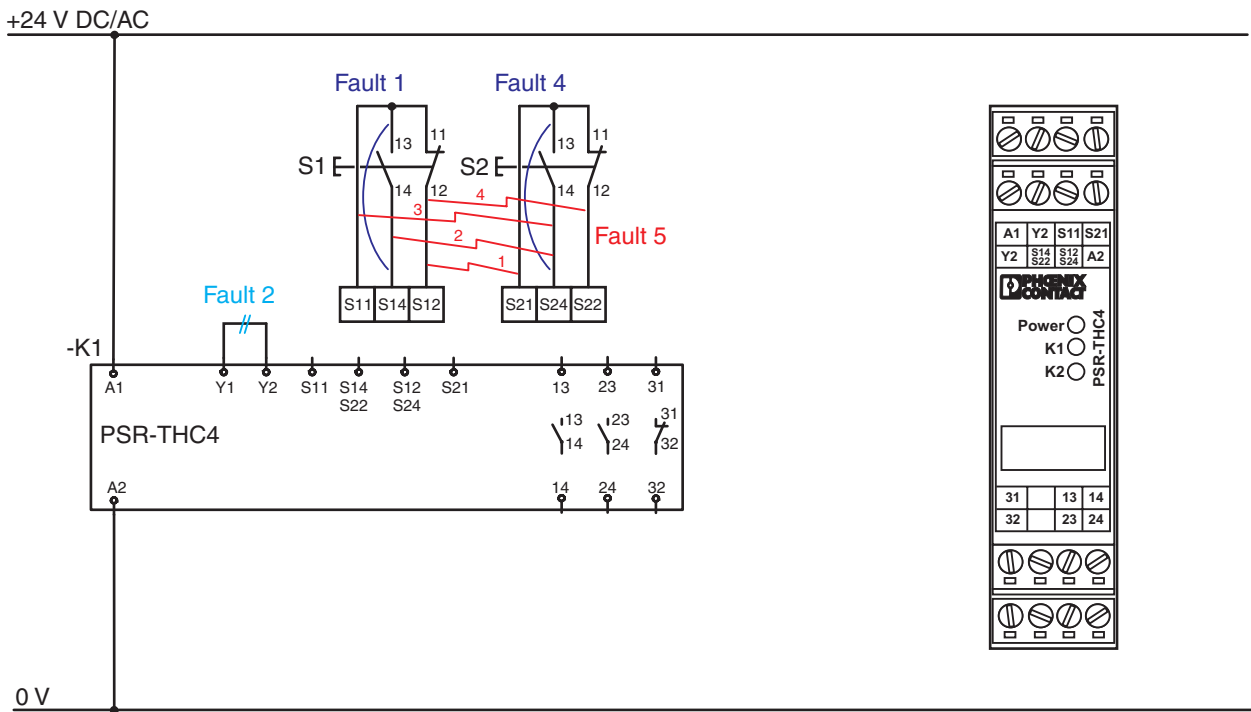
PSR-THC4

Application

Two-hand control
 Up to safety category 4, EN 954-1
 Synchronous activation monitoring < 0.5 s
 According to EN 574 type IIIC

Features

2 N/O contacts, 1 N/C contact
 $U_S = 24 \text{ V DC/AC}$
 Cross-circuit detection
 (S11-S14-S12; S21-S24-S22)



102597A010

Figure 3-13 PSR-THC4: Application example 1

Fault Monitoring

- **Fault 1:** Short circuit S11, S12, S14
 Power ON
 K1 OFF
 K2 ON
- **Fault 2:** No bridge between Y1-Y2
 Power ON
 K1 OFF
 K2 OFF

UM EN SAFETY RELAY APPLICATION

- **Fault 3:** Undervoltage at A1-A2
Power ON
K1 OFF/lights up only faintly
K2 ON
- **Fault 4:** Short circuit S21, S22, S24
Power ON
K1 ON
K2 OFF
- **Fault 5:** Cross circuit between the two emergency stop channels.
Conductive connection between the two emergency stop channels.
Power OFF
K1 OFF
K2 OFF

3.4.2 PSR-THC4: Application Example 2

PSR-THC4

Application

Monitoring of control guard according to EN 1088

Up to safety category 4, EN 954-1

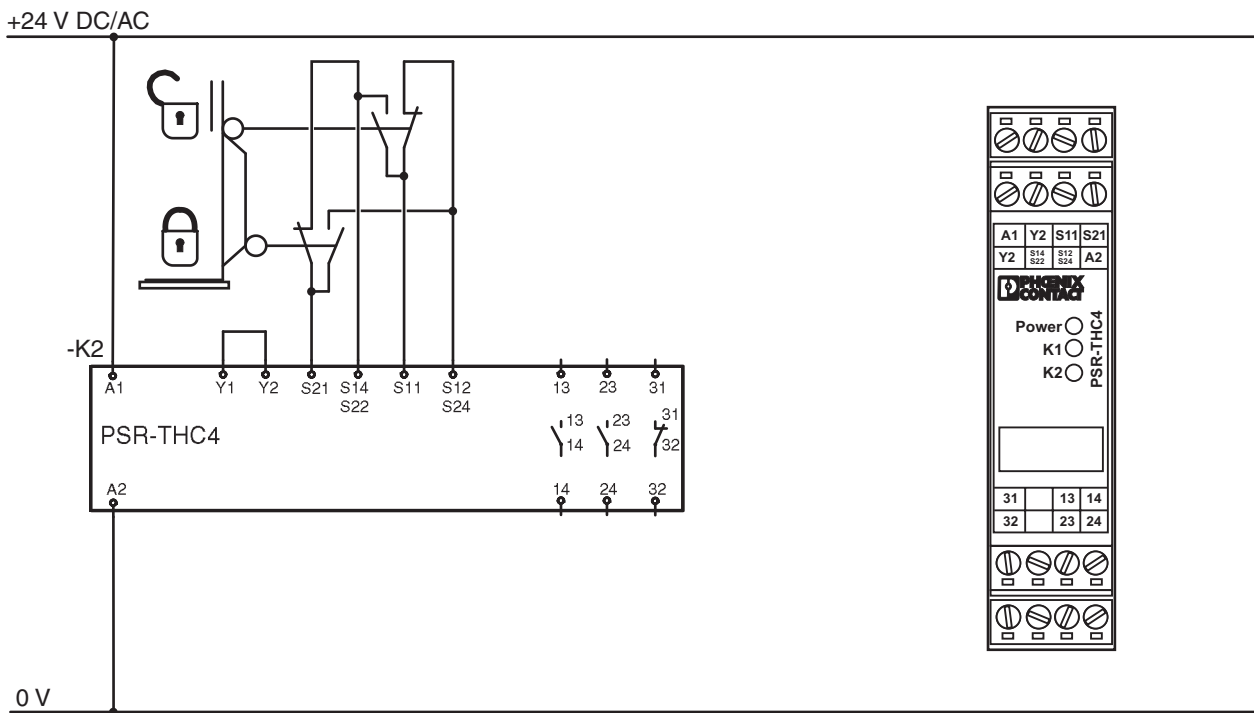
Synchronous activation monitoring < 0.5 s

According to EN 574 type IIIC

Features

2 N/O contacts, 1 N/C contact

$U_S = 24\text{ V DC/AC}$



102597A011

Figure 3-14 PSR-THC4: Application example 2

3.4.3 PSR-THC4: Application Example 3

PSR-THC4

Application

Two-hand control

Up to safety category 4, EN 954-1

Synchronous activation monitoring < 0.5 s

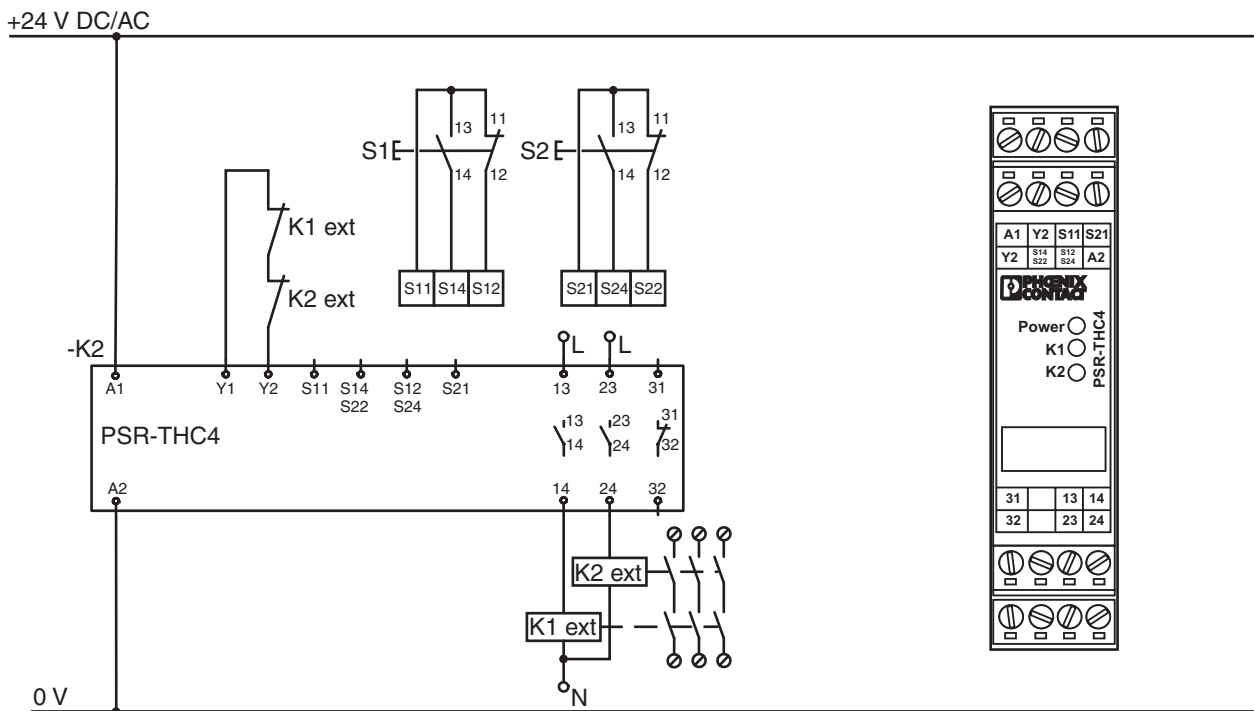
According to EN 574 type IIIC

Features

2 N/O contacts, 1 N/C contact

$U_S = 24\text{ V DC/AC}$

Monitored contact extension (Y1-Y2)



102597A012

Figure 3-15 PSR-THC4: Application example 3

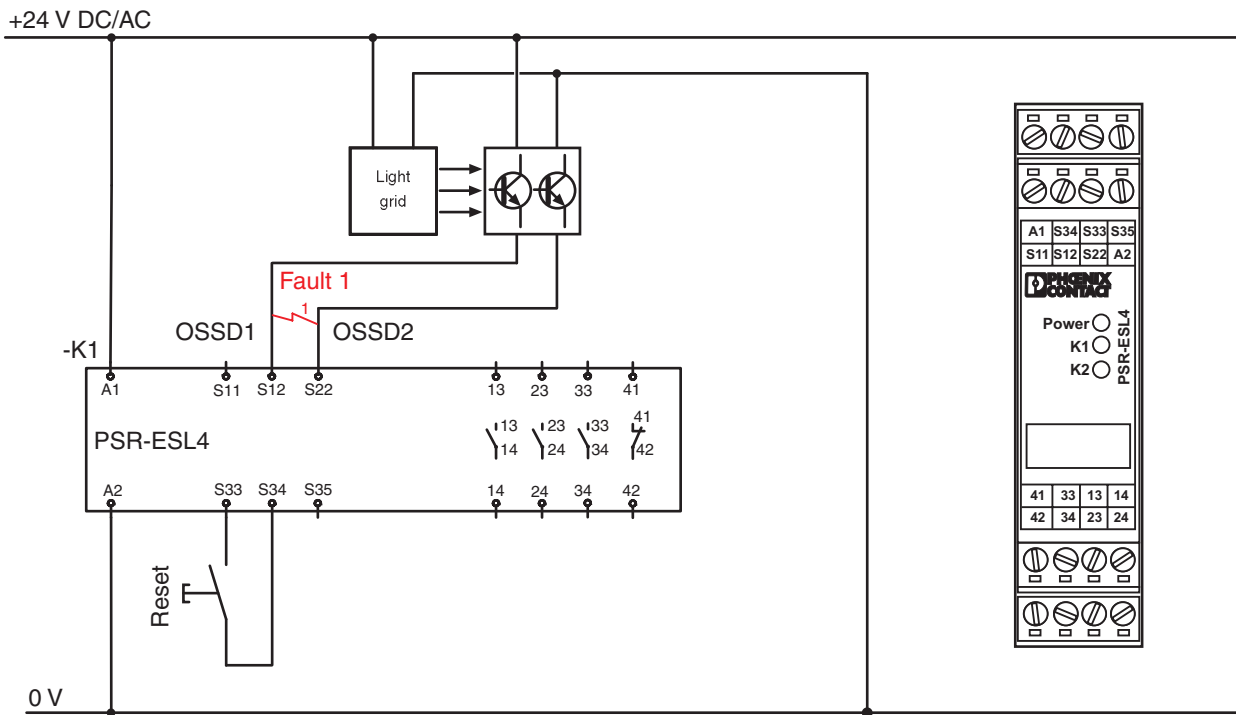
3.5 PSR-ESL4: Light Grid Applications

3.5.1 PSR-ESL4: Application Example 1 With Fault Monitoring

PSR-ESL4

Application
 Light grid monitoring
 Up to safety category 4, EN 954-1

Features
 Two-channel (OSSD1-S12, OSSD2-S22)
 3 N/O contacts, 1 N/C contact
 Cross-circuit detection (OSSD1-OSSD2)
 (fault detected by light grid)
 $U_S = 24\text{ V DC/AC}$
 Manual activation (S33-S34)
 Monitored start
 Stop category 0



102597A013

Figure 3-16 PSR-ESL4: Application example 1

Fault Monitoring

- **Fault 1:** Cross circuit of both light grid channels OSSD1 and OSSD2
Power ON
K1 OFF
K2 OFF
- **Fault 2:** Light grid channels OSSD1 and OSSD2 not connected properly.
OSSD1-S12, OSSD2-S22. S11 not connected.
Power ON
K1 OFF
K2 OFF
- **Fault 3:** During operation (all LEDs lit up), K1 and K2 OFF. Restart not possible.
Undervoltage at A1-A2.
Power ON
K1 OFF/lights up only faintly
K2 ON

3.5.2 PSR-ESL4: Application Example 2

PSR-ESL4

Application

Emergency stop monitoring
Up to safety category 3, EN 954-1

Features

Two-channel (S11-S12, S11-S22)
3 N/O contacts, 1 N/C contact
 $U_S = 24\text{ V DC/AC}$
Manual activation (S33-S34)
Monitored start
Monitored contact extension (S33-S34)
Stop category 0

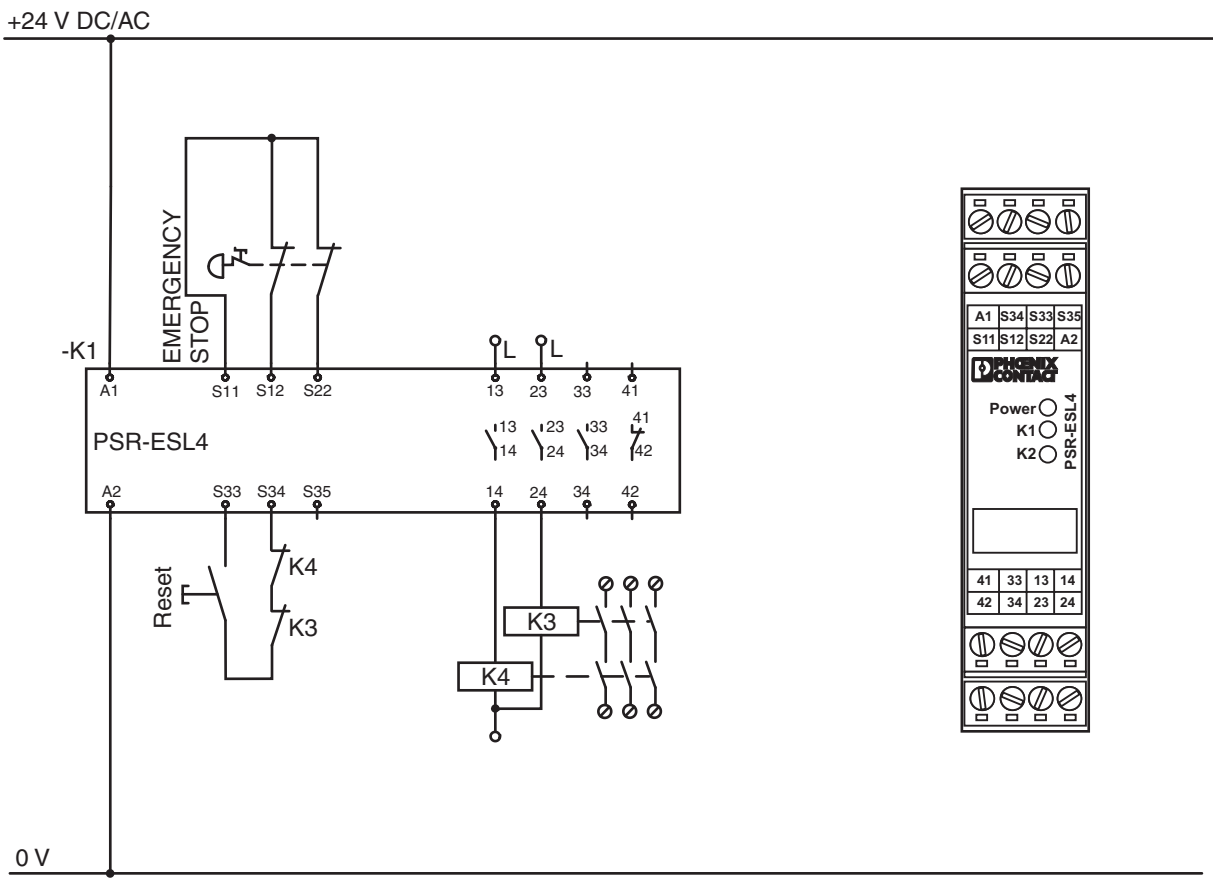


Figure 3-17 PSR-ESL4: Application example 2

3.5.3 PSR-ESL4: Application Example 3

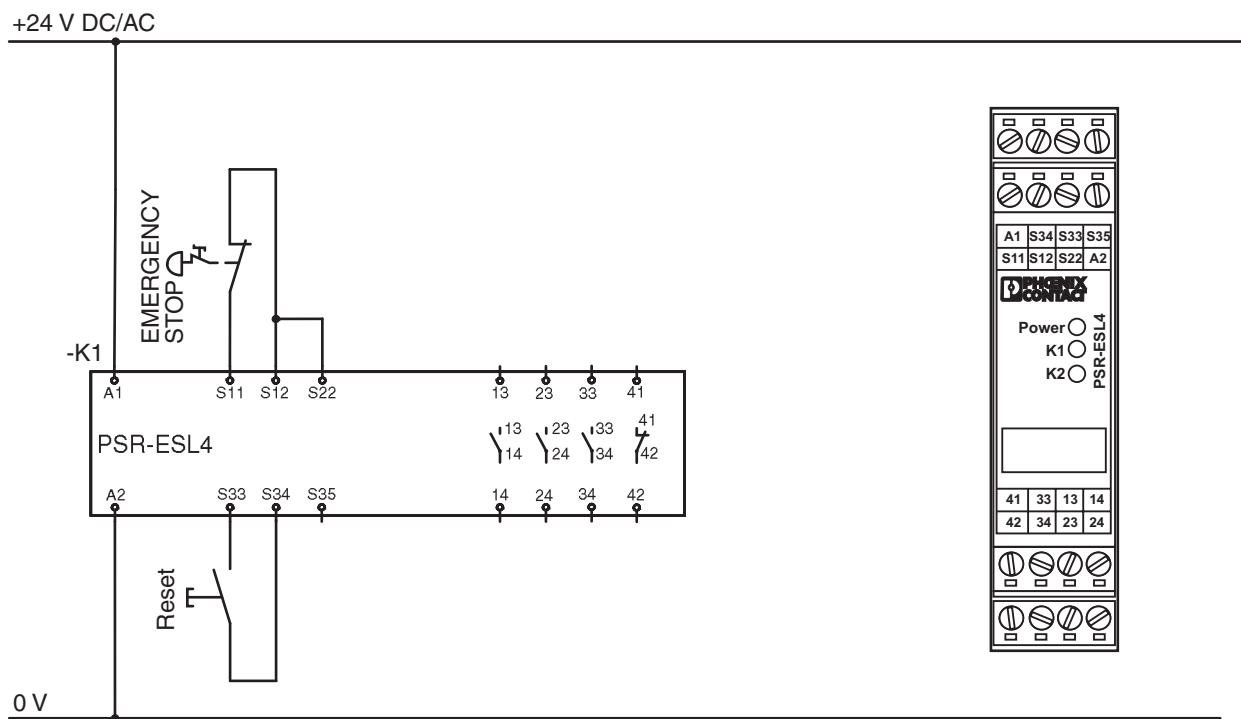
PSR-ESL4

Application

Emergency stop monitoring
Up to safety category 2, EN 954-1

Features

Single-channel (S11-S12, bridge S12-S22)
3 N/O contacts, 1 N/C contact
 $U_S = 24 \text{ V DC/AC}$
Manual activation (S33-S34)
Monitored start
Stop category 0



102597A015

Figure 3-18 PSR-ESL4: Application example 3

3.5.4 PSR-ESL4: Application Example 4

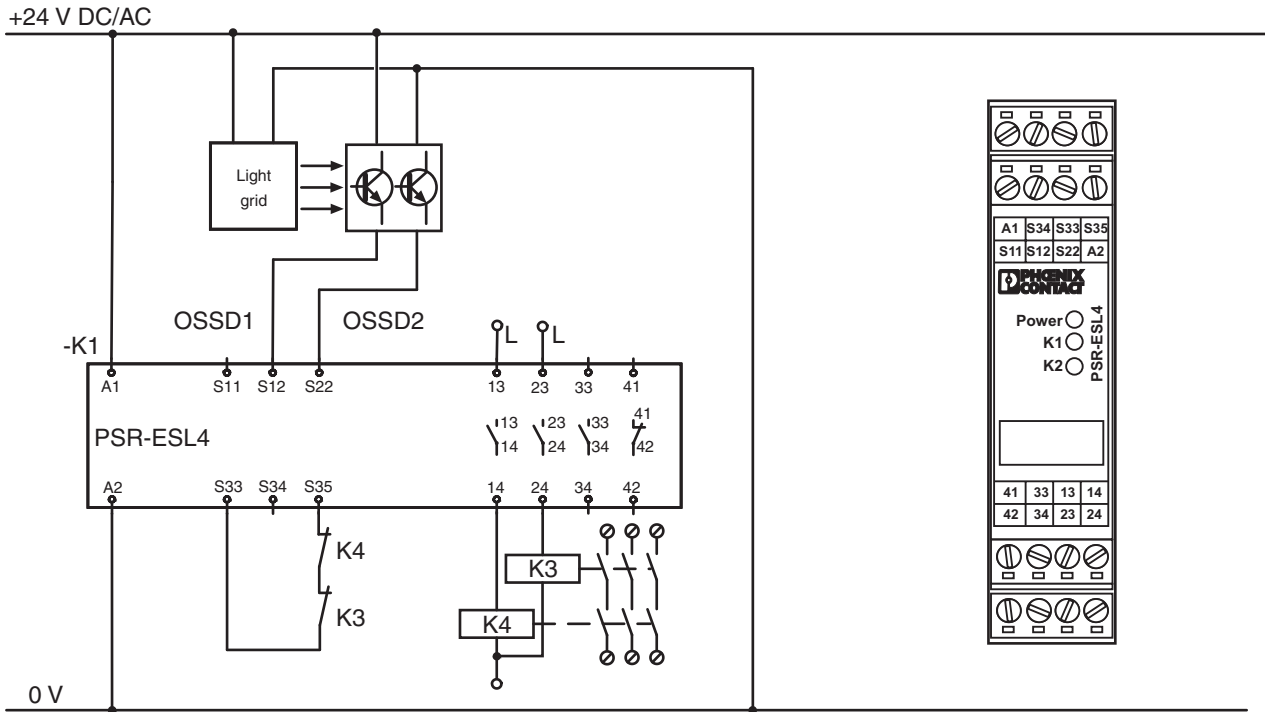
PSR-ESL4

Application

Light grid monitoring
Up to safety category 4, EN 954-1

Features

Two-channel (OSSD1-S12, OSSD2-S22)
3 N/O contacts, 1 N/C contact
Cross-circuit detection (OSSD1-OSSD2)
(fault detected by light grid)
 $U_S = 24\text{ V DC/AC}$
Automatic activation (S33-S35)
Monitored contact extension
Stop category 0



102597A016

Figure 3-19 PSR-ESL4: Application example 4

3.6 PSR-ESP4: Process Technology Applications

3.6.1 PSR-ESP4: Application Example 1

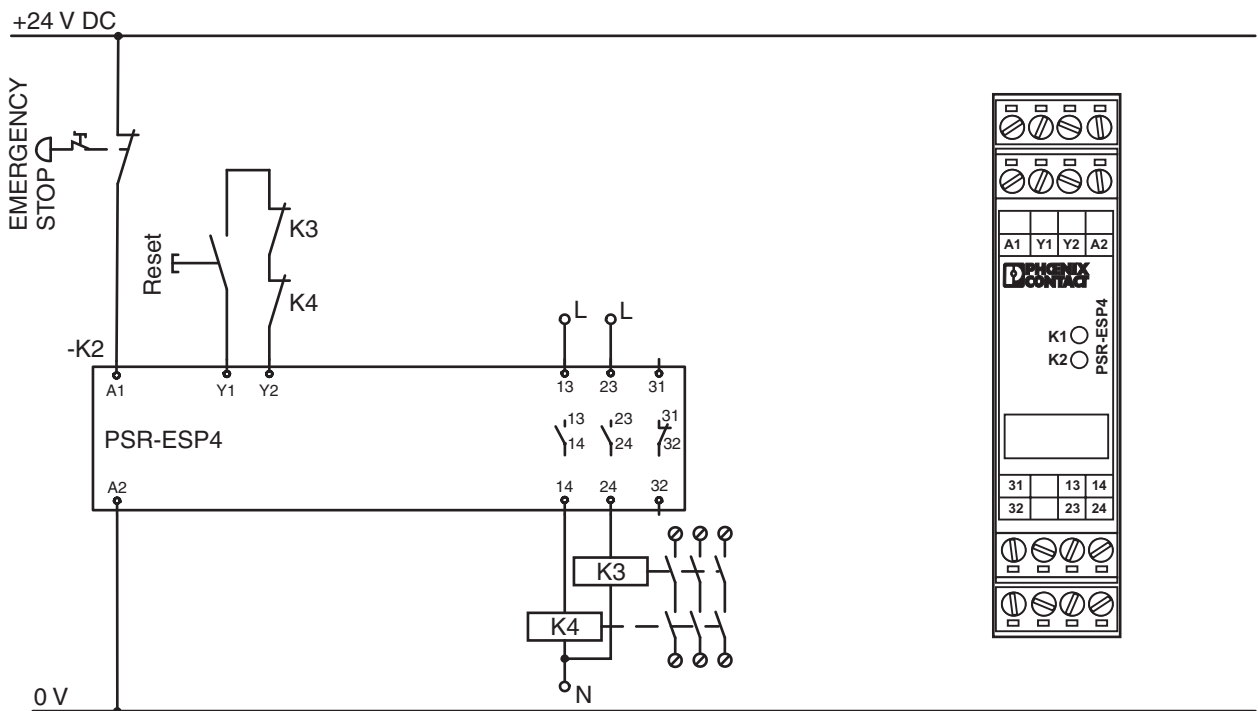
PSR-ESP4

Application

Emergency stop monitoring
 Up to safety category 2, EN 954-1
 According to EN 61508 SIL 3
 (SIL data on request)

Features

Single-channel (in circuit A1)
 2 N/O contacts, 1 N/C contact
 $U_S = 24\text{ V DC}$
 Monitored activation (Y1-Y2)
 Monitored contact extension (Y1-Y2)
 Stop category 0



102597A017

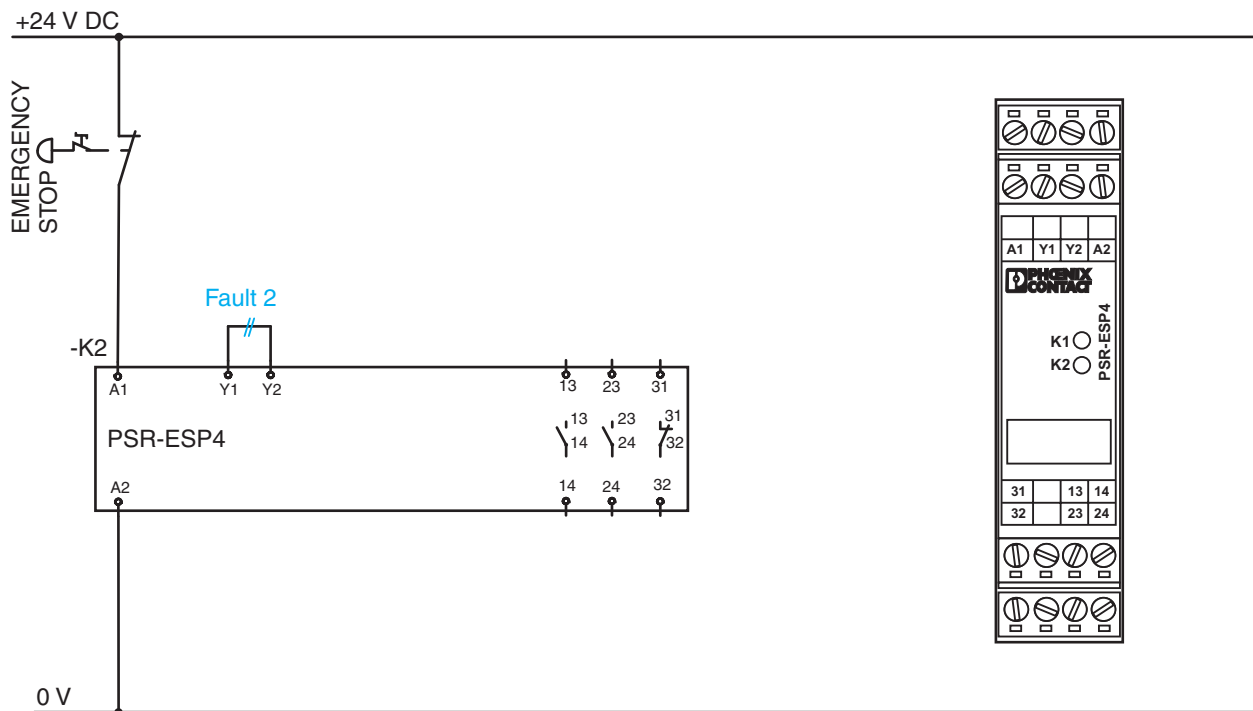
Figure 3-20 PSR-ESP4: Application example 1

3.6.2 PSR-ESP4: Application Example 2 With Fault Monitoring

PSR-ESP4

Application
 Emergency stop monitoring
 Up to safety category 2, EN 954-1
 SIL 3 according to EN 61508

Features
 Single-channel (in circuit A1)
 2 N/O contacts, 1 N/C contact
 $U_S = 24\text{ V DC}$
 Automatic activation (bridge Y1-Y2)
 Stop category 0



102597A018

Figure 3-21 PSR-ESP4: Application example 2

Fault Monitoring

- **Fault 1:** Recovery time not reached. Remove fault through voltage reset.
 Power at A1-A2
 K1 ON
 K2 OFF
- **Fault 2:** Bridge Y1-Y2 missing.
 Power at A1-A2
 K1 OFF
 K2 OFF

3.6.3 PSR-ESP4: Application Example 3

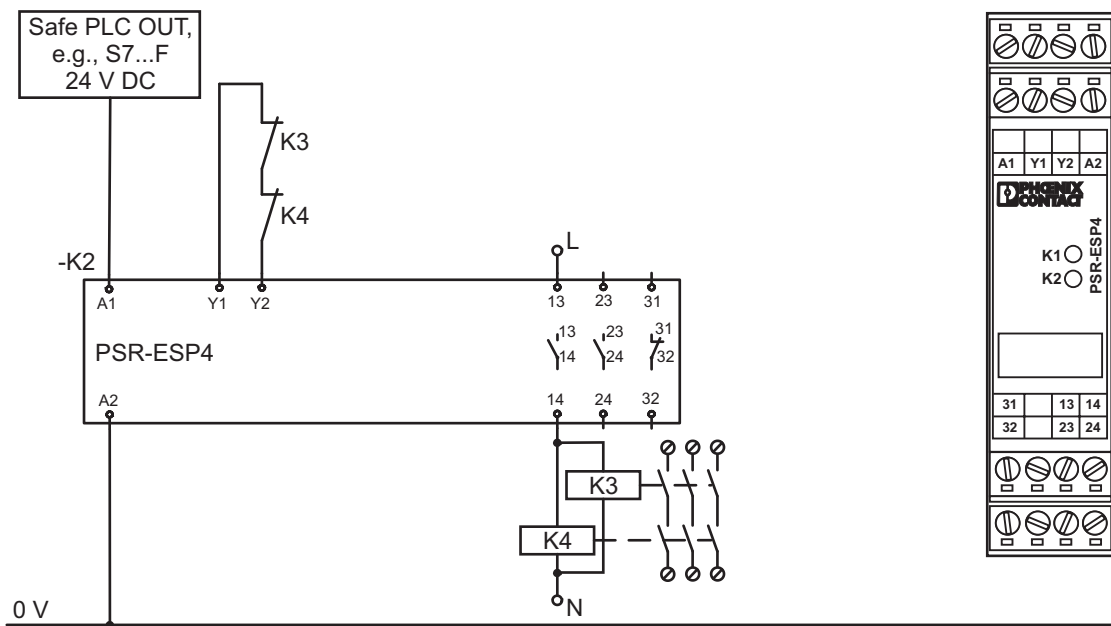
PSR-ESP4

Application

Evaluation of a safety control system
 Up to safety category 4, EN 954-1
 SIL 3 according to EN 61508
 (with fault prevention in the input circuit)

Features

2 N/O contacts, 1 N/C contact
 $U_S = 24 \text{ V DC}$
 Monitored contact extension (Y1-Y2)
 Stop category 0



102597A019

Figure 3-22 PSR-ESP4: Application example 3

3.7 PSR-ESD: Emergency Stop With Delayed Contacts

3.7.1 PSR-ESD: Application Example 1 With Fault Monitoring

PSR-ESD/300

Application

Emergency stop monitoring

Up to safety category 3/4, EN 954-1

Features

Two-channel (S11-S12 and S21-S22, bridge S10-S11, Y1-Y2)

3 undelayed N/O contacts, 2 delayed N/O contacts, 1 N/O contact

$U_S = 24\text{ V DC}$

Cross-circuit detection (S10-S11-S12, S21-S22)

Manual activation (S33-S34)

Monitored start

Stop category 0/1

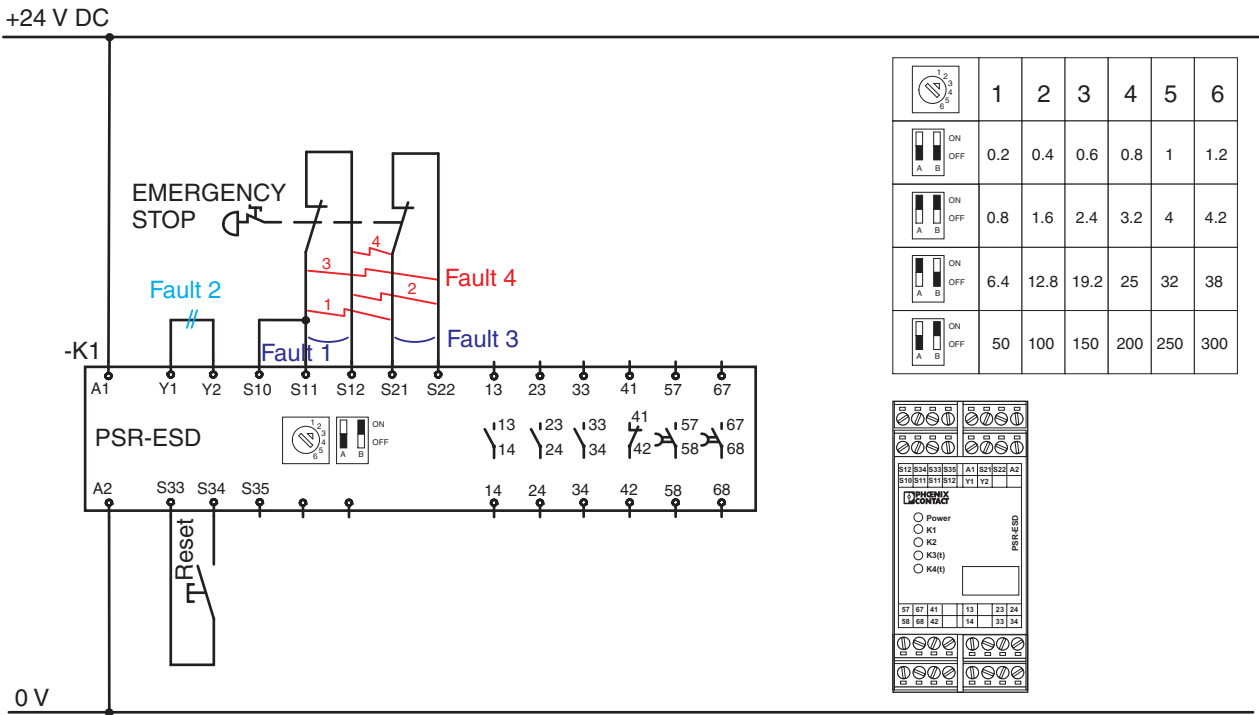


Figure 3-23 PSR-ESD: Application example 1

102597A020

Fault Monitoring

- **Fault 1:** Short circuit S11-S12
Power ON
K1 ON
K2 OFF
- **Fault 2:** Faulty wiring S33-S34 or bridge Y1-Y2 missing.
Power ON
K1 OFF
K2 OFF
K3(t) OFF
K4(t) OFF
- **Fault 3:** Short circuit S21-S22
Power ON
K1 OFF
K2 ON
- **Fault 4:** Cross circuit between the two emergency stop channels.
Conductive connection between the two emergency stop channels.
Power OFF
K1 OFF
K2 OFF
K3(t) OFF
K4(t) OFF

3.7.2 PSR-ESD: Application Example 2

PSR-ESD/300

Application

Emergency stop monitoring

Up to safety category 2, EN 954-1

Up to safety category 4 only when using positive-opening switches and installing cable in separate cable sheaths

Features

Single-channel (S11-S12, bridge S10-S12, Y1-Y2)

3 undelayed N/O contacts, 2 delayed N/O contacts, 1 N/O contact

$U_S = 24\text{ V DC}$

Manual activation (S33-S34)

Monitored start

Stop category 0/1

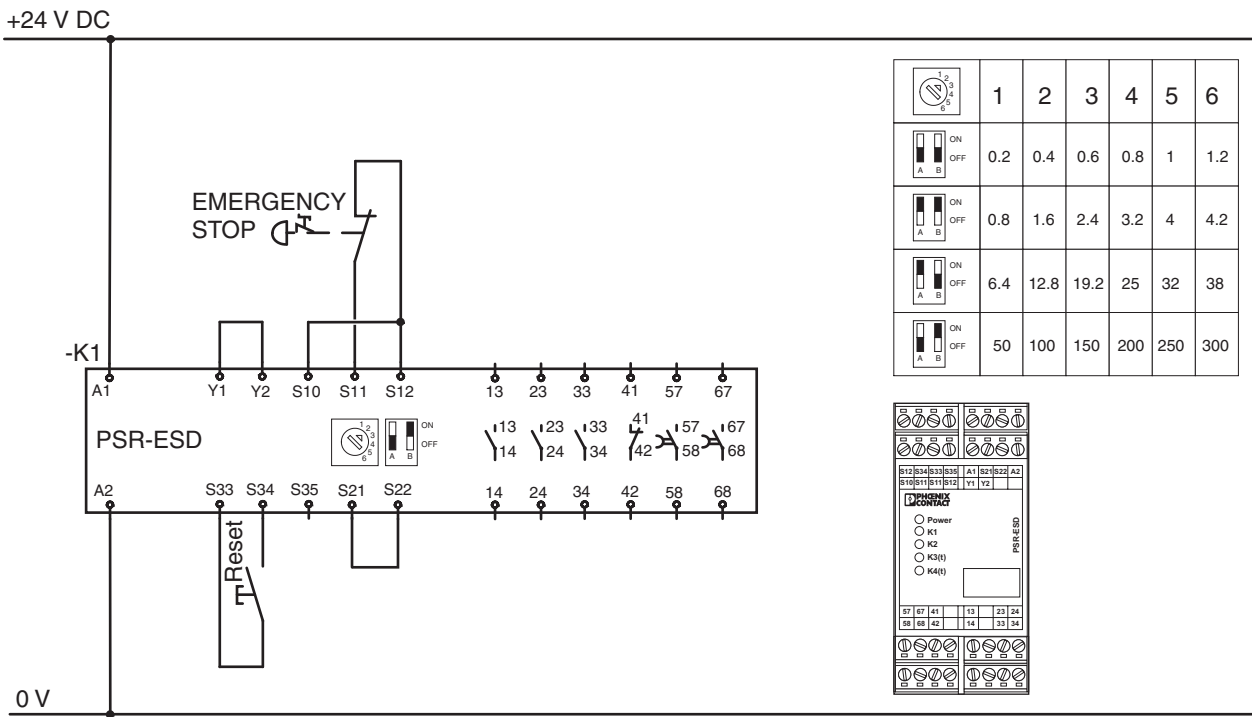


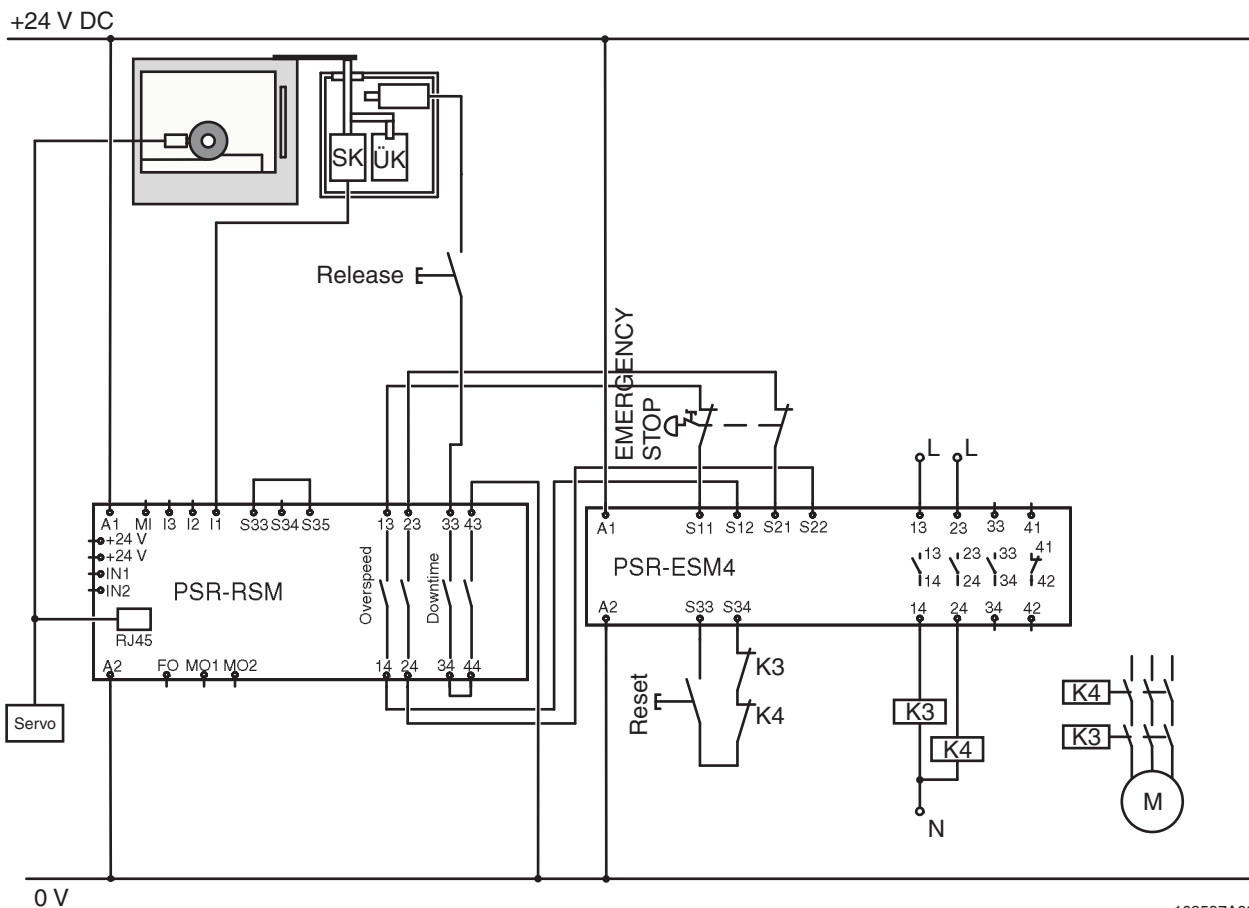
Figure 3-24 PSR-ESD: Application example 2

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3.8 PSR-RSM, PSR-SSM: Speed and Downtime Monitoring

3.8.1 PSR-RSM: Application Example 1 (Most Basic Machine)

PSR-RSM	Application	Features
	Evaluation of a safe speed	4 N/O contacts
	Encoder sensors	$U_S = 24\text{ V DC}$
	Connection via RJ45	Automatic activation (bridge S33-S35)
	Up to safety category 3, EN 954-1	Stop category 0
	SIL 3 according to EN 61508 (SIL data on request)	



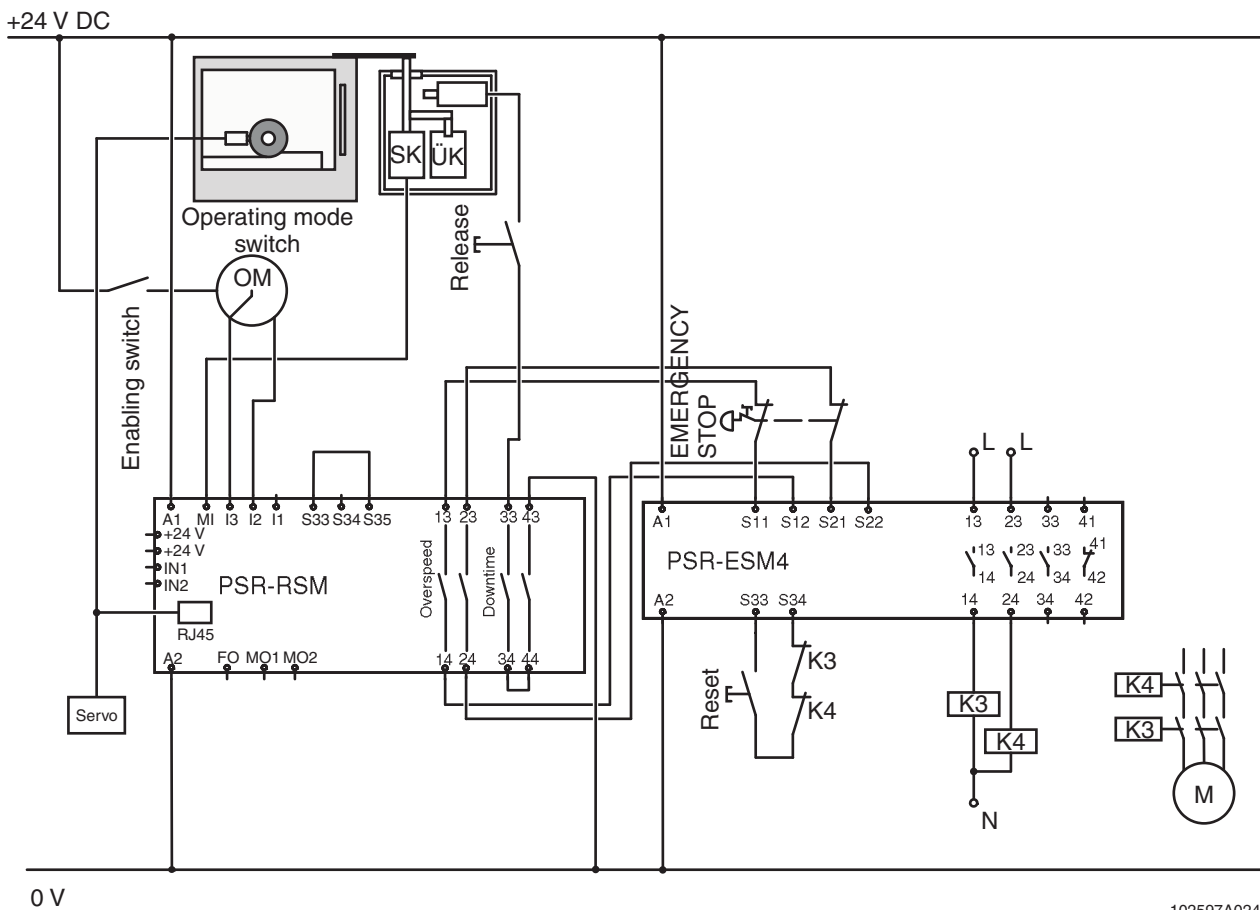
102597A023

Figure 3-26 PSR-RSM: Application example 1 (most basic machine)

SK = Safety contact
 ÜK = Monitoring contact

3.8.2 PSR-RSM: Application Example 2 (Basic Machine With a Monitored Drive)

PSR-RSM	Application	Features
	Downtime monitoring	4 N/O contacts
	Monitoring of parameterized speeds I3, I2	$U_S = 24\text{ V DC}$
	Encoder sensors	Automatic activation (bridge S33-S35)
	Connection via RJ45	Stop category 0
	Up to safety category 3, EN 954-1	
	SIL 3 according to EN 61508 (SIL data on request)	



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Figure 3-27 PSR-RSM: Application example 2 (basic machine with a monitored drive)

SK = Safety contact
 ÜK = Monitoring contact

3.8.3 PSR-RSM: Application Example 3 (Machine Tool With Several Drives and Differentiated Operating Modes)

PSR-RSM	Application	Features
	Monitoring of several drives in a working area	4 N/O contacts
	Encoder sensors	$U_S = 24\text{ V DC}$
	Connection via RJ45	Automatic start following overspeed (bridge S33-S35)
	Up to safety category 3, EN 954-1	Stop category 0
	SIL 3 according to EN 61508 (SIL data on request)	

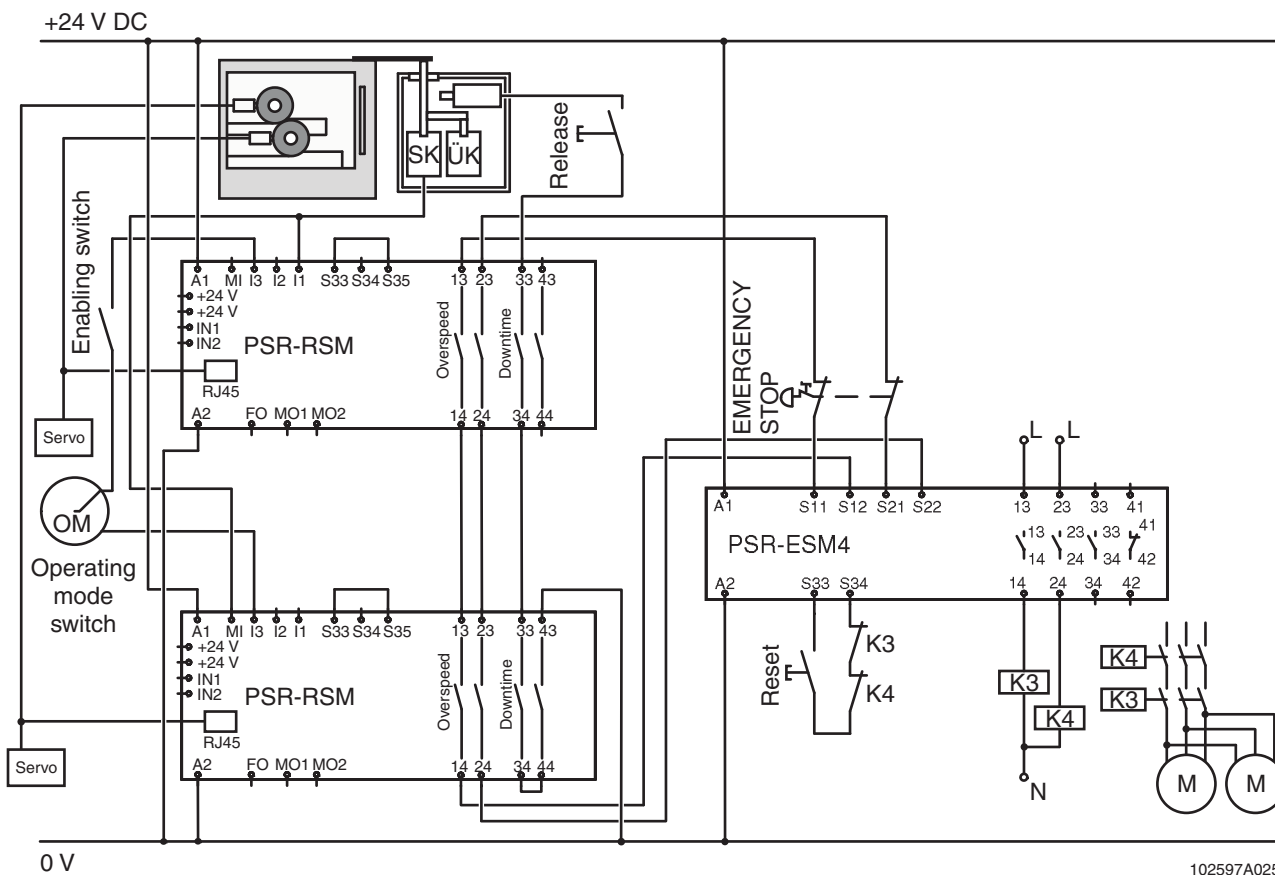


Figure 3-28 PSR-RSM: Application example 3 (machine tool with several drives and differentiated operating modes)

SK = Safety contact
 ÜK = Monitoring contact

3.8.4 PSR-RSM: Application Example 4 (Speed Monitoring Using 2-Wire Proximity Switches)

PSR-RSM	Application	Features
	Speed monitoring IN1, IN2	4 N/O contacts
	2-wire proximity switch	$U_S = 24\text{ V DC}$
	Up to safety category 3, EN 954-1	Automatic activation (bridge S33-S35)
	SIL 3 according to EN 61508 (SIL data on request)	Stop category 0

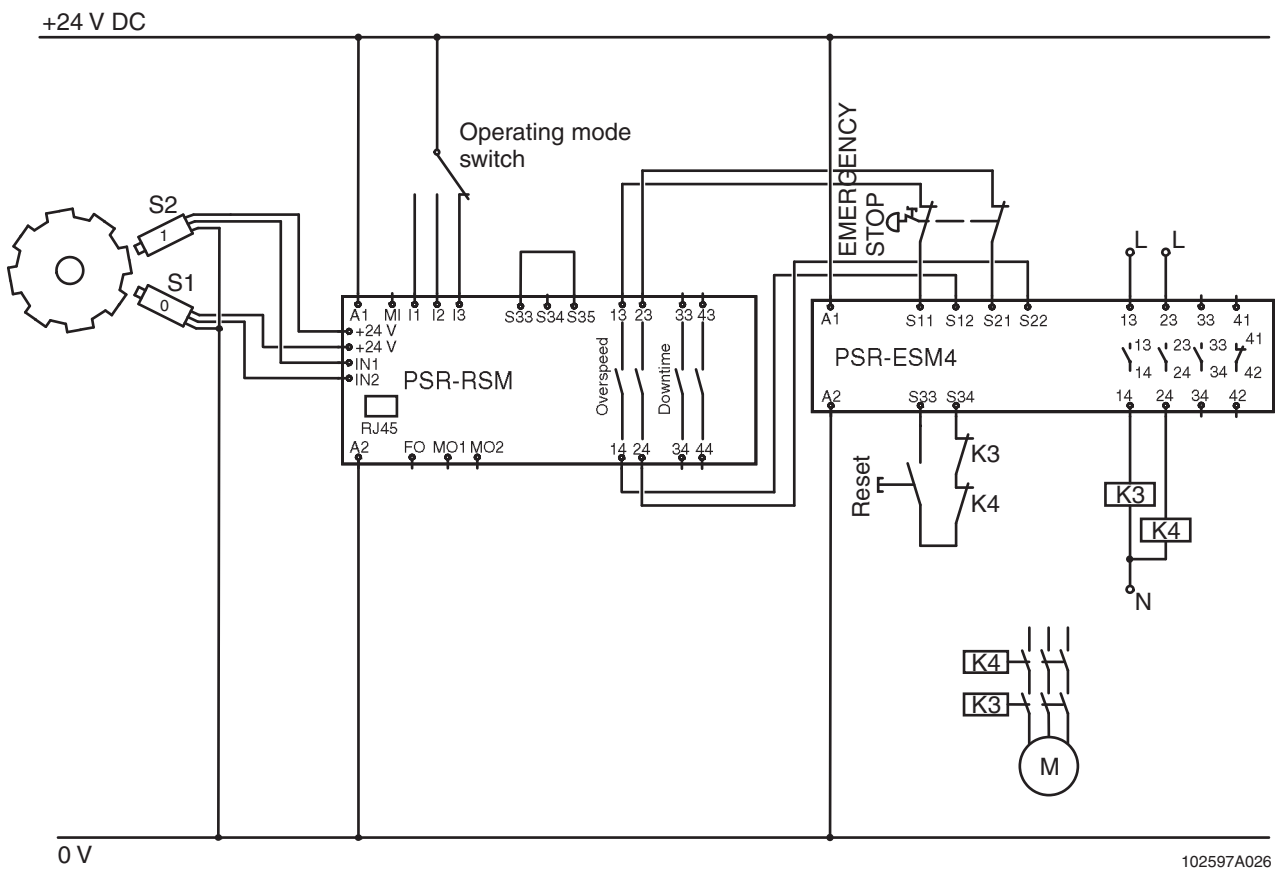


Figure 3-29 PSR-RSM: Application example 4 (speed monitoring using 2-wire proximity switches)

S1, S2:

- 1 = Contact (tooth)
- 0 = No contact (gap)

3.8.5 PSR-RSM: Application Example 5 (Basic Machine With Monitored Drive and Additional Drive Shaft Monitoring)

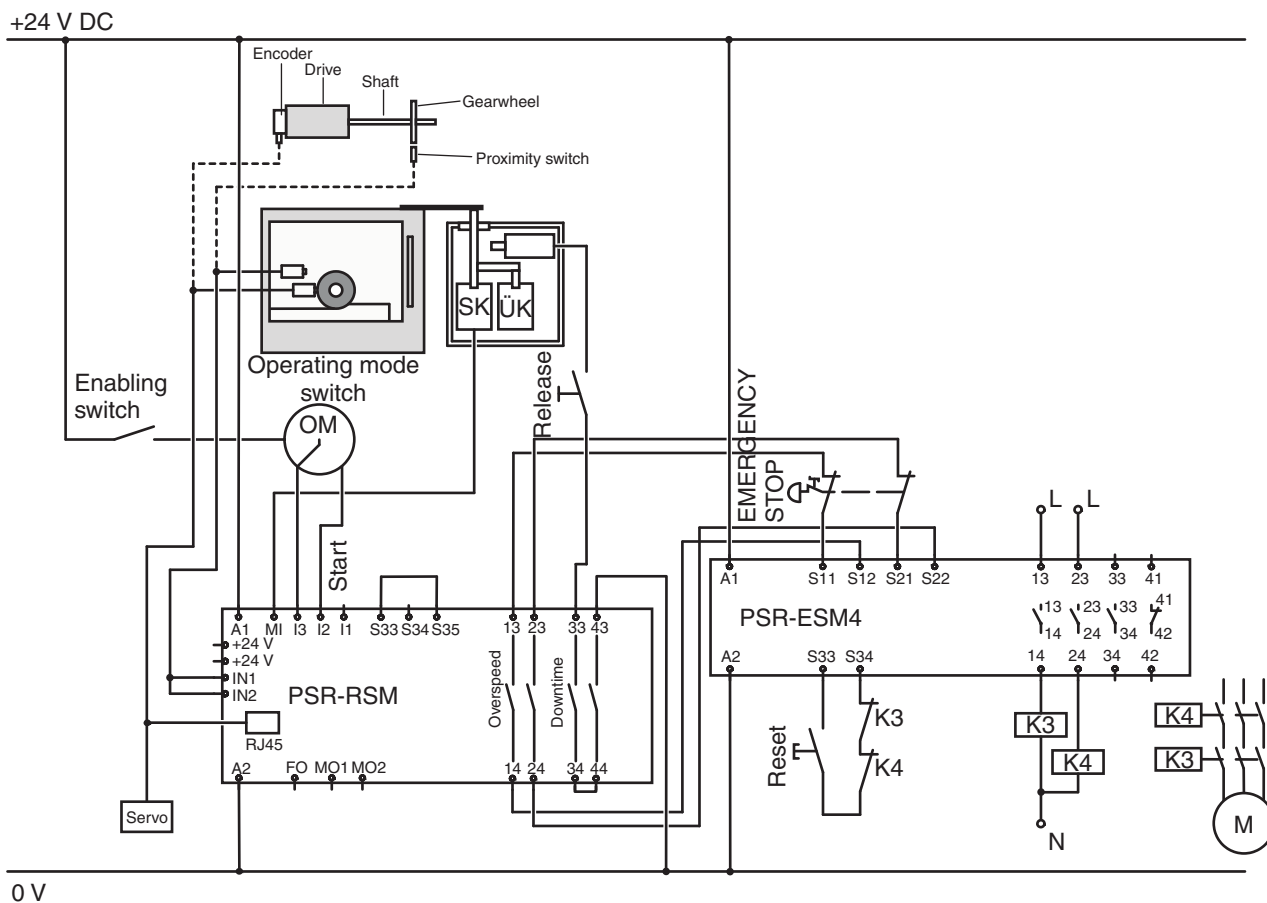
PSR-SSM

Application

Evaluation of a safe speed
 Additional drive shaft monitoring (IN1, IN2)
 Encoder sensors
 Connection via RJ45
 Up to safety category 4, EN 954-1
 SIL 3 according to EN 61508 (SIL data on request)

Features

4 N/O contacts
 $U_S = 24 \text{ V DC}$
 Automatic activation (bridge S33-S35)
 Stop category 0



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Figure 3-30 PSR-RSM: Application example 5 (basic machine with monitored drive and additional drive shaft monitoring)

3.8.6 PSR-SSM: Application Example 1 (Downtime Monitoring Using PNP or 2-Wire Proximity Switches)

PSR-SSM	Application	Features
	Downtime monitoring	Two-channel (IN1/SEN1, IN2/+SEN2) using two PNP or 2-wire proximity switches
	Up to safety category 3*, EN 954-1	
	SIL 3 according to EN 61508	

* Safety category 4 is possible if a test is performed within 24 hours of machine downtime to detect the internal sensor errors.

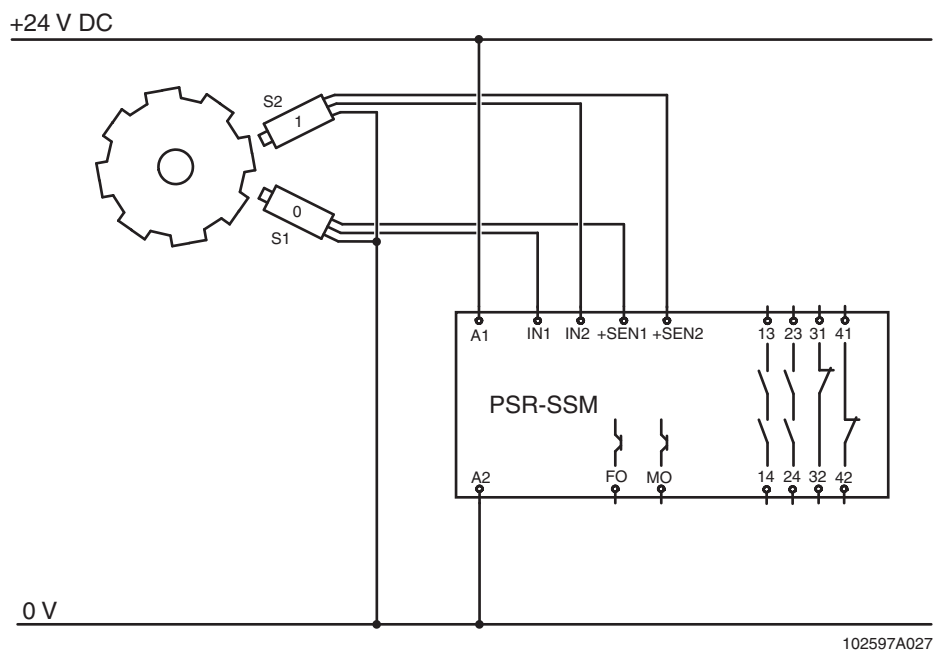


Figure 3-31 PSR-SSM: Application example 1 (downtime monitoring using PNP or 2-wire proximity switches)

S1, S2:

- 1 = Contact (tooth)
- 0 = No contact (gap)

3.9 PSR-SDC4, PSR-URD4, PSR-URM4: Emergency Stop Monitoring

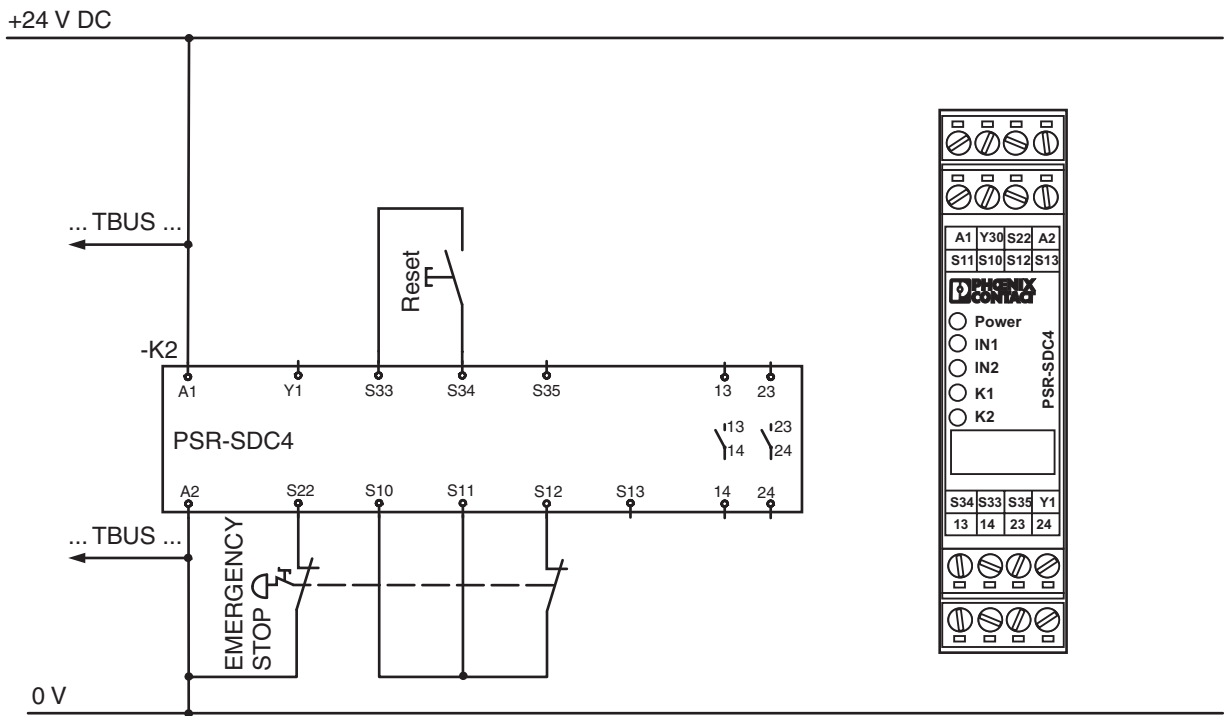
3.9.1 PSR-SDC4: Application Example 1

PSR-SDC4

Application
Emergency stop monitoring

Up to safety category 4, EN 954-1

Features
Two-channel (A2-S22, S11-S12, bridge S10-S11)
2 N/O contacts
 $U_S = 24\text{ V DC}$
Cross-circuit detection (A2-S22, S11-S12)
Manual activation (S33-S34)
Monitored start
Stop category 0



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Figure 3-32 PSR-SDC4: Application example 1

3.9.2 PSR-SDC4: Application Example 2

PSR-SDC4

Application

Emergency stop monitoring

Up to safety category 4, EN 954-1

Features

Two-channel (A2-S22, S11-S12, bridge S10-S11)

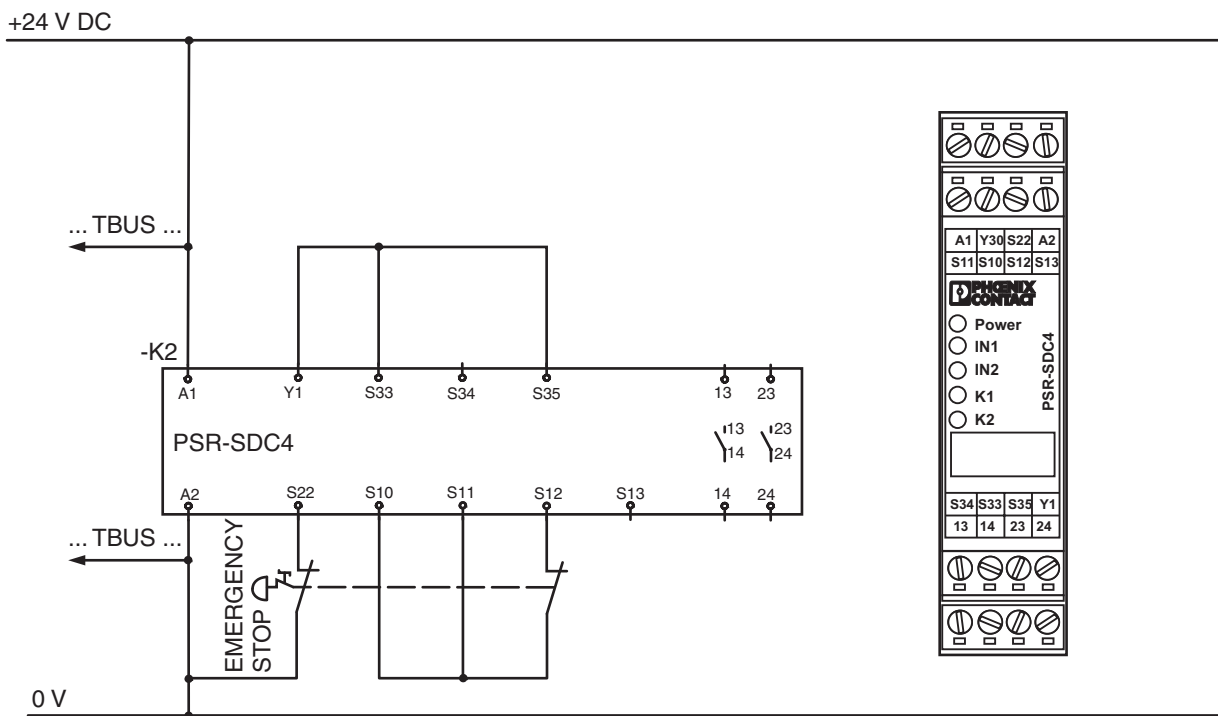
2 N/O contacts

$U_S = 24\text{ V DC}$

Cross-circuit detection (A2-S22, S11-S12)

Automatic activation (bridge Y1-S33-S35)

Stop category 0



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Figure 3-33 PSR-SDC4: Application example 2

3.9.3 PSR-SDC4: Application Example 3

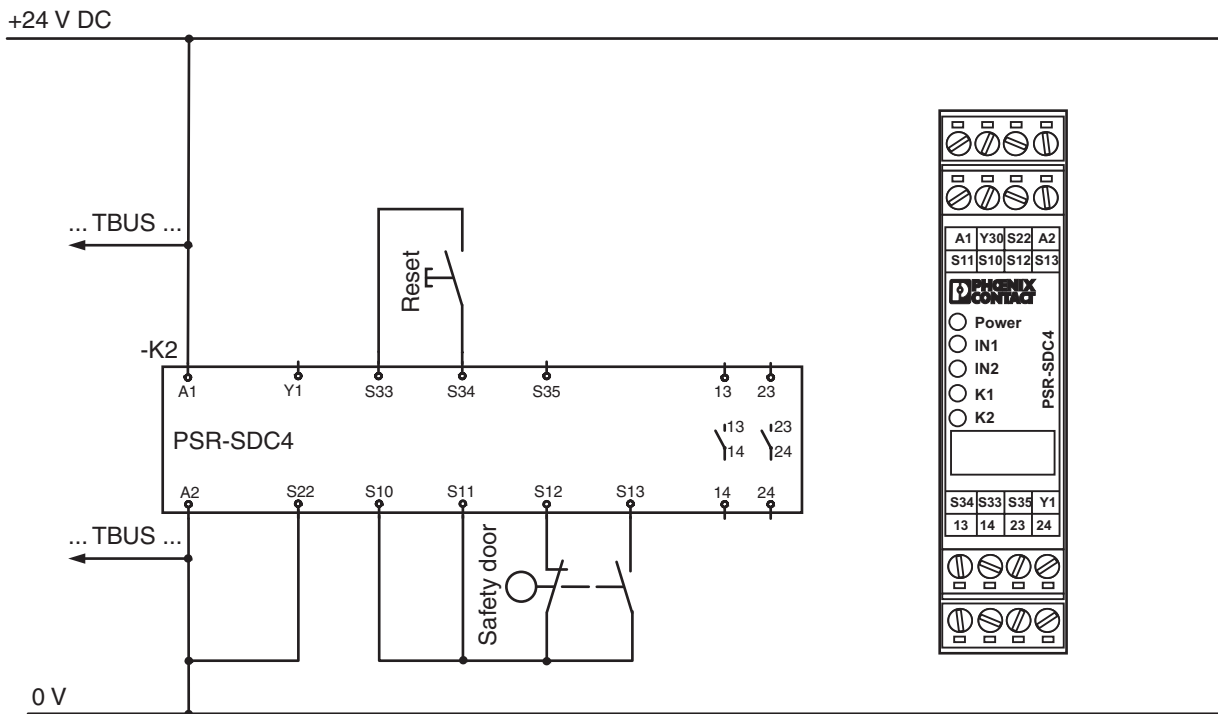
PSR-SDC4

Application

Safety door monitoring
 (1 N/O contact, 1 N/C contact)
 Up to safety category 3, EN 954-1

Features

Two-channel (S11-S12, S11-S13
 bridge S10-S11, A2-S22)
 2 N/O contacts
 $U_S = 24\text{ V DC}$
 Manual activation (S33-S34)
 Monitored start
 Stop category 0



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Figure 3-34 PSR-SDC4: Application example 3

3.9.4 PSR-SDC4: Application Example 4

PSR-SDC4

Application

Emergency stop monitoring

Up to safety category 2, EN 954-1

Features

Single-channel (S11-S12, bridge S10-S12, A1-S22)

2 N/O contacts

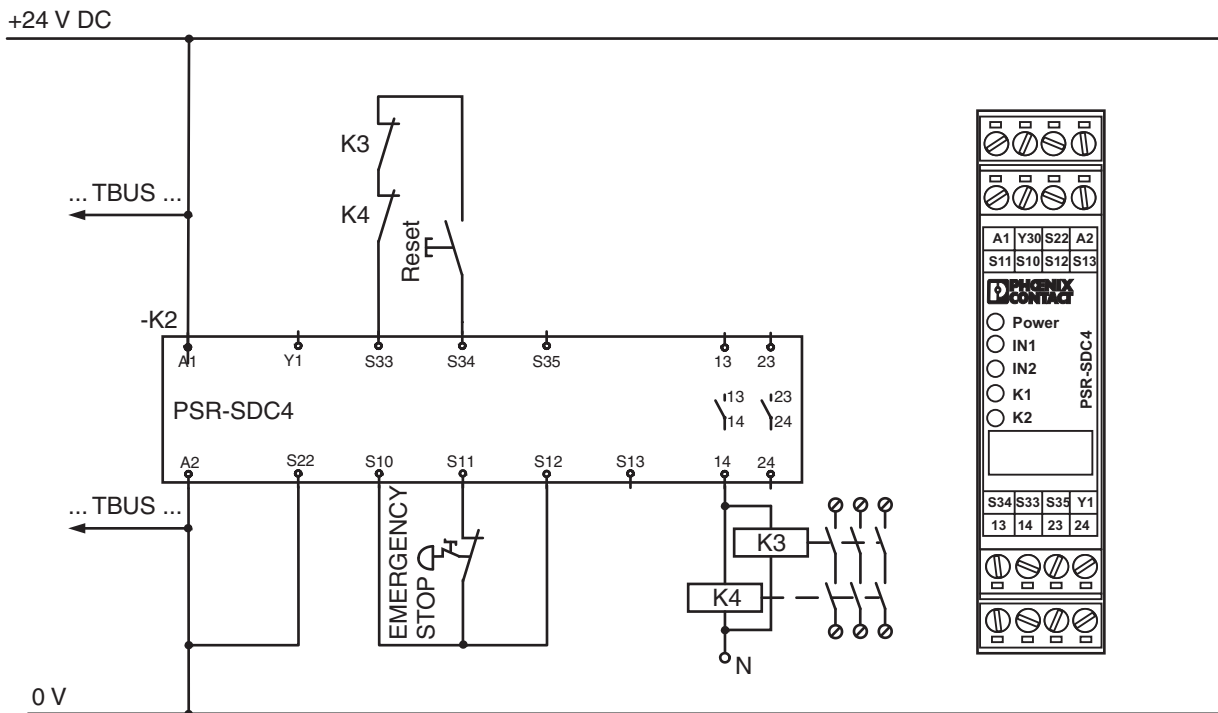
$U_S = 24\text{ V DC}$

Manual activation (S33-S34)

Monitored start

Monitored contact extension

Stop category 0



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Figure 3-35 PSR-SDC4: Application example 4

3.9.5 PSR-SDC4: Application Example 5

PSR-SDC4

Application

Light grid monitoring

Up to safety category 4, EN 954-1

Features

Two-channel (OSSD1-S10, OSSD2-S12, bridge A2-S22)

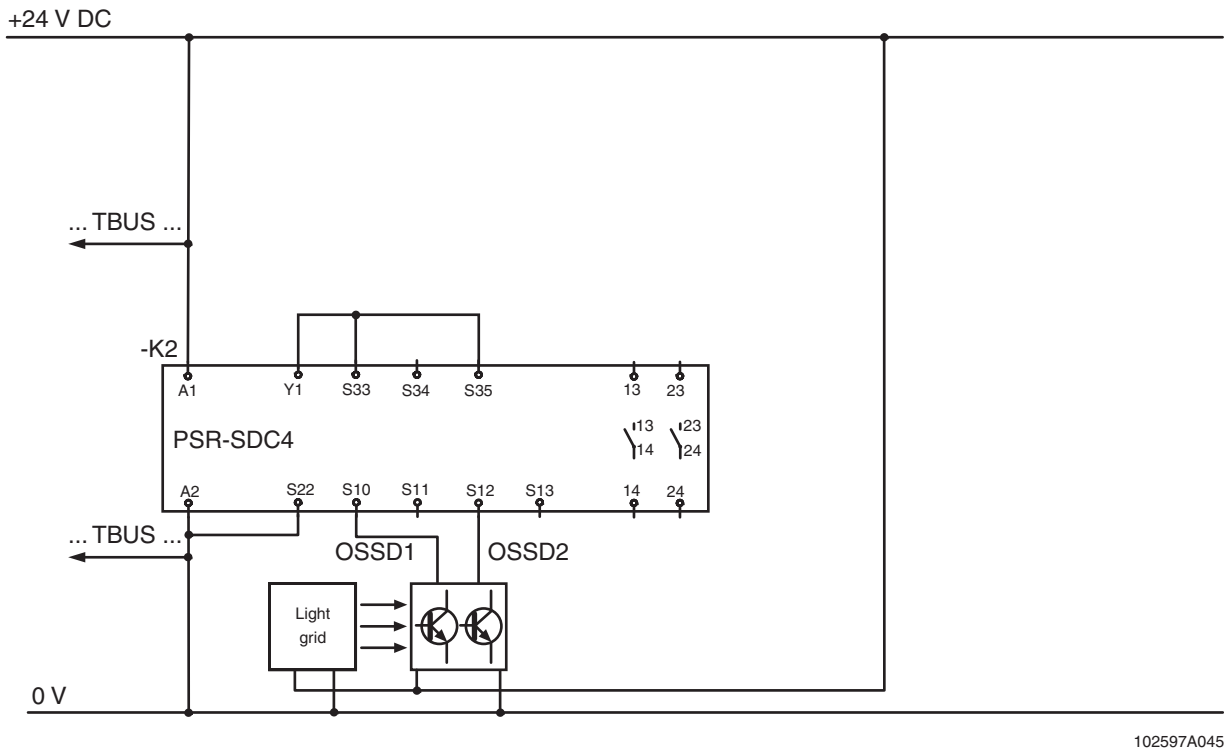
2 N/O contacts

$U_S = 24\text{ V DC}$

Automatic activation (bridge Y1-S33-S35)

Cross-circuit detection (OSSD1-OSSD2) (fault detected by light grid)

Stop category 0

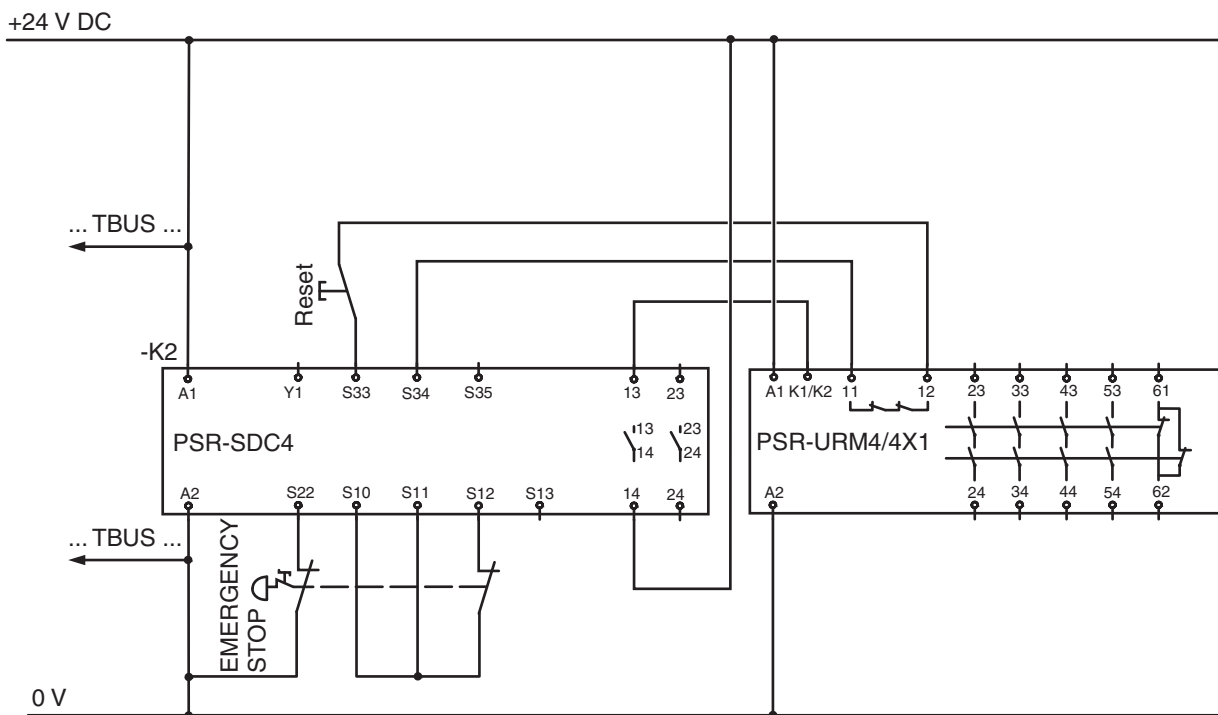


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Figure 3-36 PSR-SDC4: Application example 5

3.9.6 PSR-SDC4 and PSR-URM4/4X1 Extension Module: Application Example 6

PSR-SDC4	Application	Features
	Emergency stop monitoring	Two-channel (A2-S22, S11-S12, bridge S10-S11)
	Up to safety category 4, EN 954-1	5 N/O contacts, 1 N/C contact
		$U_S = 24\text{ V DC}$
		Cross-circuit detection (A2-S22 and S11-S12)
		Manual activation (S33-S34)
		Monitored start
		Stop category 0



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Figure 3-37 PSR-SDC4 and PSR-URM4/4X1 extension module: Application example 6

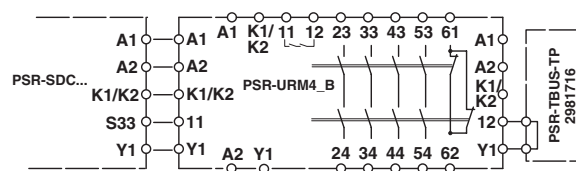
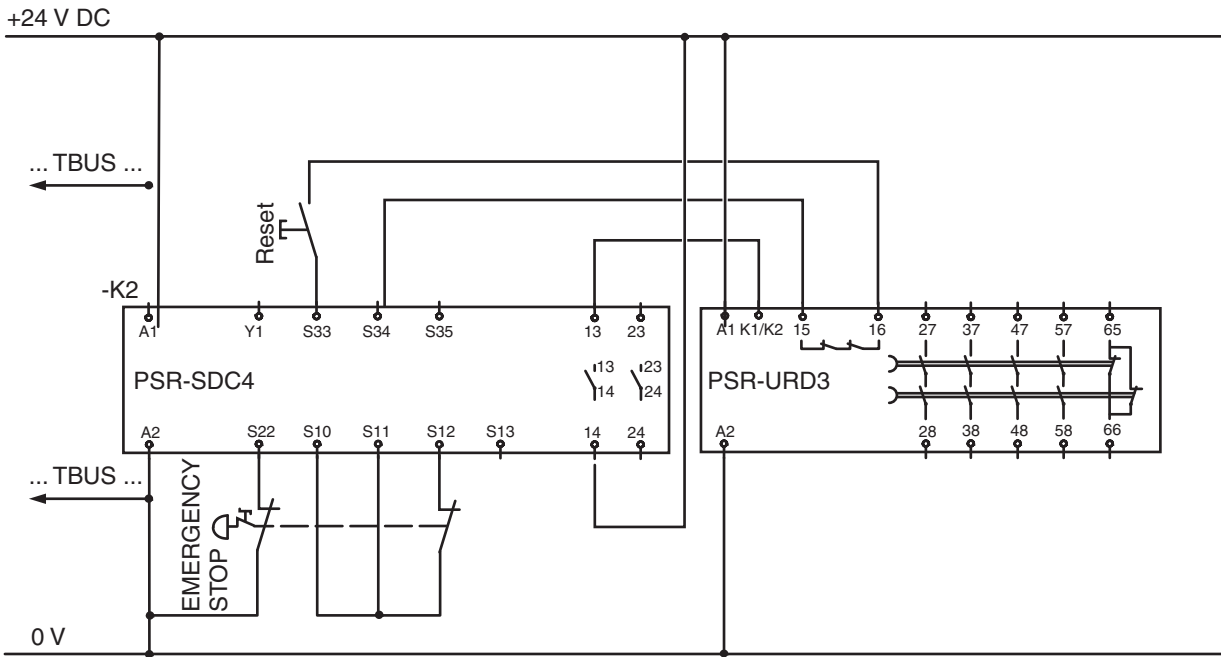


Figure 3-38 Wiring via T-BUS DIN rail connector

3.9.7 PSR-SDC4 and PSR-URD3 Extension Module: Application Example 7

PSR-SDC4	Application	Features
	Emergency stop monitoring	Two-channel (A2-S22, S11-S12, bridge S10-S11)
	Up to safety category 4, EN 954-1 (undelayed contacts)	2 N/O contacts
	Up to safety category 3, EN 954-1 (delayed contacts)	Delayed contacts: 4 N/O contacts, 1 N/C contact
		$U_S = 24 \text{ V DC}$
		Cross-circuit detection (A2-S22 and S11-S12)
		Manual activation (S33-S34)
		Monitored start
		Stop category 1



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Figure 3-39 PSR-SDC4 and PSR-URD3 extension module: Application example 7

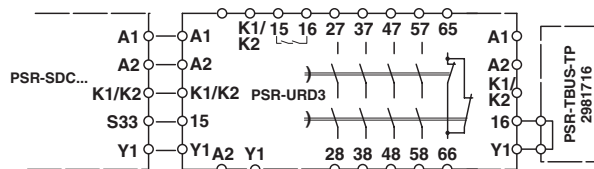


Figure 3-40 Wiring via T-BUS DIN rail connector

3.10 PSR-ES...4: Connection of Several Safety Relays

3.10.1 PSR-ES...4: Application Example 1

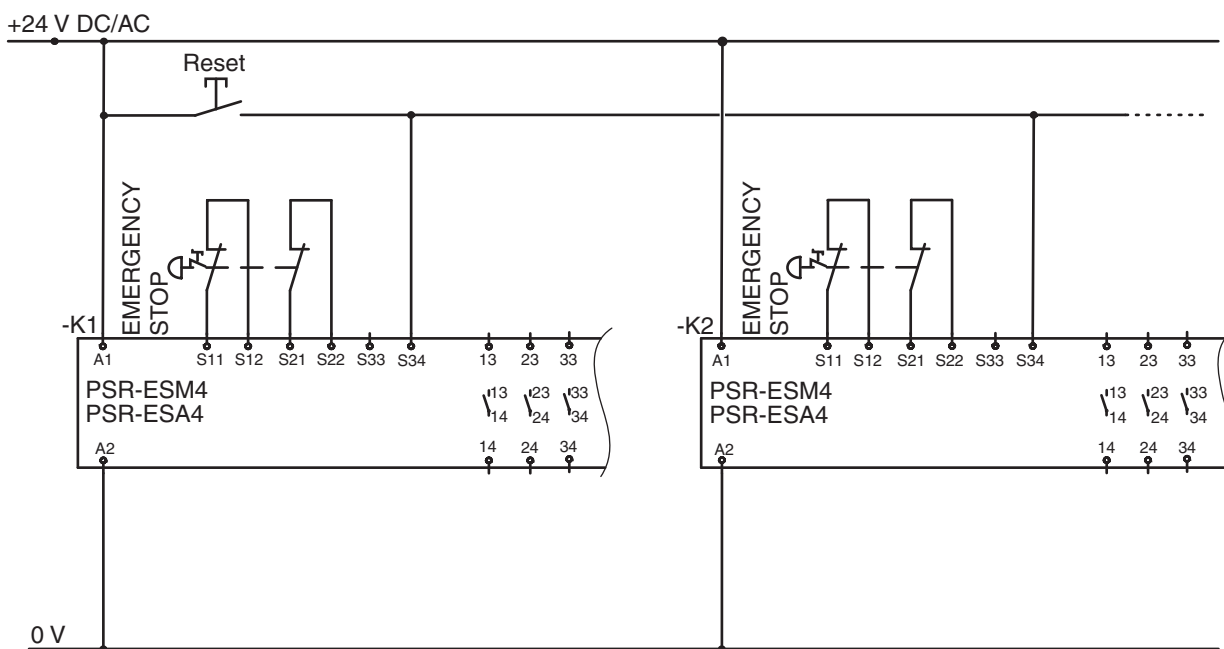
PSR-ES...4

Application

Emergency stop monitoring
Up to safety category 4, EN 954-1

Features

Two-channel (S11-S12, S21-S22)
x N/O contacts, x N/C contacts
 $U_S = 24\text{ V DC/AC}$
Cross-circuit detection (S11-S12 and S21-S22)
Manual activation of several safety relays with a monitored reset button (A1-S34), the button is only monitored for PSR-ESM



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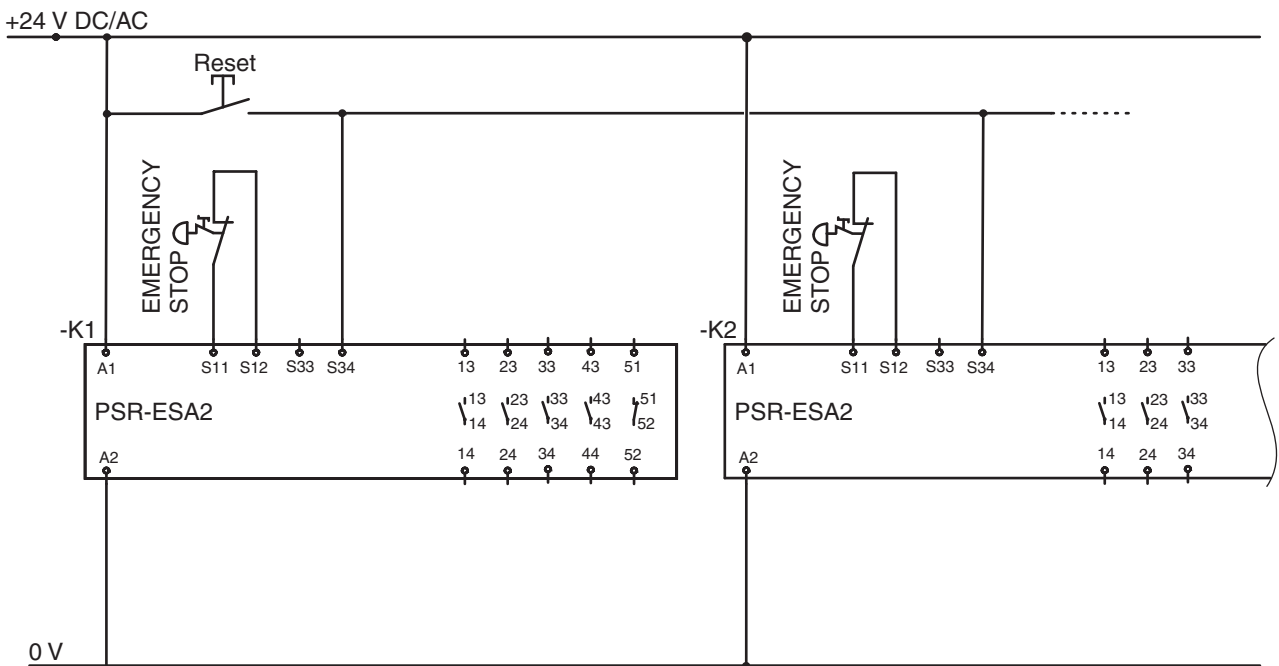
Figure 3-41 PSR-ES...4: Application example 1

3.10.2 PSR-ESA2: Application Example 2

PSR-ESA2

Application
 Emergency stop monitoring
 Up to safety category 2, EN 954-1

Features
 Single-channel (S11-S12)
 x N/O contacts, x N/C contacts
 $U_S = 24\text{ V DC/AC}$
 Manual activation of several safety relays
 with a monitored reset button (A1-S34), the
 button is not monitored



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Figure 3-42 PSR-ESA2: Application example 2

3.10.3 PSR-ES...4 and PSR-URM4 Extension Module: Application Example 3

PSR-ES...4/PSR-URM4	Application	Features
	Emergency stop monitoring	Two-channel (S11-S12, S21-S22)
	Up to safety category 4, EN 954-1	x N/O contacts, x N/C contacts
		$U_S = 24 \text{ V DC/AC}$
		Cross-circuit detection (S11-S12 and S21-S22)
		Manual activation without start button monitoring for PSR-ESA (S33-S34)
		Manual activation with start button monitoring for PSR-ESM (S33-S34)
		Contact extension by PSR-URM4
		Feedback circuit for monitoring contact extension

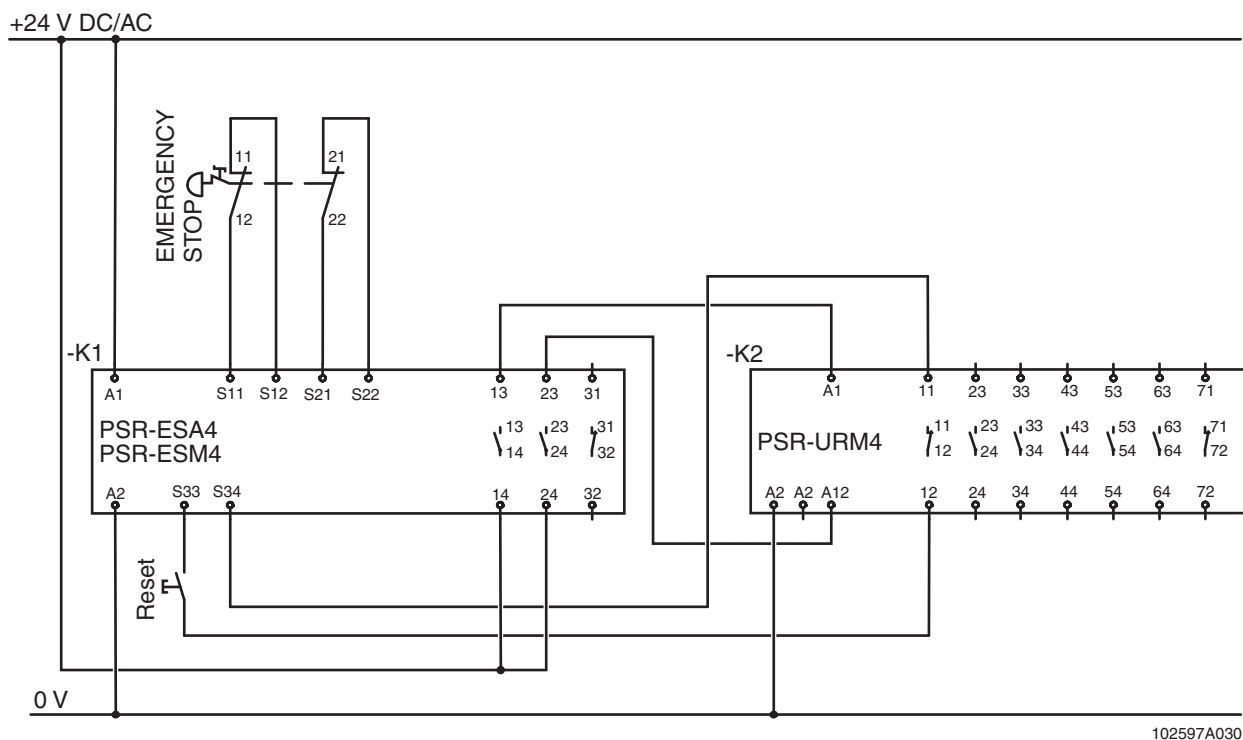
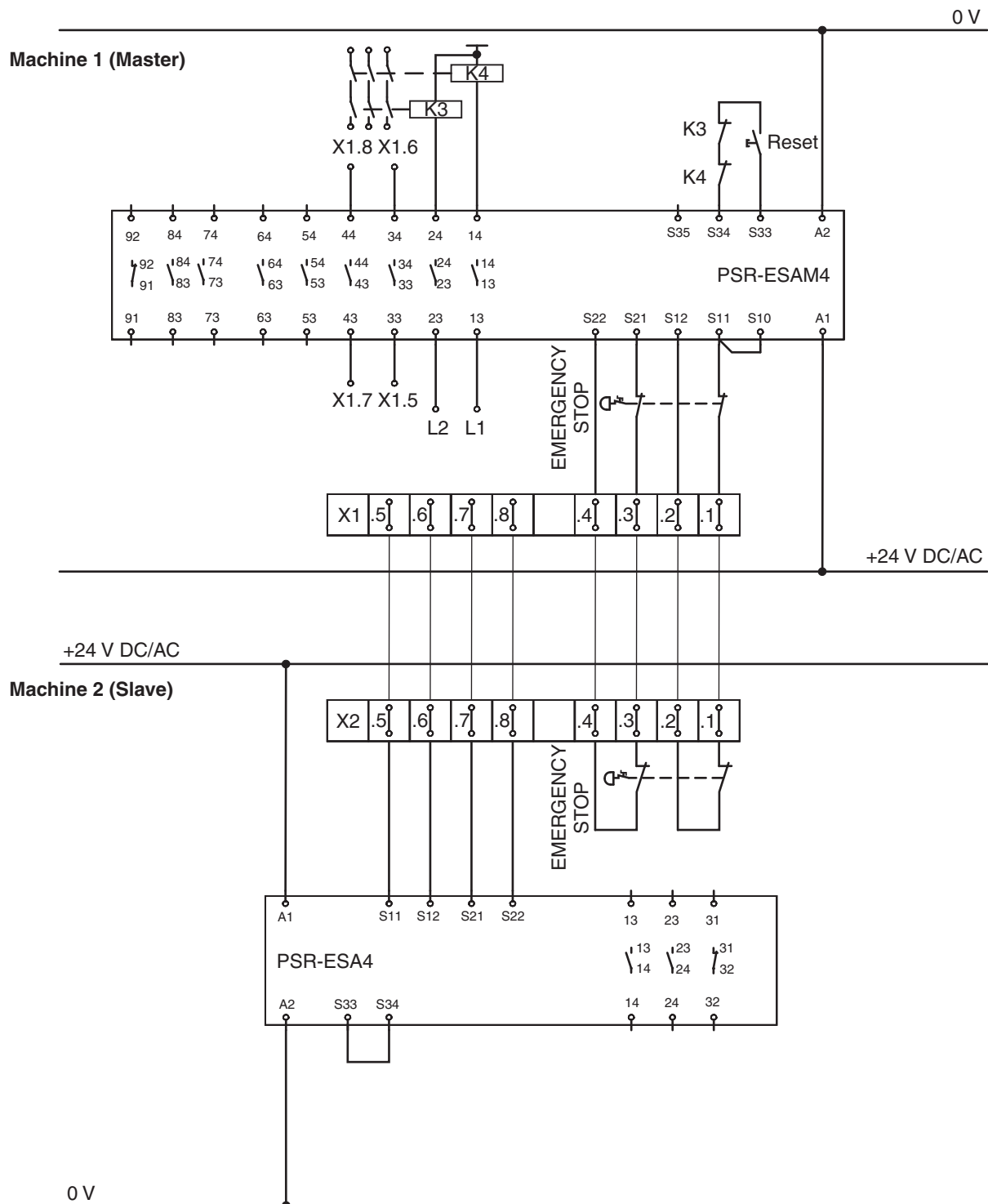


Figure 3-43 PSR-ES...4 and PSR-URM4 extension modules: Application example 3

3.11 PSR-ESAM4, PSR-ESA4: Machines in Integrated Systems

3.11.1 PSR-ESAM4, PSR-ESA4: Application Example 1

PSR-ESAM4/PSR-ESA4	Application of Machine 1	Features of Machine 1
	Emergency stop monitoring Up to safety category 4, EN 954-1	Two-channel (S11-S12, S21-S22, bridge S10/S11) x N/O contacts, x N/C contacts $U_S = 24 \text{ V DC/AC}$ Manual activation with reset button monitoring (S33-S34) Monitored contact extension
PSR-ESAM4/PSR-ESA4	Application of Machine 2	Features of Machine 2
	Emergency stop monitoring Up to safety category 4, EN 954-1	Two-channel via machine 1 (S11-S12, S21-S22) x N/O contacts, x N/C contacts $U_S = 24 \text{ V DC/AC}$ Automatic activation (S33-S34)



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Figure 3-44 PSR-ESAM4, PSR-ESA4: Application example 1

A Approvals and Certificates

A 1 Approvals

Order No.	Type	CE	BG	TÜV	CUL	Fuel Technology (EN 50156-1/ VDE 0116)	EN 954-1	IEC 61508, SIL 3
2963718-07	PSR-SCP- 24UC/ESM4/2X1/1X2	•	•		•		•	
2963705-00	PSR-SPP- 24UC/ESM4/2X1/1X2	•	•		•		•	
2963750-02	PSR-SCP- 24UC/ESA4/2X1/1X2	•	•		•		•	
2963938-00	PSR-SPP- 24UC/ESA4/2X1/1X2	•	•		•		•	
2963776-02	PSR-SCP- 24UC/ESM4/3X1/1X2/B	•	•		•		•	
2963925-00	PSR-SPP- 24UC/ESM4/3X1/1X2/B	•	•		•		•	
2963763-02	PSR-SCP- 24UC/ESA4/3X1/1X2/B	•	•		•		•	
2963941-00	PSR-SPP- 24UC/ESA4/3X1/1X2/B	•	•		•		•	
2963912-02	PSR-SCP- 24UC/ESAM4/8X1/1X2	•	•		•		•	
2963996-00	PSR-SPP- 24UC/ESAM4/8X1/1X2	•	•		•		•	
2981114-00	PSR-SCP- 24-230UC/ESAM4/3X1/1X2	•		•	•		•	•
2981127-00	PSR-SPP- 24-230UC/ESAM4/3X1/1X2	•		•	•		•	•
2963802-02	PSR-SCP- 24UC/ESA2/4X1/1X2/B	•	•		•		•	
2963954-00	PSR-SPP- 24UC/ESA2/4X1/1X2/B	•	•		•		•	
2981020-01	PSR-SCP- 24DC/ESP4/2X1/1X2	•		•	•	•	•	•
2981017-01	PSR-SPP- 24DC/ESP4/2X1/1X2	•		•	•	•	•	•
2981059-02	PSR-SCP- 24UC/ESL4/3X1/1X2/B	•	•		•		•	
2981062-02	PSR-SPP- 24UC/ESL4/3X1/1X2/B	•	•		•		•	
2963721-03	PSR-SCP- 24UC/THC/2X1/1X2	•		•	•		•	
2963983-00	PSR-SPP- 24UC/THC/2X1/1X2	•		•	•		•	
2981677-00	PSR-SCP- 24DC/URM4/4X1/2X2/B	•	•		•		•	
2981680-00	PSR-SPP- 24DC/URM4/4X1/2X2/B	•	•		•		•	
2963734-03	PSR-SCP- 24UC/URM4/5X1/2X2	•	•		•		•	
2964005-00	PSR-SPP- 24UC/URM4/5X1/2X2	•	•		•		•	
2981033-00	PSR-SCP- 24UC/URM4/5X1/2X2/B	•	•		•		•	
2981046-00	PSR-SPP- 24UC/URM4/5X1/2X2/B	•	•		•		•	
2963747-03	PSR-SCP- 24UC/URM/5X1/2X2	•	•		•		•	
2963970-00	PSR-SPP- 24UC/URM/5X1/2X2	•	•		•		•	
2981402-01	PSR-SCP-120UC/URM/5X1/2X2	•			•		•	
2981415-00	PSR-SPP-120UC/URM/5X1/2X2	•			•		•	
2981363-00	PSR-SCF- 24UC/URM/2X21	•			•		•	
2981376-00	PSR-SCF-120UC/URM/2X21	•			•		•	
2981486-00	PSR-SCP- 24DC/SDC4/2X1/B	•	•		•		•	
2981499-00	PSR-SPP- 24DC/SDC4/2X1/B	•	•		•		•	
2981512-00	PSR-SCP- 24DC/URD3/4X1/2X2	•	•		•		•	
2981525-00	PSR-SPP- 24DC/URD3/4X1/2X2	•	•		•		•	

UM EN SAFETY RELAY APPLICATION

Order No.	Type	CE	BG	TÜV	CUL	Fuel Technology (EN 50156-1/ VDE 0116)	EN 954-1	IEC 61508, SIL 3
2981428-02	PSR-SCP- 24DC/ESD/5X1/1X2/300	•	•		•		•	
2981431-02	PSR-SPP- 24DC/ESD/5X1/1X2/300	•	•		•		•	
2981101-00	PSR-SCP- 24DC/ESD/5X1/1X2/0T5	•	•		•		•	
2981130-00	PSR-SPP- 24DC/ESD/5X1/1X2/0T5	•	•		•		•	
2981143-00	PSR-SCP- 24DC/ESD/5X1/1X2/T1	•	•		•		•	
2981156-00	PSR-SPP- 24DC/ESD/5X1/1X2/T1	•	•		•		•	
2981169-00	PSR-SCP- 24DC/ESD/5X1/1X2/1T5	•	•		•		•	
2981172-00	PSR-SPP- 24DC/ESD/5X1/1X2/1T5	•	•		•		•	
2981125-00	PSR-SCP- 24DC/ESD/5X1/1X2/T2	•	•		•		•	
2981198-00	PSR-SPP- 24DC/ESD/5X1/1X2/T2	•	•		•		•	
2981208-00	PSR-SCP- 24DC/ESD/5X1/1X2/2T5	•	•		•		•	
2981211-00	PSR-SPP- 24DC/ESD/5X1/1X2/2T5	•	•		•		•	
2981224-00	PSR-SCP- 24DC/ESD/5X1/1X2/T3	•	•		•		•	
2981237-00	PSR-SPP- 24DC/ESD/5X1/1X2/T3	•	•		•		•	
2981240-00	PSR-SCP- 24DC/ESD/5X1/1X2/T4	•	•		•		•	
2981253-00	PSR-SPP- 24DC/ESD/5X1/1X2/T4	•	•		•		•	
2981266-00	PSR-SCP- 24DC/ESD/5X1/1X2/T5	•	•		•		•	
2981279-00	PSR-SPP- 24DC/ESD/5X1/1X2/T5	•	•		•		•	
2981282-00	PSR-SCP- 24DC/ESD/5X1/1X2/T6	•	•		•		•	
2981295-00	PSR-SPP- 24DC/ESD/5X1/1X2/T6	•	•		•		•	
2981088-01	PSR-SCP- 24DC/ESD/5X1/1X2/T10	•	•		•		•	
2981091-03	PSR-SPP- 24DC/ESD/5X1/1X2/T10	•	•		•		•	
2981305-00	PSR-SCP- 24DC/ESD/5X1/1X2/T15	•	•		•		•	
2981318-00	PSR-SPP- 24DC/ESD/5X1/1X2/T15	•	•		•		•	
2981321-00	PSR-SCP- 24DC/ESD/5X1/1X2/T20	•	•		•		•	
2981334-00	PSR-SPP- 24DC/ESD/5X1/1X2/T20	•	•		•		•	
2981347-00	PSR-SCP- 24DC/ESD/5X1/1X2/T30	•	•		•		•	
2981350-00	PSR-SPP- 24DC/ESD/5X1/1X2/T30	•	•		•		•	
2963538-00	PSR-SCP- 24DC/RSM/4X1	•		•	•		•	•
2963541-00	PSR-SPP- 24DC/RSM/4X1	•		•	•		•	•
2963567-00	PSR-SCP- 24DC/SSM/2X1	•		•	•		•	•
2963570-00	PSR-SPP- 24DC/SSM/2X1	•		•	•		•	•

A 2 Certificates



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32825 BLOMBERG, GERMANY

Controllers Types IL, PB, BK, may be followed by DP/V1, may be followed by -PAC and Type VARIO BK DP/V1.

Din mountable safety relays, Types PSR-..P-24UC, PSR-..P-24DC, PSR-..P-24UC or PSR-..P-120UC, followed by alpha numeric characters; Types PSR-SCP24UC/ESL4/3X1/1X2/B and PSR-SPP24UC/ESL4/3X1/1X2/B .

Types PSR-..P-24DC/ESD/5X1/1X2/ followed by xTy, Tz or 300.

Types PSR-SCF-24UC/URM/2X21 and PSR-SCF-120UC/URM/2X21.

Last Updated on 2004-11-18

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A 2.1 PSR-ESA4



Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle
 im BG-PRÜFZERT

Hauptverband der gewerblichen
 Berufsgenossenschaften

Baumusterprüfbescheinigung

02117

 Bescheinigungs-Nummer

Name und Anschrift
 des Bescheinigungsinhabers:
 (Auftraggeber) Phoenix Contact GmbH & Co.
 Flachsmarktstraße 2
 32825 Blomberg

Name und Anschrift
 des Herstellers: siehe Auftraggeber

Zeichen des Auftraggebers: Zeichen der Prüf- und Zertifizierungsstelle: 23.520.25/01-79-318 Wld/Ow
 Ausstellungsdatum: 15.04.2002

Produktbezeichnung: Relais-Sicherheitskombination

Typ: PSR-SCP-24UC/ESA4/2X1/1X2
 PSR-SCP-24UC/ESA4/3X1/1X2/B

Bestimmungsgemäße
 Verwendung:

Prüfgrundlage:	73/23/EWG 89/336/EWG GS-ET-20 DIN EN 60947-5-1 DIN EN 61000-4-6	„Niederspannungsrichtlinie“ „EMV-Richtlinie“ „Grundsätze für die Prüfung und Zertifizierung von Relais-Sicherheitskombinationen“ (03.99) „Steuergeräte und Schaltelemente; Elektromechanische Steuergeräte“ (08.00) „Störfestigkeit gegen leitungsgeführte Störgrößen induziert durch hochfrequente Felder“ (12.01)
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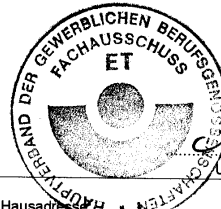
Bemerkungen: Die sicherheitsrelevanten Strompfade mit den Ausgangskontakten 13/14 und 23/24 (bei PSR-SCP-24UC/ESA4/3X1/1X2/B zusätzlich die Kontakte 33/34) erfüllen die Anforderungen der Kategorie 4 nach DIN EN 954-1 (03.97).

Das geprüfte Baumuster entspricht den einschlägigen Bestimmungen der Richtlinie 98/37/EG (**Maschinen**).

Diese Bescheinigung wird spätestens ungültig am:

31.12.2006

Weiteres über die Gültigkeit, eine Gültigkeitsverlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsordnung vom Oktober 1997.



Unterschrift (Dipl.-Ing. Mehlem)

PZB10
10.98




Postadresse:
 Postfach 51 05 80
 50941 Köln

Hausadresse:
 Gustav-Heinemann-Ufer 130
 50968 Köln

Tel: 02 21/37 78-0
 Fax: 02 21/37 78-3 66

A 2.2 PSR-ESM4



**Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle
im BG-PRÜFZERT**

Hauptverband der gewerblichen
Berufsgenossenschaften

GS-Prüfbescheinigung

05278

Bescheinigungs-Nummer

Name und Anschrift des Bescheinigungsinhabers: (Auftraggeber)	PHOENIX CONTACT GmbH & Co. KG Flachmarktstraße 8 32825 Blomberg
Name und Anschrift des Herstellers:	siehe Auftraggeber

Zeichen des Auftraggebers:	Zeichen der Prüf- und Zertifizierungsstelle: 23.520.25/05-155-318 Wld/Ow	Ausstellungsdatum: 30.12.2005
----------------------------	---	----------------------------------

Produktbezeichnung: Not-Aus-Relais

Typ: PSR-SCP-24UC/ESM4/... (siehe Anlage)
PSR-SPP-24UC/ESM4/... (siehe Anlage)

Bestimmungsgemäße Verwendung:

Prüfgrundlage:	73/23/EWG 89/336/EWG GS-ET-20	„Niederspannungsrichtlinie“ „EMV-Richtlinie“ „Grundsätze für die Prüfung und Zertifizierung von Sicherheitsschaltgeräten“ (2001-04)
	DIN EN 60947-5-1	„Steuergeräte und Schaltelemente; Elektromechanische Steuergeräte“ (2000-08)

Bemerkungen: Die sicherheitsrelevanten Strompfade mit den Ausgangskontakten (siehe Anlage) erfüllen hinsichtlich der sicherheitsrelevanten Funktion die Anforderungen der Kategorie 4 nach DIN EN 954-1 (1997-03).

Das geprüfte Baumuster stimmt mit den in § 4 Absatz 1 des Geräte- und Produktsicherheitsgesetzes genannten Anforderungen überein.
Das Baumuster entspricht somit auch den einschlägigen Bestimmungen der Richtlinie 98/37/EG (**Maschinen**).
Der Bescheinigungsinhaber ist berechtigt, das umseitig abgebildete GS-Zeichen an den mit dem geprüften Baumuster übereinstimmenden Produkten anzubringen. Der Bescheinigungsinhaber hat dabei die umseitig aufgeführten Bedingungen zu beachten.

Diese Bescheinigung einschließlich der Berechtigung zur Anbringung des GS-Zeichens wird spätestens ungültig am:

01.05.2007

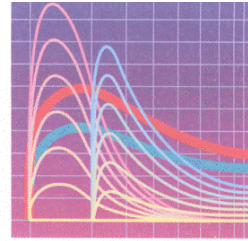
Weiteres über die Gültigkeit, eine Gültigkeitsverlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsordnung vom April 2004.



Dipl.-Ing. Stefan Stommel
Leiter der Zertifizierungsstelle



<p>PZB03D 05.04</p> 	<p>Postadresse: Postfach 51 05 80 50941 Köln</p>	<p>Hausadresse: Gustav-Heinemann-Ufer 130 50968 Köln</p>	<p>Telefon: 02 21 / 37 78 - 6301 Telefax: 02 21 / 37 78 - 6322</p>
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PHOENIX TEST-LAB GmbH
Königswinkel 10
D-32825 Blomberg, Germany
Phone ++49 5235 9500-0
Fax ++49 5235 9500-10

Typprüfbescheinigung des Prüflabors
Type Certificate of the Test Laboratory

Prüfgebiet: EMV Konformitätsprüfung
Scope:

Prüfvorschriften: Werknorm 10
Test Standards:
basierend auf
EN 50081-2:1993
EN 61000-6-2:1999

Prüfgegenstand: PSR-SCP-24UC/ESM4/2X1/1X2
Equipment under Test:
Artikel-Nr.: 2963718

Prüfberichtsnummer: E00442
Test Report Number:

Auftraggeber: Fa. Phoenix Contact GmbH & Co.
Client: Flachsmarktstraße 8 - 28
32825 Blomberg

Datum der Prüfung: 07.08. - 14.08.2000
Date of Test:

Prüfergebnis: Das geprüfte Baumuster ist konform zu den genannten Prüfvorschriften
Test Result: The examined type is in conformity with the above-mentioned test standards

Blomberg, den 16.11.2000.
Blomberg, 16.11.2000

verantwortlicher Prüfer: M. Pohl
Examiner:

Laborleiter: D. Pelz
Laboratory Director:

EMC and Radio Accreditation



Registration No. TTI-P-G071/94-01

Safety and Environment Accreditation



Registration No. DAT-P-105/00-00

Examiner: M. Pohl
Date of issue: 15.10.2000

Test Report No.: E00442
Order No.: 00442

page 1 of 1



TÜV Rheinland Group

TÜV Industrie Service GmbH
Automation, Software und Informationstechnologie

**ZERTIFIKAT
CERTIFICATE**

Nr./No. 968/EL 355.00/05

Prüfgegenstand Product tested	Relais-Sicherheitskombination	Zertifikatsinhaber Licence Holder	Phoenix Contact GmbH & Co. Flachmarktstraße 8 D-32825 Blomberg
Typbezeichnung Type designation	PSR-SCP-24-230UC/ ESAM4/3X1/1X2 PSR-SPP-24-230UC/ ESAM4/3X1/1X2	Verwendungszweck Intended application	Relais-Sicherheitskombination für Not-Aus and Schutzföranwendungen
Prüfgrundlagen Codes and standards forming the basis of testing	EN 954-1:1996 EN 50178:1998 EN 418:1992	EN 60204-1:1998 IEC 61508 Teile 1 - 7	
Prüfungsergebnis Test results	Unter Beachtung der Hinweise in der Betriebsanleitung werden die Anforderungen der Sicherheitskategorie 4 nach EN 954-1 und SIL 3 nach der Normenreihe IEC 61508 erfüllt.		
Besondere Bedingungen Specific requirements	<p>Nach 6 Monaten ist die Schutzeinrichtung zu betätigen, damit sichergestellt ist, dass Fehler nicht unentdeckt bleiben und die Sicherheitsfunktion durch einen zweiten Fehler nicht außer Kraft gesetzt wird.</p> <p>Ein Anteil von 15 % des SIL 3 nach IEC 61508 wird eingehalten, sofern die ermittelte Einsatzzeit von 34 Monaten nicht überschritten und nach dieser Zeit eine Funktionsprüfung durchgeführt wird.</p> <p>Die Installationsbedingungen und Anwendungshinweise in der Betriebsanleitung müssen beachtet werden.</p>		

Der Prüfbericht-Nr. 968/EL 355.00/05 vom 2005-09-05 ist Bestandteil dieses Zertifikates.

Dieses Zertifikat ist nur gültig für Erzeugnisse, die mit dem Prüfgegenstand übereinstimmen. Es wird ungültig bei jeglicher Änderung der Prüfgrundlagen für den angegebenen Verwendungszweck.

The test report-no. 968/EL 355.00/05 dated 2005-09-05 is an integral part of this certificate.

This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.

TÜV Industrie Service GmbH
Geschäftsfeld ASI
Automation, Software und Informationstechnologie
Am Grauen Stein, 51105 Köln
Postfach 91 09 51, 51101 Köln



2005-09-05

Datum/Date

Firmenstempel/Company seal

Unterschrift/Signature

A 2.4 PSR-THC

Z E R T I F I K A T	
<p>EG-Baumusterbescheinigung Richtlinie 98/37/EG, Anhang VI Sicherheitsbauteile nach Maschinenrichtlinie</p>	
<p>Registrier Nr.: BB 60006385 0001</p> <p>Bericht Nr.: 21109759 001</p>	
<p>Inhaber der Bescheinigung:</p> <p>Phoenix Contact GmbH & Co. Flachsmarktstr. 8-28 32825 Blomberg Deutschland</p>	<p>Hersteller:</p> <p>Phoenix Contact GmbH & Co. Flachsmarktstr. 8-28 32825 Blomberg Deutschland</p>
<p>Produkt:</p> <p><u>Zweihandschaltungen</u> Zweihand-Steuierungs-Relais vom Typ IIIC nach EN 574:1996</p>	
<p>Identifikation:</p> <p>Sicherheits-Relais-Kombination Typ PSR-SCP-24UC/THC4 Typ PSR-SPP-24UC/THC4 Betriebsarten: - Zweihand-Steuerung - Schutzüberwachung jeweils mit Gleichheitsüberwachung < 0,5 sec Max. Reaktionszeit: 20 ms Ersetzt bisheriges Zertifikat BB 60006134 vom 09.10.2003</p>	
<p>Die EG-Baumusterbescheinigung bezieht sich auf das o.g. Produkt. Es wird bescheinigt, dass das Baumuster mit den grundlegenden Anforderungen der o.g. Richtlinie und den dazu erlassenen Änderungsrichtlinien übereinstimmt. Der Inhaber ist berechtigt, diese Bescheinigung im Rahmen seiner EG-Konformitätserklärung zu verwenden.</p>	
<p>Köln, den <u>05.11.2003</u></p>	<p style="text-align: center;">Zertifizierungsstelle</p>  Dipl.-Ing. F. Schuh
<p>TÜV Rheinland Product Safety GmbH - Am Grauen Stein - D-51105 Köln Akkreditiert von der Zentralstelle der Länder für Sicherheitstechnik (ZLS).</p> <p>Notifiziert unter der Nr. 0197 bei der Kommission der Europäischen Gemeinschaft.</p>	
<p>CE Die CE-Kennzeichnung darf bei Einhaltung aller zutreffenden EG-Richtlinien angebracht werden. CE</p>	

A 2.5 PSR-ESP



TÜV TÜV Rheinland Group

TÜV Industrie Service GmbH
Automation, Software und Informationstechnologie

ZERTIFIKAT

CERTIFICATE

Nr./No. 968/EL 200.01/04

Prüfgegenstand Product tested	Sicherheits-Relais	Hersteller Manufacturer	Phoenix Contact GmbH & Co. Flachmarktstraße 8 D-32825 Blomberg
Typbezeichnung Type designation	PSR-SCP-24DC/ESP4/2X1/1X2 PSR-SPP-24DC/ESP4/2X1/1X2	Verwendungszweck Intended application	Sicherheits-Relais für Not-Aus und Schutzüranwendungen
Prüfgrundlagen Codes and standards forming the basis of testing	DIN VDE 0116:10.1989 EN 954-1:1996 EN 50178:1998 EN 60204-1:1998 IEC 61508 Teile 1 - 7 EN 50156-1:2004		
Prüfungsergebnis Test results	Unter Beachtung der Hinweise in der Betriebsanleitung werden die Anforderungen der Sicherheitskategorie 4 nach EN 954-1, SIL 3 nach der Normenreihe IEC 61508 und Sicherheitsniveau 3 gemäß EN 50156-1 für Feuerungsanlagen im Dauerbetrieb erfüllt.		
Besondere Bedingungen Specific requirements	<p>Das Betriebsintervall von 6 Monaten zwischen zwei Funktionsprüfungen gemäß EN 50156-1, Tabelle 2 darf nicht überschritten werden.</p> <p>Die Einsatzzeit nach der IEC 61508 beträgt 48 Monate. Innerhalb dieses Zeitraums ist SIL 3 eingehalten. Darüber hinaus wird SIL 3 verlassen.</p> <p>Der Prüfbericht-Nr. 968/EL 200.01/04 vom 2004-09-08 ist Bestandteil dieses Zertifikates.</p> <p>Dieses Zertifikat ist nur gültig für Erzeugnisse, die mit dem Prüfgegenstand übereinstimmen. Es wird ungültig bei jeglicher Änderung der Prüfgrundlagen für den angegebenen Verwendungszweck.</p> <p>The test report-no. 968/EL 200.01/04 dated 2004-09-08 is an integral part of this certificate.</p> <p>This certificate is valid only for products which are identical with the product tested. It becomes invalid at any change of the codes and standards forming the basis of testing for the intended application.</p>		

2004-09-08
Date

TÜV Industrie Service GmbH
Geschäftsfeld ASI
Automation, Software und Informationstechnologie
Am Grauen Stein, 51105 Köln
Postfach 91 09 51, 51101 Köln


Signature

A 2.6 PSR-ESD



**Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle
im BG-PRÜFZERT**

Hauptverband der gewerblichen
Berufsgenossenschaften

GS-Prüfbescheinigung

04218

Bescheinigungs-Nummer

Name und Anschrift des Bescheinigungsinhabers: (Auftraggeber)	Phoenix Contact GmbH & Co. KG Flachmarktstraße 8 32825 Blomberg																			
Name und Anschrift des Herstellers:	siehe Auftraggeber																			
Zeichen des Auftraggebers:	Zeichen der Prüf- und Zertifizierungsstelle: 23.520.25/04-105-318 Sto/Ow	Ausstellungsdatum: 29.11.2004																		
Produktbezeichnung:	Not-Aus-Sicherheitsrelais und Schutztürwächter																			
Typ:	PSR-SCP-24 DC/ESD/5x1/1x2/300 (Art.-Nr. 298 1428) PSR-SPP-24 DC/ESD/5x1/1x2/300 (Art.-Nr. 298 1431)																			
Bestimmungsgemäße Verwendung:																				
Prüfgrundlage:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">73/23/EWG</td> <td style="width: 40%;">„Niederspannungsrichtlinie“</td> <td style="width: 30%;"></td> </tr> <tr> <td>89/336/EWG</td> <td>„EMV-Richtlinie“</td> <td></td> </tr> <tr> <td>GS-ET-20</td> <td>„Grundsätze für die Prüfung und Zertifizierung von Sicherheitschaltgeräten“</td> <td style="text-align: right;">(2004-01)</td> </tr> <tr> <td>DIN EN ISO 13849-2</td> <td>„Sicherheitsbezogene Teile von Steuerungen, Teil 2: Validierung“</td> <td style="text-align: right;">(2003-12)</td> </tr> <tr> <td>DIN EN 60947-5-1</td> <td>„Steuergeräte und Schaltelemente; Elektromechanische Steuergeräte“</td> <td style="text-align: right;">(2000-08)</td> </tr> <tr> <td>VDE 0660 Teil 1</td> <td></td> <td></td> </tr> </table>		73/23/EWG	„Niederspannungsrichtlinie“		89/336/EWG	„EMV-Richtlinie“		GS-ET-20	„Grundsätze für die Prüfung und Zertifizierung von Sicherheitschaltgeräten“	(2004-01)	DIN EN ISO 13849-2	„Sicherheitsbezogene Teile von Steuerungen, Teil 2: Validierung“	(2003-12)	DIN EN 60947-5-1	„Steuergeräte und Schaltelemente; Elektromechanische Steuergeräte“	(2000-08)	VDE 0660 Teil 1		
73/23/EWG	„Niederspannungsrichtlinie“																			
89/336/EWG	„EMV-Richtlinie“																			
GS-ET-20	„Grundsätze für die Prüfung und Zertifizierung von Sicherheitschaltgeräten“	(2004-01)																		
DIN EN ISO 13849-2	„Sicherheitsbezogene Teile von Steuerungen, Teil 2: Validierung“	(2003-12)																		
DIN EN 60947-5-1	„Steuergeräte und Schaltelemente; Elektromechanische Steuergeräte“	(2000-08)																		
VDE 0660 Teil 1																				
Bemerkungen:	Die sicherheitsrelevanten Strompfade mit den unverzögerten Ausgangskontakten: 13/14, 23/24 und 33/34 erfüllen die Anforderungen der Kategorie 4, die rückfallverzögerten Ausgangskontakte: 57/58 und 67/68 erfüllen die Anforderungen der Kategorie 3 nach DIN EN 954-1 (1997-03).																			
<p>Das geprüfte Baumuster stimmt mit den in § 4 Absatz 1 des Geräte- und Produktsicherheitsgesetz genannten Anforderungen überein. Das Baumuster entspricht somit auch den einschlägigen Bestimmungen der Richtlinie 98/37/EG (Maschinen). Der Bescheinigungsinhaber ist berechtigt, das umseitig abgebildete GS-Zeichen an den mit dem geprüften Baumuster übereinstimmenden Produkten anzubringen. Der Bescheinigungsinhaber hat dabei die umseitig aufgeführten Bedingungen zu beachten.</p> <p>Diese Bescheinigung einschließlich der Berechtigung zur Anbringung des GS-Zeichens wird spätestens ungültig am:</p> <div style="text-align: center; border: 1px solid black; padding: 2px 10px; display: inline-block;">30.06.2009</div> <p>Weiteres über die Gültigkeit, eine Gültigkeitsverlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsordnung vom April 2004.</p>																				
 <p>Dipl.-Ing. Stefan Stömmel Leiter der Zertifizierungsstelle</p> 																				
	 <p>Postadresse: Postfach 51 05 80 50941 Köln</p>	<p>Hausadresse: Gustav-Heinemann-Ufer 130 50968 Köln</p> <p>Telefon: 02 21 / 37 78 - 6301 Telefax: 02 21 / 37 78 - 6322</p>																		

B Ordering Data

PSR safety relays are available in two connection versions:

- With screw connection (PSR-SC...-...)
- With spring-cage connection (PSR-SP...-...)

PSR-ES...4

Description	Activation	Type	Order No.	Pcs./Pck.
Emergency stop and safety door monitoring, 24 V AC/DC, single and two-channel, 2 enabling current paths, with cross-circuit detection	Manual*	PSR-SCP- 24UC/ESM4/2X1/1X2	2963718	1
		PSR-SPP- 24UC/ESM4/2X1/1X2	2963705	1
Emergency stop and safety door monitoring, 24 V AC/DC, single and two-channel, 3 enabling current paths, with cross-circuit detection	Manual and automatic	PSR-SCP- 24UC/ESA4/2X1/1X2	2963750	1
		PSR-SPP- 24UC/ESA4/2X1/1X2	2963938	1
Emergency stop and safety door monitoring, 24 V AC/DC, single and two-channel, 3 enabling current paths, with cross-circuit detection	Manual*	PSR-SCP- 24UC/ESM4/3X1/1X2/B	2963776	1
		PSR-SPP- 24UC/ESM4/3X1/1X2/B	2963925	1
Emergency stop and safety door monitoring, 24 V AC/DC, single and two-channel, 3 enabling current paths, with cross-circuit detection	Manual and automatic	PSR-SCP- 24UC/ESA4/3X1/1X2/B	2963763	1
		PSR-SPP- 24UC/ESA4/3X1/1X2/B	2963941	1
Emergency stop and safety door monitoring, 24 V AC/DC, single-channel, 4 enabling current paths	Manual and automatic	PSR-SCP- 24UC/ESA2/4X1/1X2/B	2963802	1
		PSR-SPP- 24UC/ESA2/4X1/1X2/B	2963954	1
Process technology, emergency stop and safety door monitoring, 24 V DC, single-channel, 2 enabling current paths	Manual and automatic	PSR-SCP- 24DC/ESP4/2X1/1X2	2981020	1
		PSR-SPP- 24DC/ESP4/2X1/1X2	2981017	1

PSR-ESAM4

Description	Activation	Type	Order No.	Pcs./Pck.
Emergency stop and safety door monitoring, 24 V AC/DC, single and two-channel, 8 enabling current paths, with/without cross-circuit detection	Manual* and automatic	PSR-SCP- 24UC/ESAM4/8X1/1X2	2963912	1
		PSR-SPP- 24UC/ESAM4/8X1/1X2	2963996	1
Emergency stop and safety door monitoring, 24 V AC/DC ... 230 V AC/DC, single and two-channel, 3 enabling current paths, with/without cross-circuit detection	Manual* and automatic	PSR-SCP- 24-230UC/ESAM4/3X1/1X2	2981114	1
		PSR-SPP- 24-230UC/ESAM4/3X1/1X2	2981127	1

PSR-THC

Description	Activation	Type	Order No.	Pcs./Pck.
Two-hand controls and safety door monitoring, synchronous activation monitoring < 0.5 s, 24 V AC/DC, two-channel, 2 enabling current paths, with cross-circuit detection	Automatic	PSR-SCP- 24UC/THC4/2X1/1X2	2963721	1
		PSR-SPP- 24UC/THC4/2X1/1X2	2963983	1

PSR-ESL

Description	Activation	Type	Order No.	Pcs./Pck.
Light grid, emergency stop, and safety door monitoring, 24 V AC/DC, single and two-channel	Manual* and automatic	PSR-SCP- 24UC/ESL4/3X1/1X2/B	2981059	1
		PSR-SPP- 24UC/ESL4/3X1/1X2/B	2981062	1

* With start button monitoring

UM EN SAFETY RELAY APPLICATION

PSR-ESD

Description	Activation	Type	Order No.	Pcs./Pck.
Emergency stop and safety door monitoring, with delayed and undelayed contacts, 24 V DC, single and two-channel, adjustable from 200 ms to 300 s, with/without cross-circuit detection	Manual* and automatic	PSR-SCP- 24DC/ESD/5X1/1X2/300	2981428	1
		PSR-SPP- 24DC/ESD/5X1/1X2/300	2981431	1
Emergency stop and safety door monitoring, with delayed and undelayed contacts, 24 V DC, single and two-channel, with/without cross-circuit detection, with fixed times 0.5 s; 1 s ... 30 s (see table)	Manual* and automatic	PSR-SCP- 24DC/ESD/5X1/1X2/T...	See table	1
		PSR-SPP- 24DC/ESD/5X1/1X2/T...	See table	1

* With start button monitoring

PSR-ESD-T Order Versions

Type	Order No.	Delay Time
Screw Connection		
PSR-SCP- 24DC/ESD/5X1/1X2/0T5	2981101	0.5 s
PSR-SCP- 24DC/ESD/5X1/1X2/T1	2981143	1 s
PSR-SCP- 24DC/ESD/5X1/1X2/1T5	2981169	1.5 s
PSR-SCP- 24DC/ESD/5X1/1X2/T2	2981125	2 s
PSR-SCP- 24DC/ESD/5X1/1X2/2T5	2981208	2.5 s
PSR-SCP- 24DC/ESD/5X1/1X2/T3	2981224	3 s
PSR-SCP- 24DC/ESD/5X1/1X2/T4	2981240	4 s
PSR-SCP- 24DC/ESD/5X1/1X2/T5	2981266	5 s
PSR-SCP- 24DC/ESD/5X1/1X2/T6	2981282	6 s
PSR-SCP- 24DC/ESD/5X1/1X2/T10	2981088	10 s
PSR-SCP- 24DC/ESD/5X1/1X2/T15	2981305	15 s
PSR-SCP- 24DC/ESD/5X1/1X2/T20	2981321	20 s
PSR-SCP- 24DC/ESD/5X1/1X2/T30	2981347	30 s
Spring-Cage Connection		
PSR-SPP- 24DC/ESD/5X1/1X2/0T5	2981130	0.5 s
PSR-SPP- 24DC/ESD/5X1/1X2/T1	2981156	1 s
PSR-SPP- 24DC/ESD/5X1/1X2/1T5	2981172	1.5 s
PSR-SPP- 24DC/ESD/5X1/1X2/T2	2981198	2 s
PSR-SPP- 24DC/ESD/5X1/1X2/2T5	2981211	2.5 s
PSR-SPP- 24DC/ESD/5X1/1X2/T3	2981237	3 s
PSR-SPP- 24DC/ESD/5X1/1X2/T4	2981253	4 s
PSR-SPP- 24DC/ESD/5X1/1X2/T5	2981279	5 s
PSR-SPP- 24DC/ESD/5X1/1X2/T6	2981295	6 s
PSR-SPP- 24DC/ESD/5X1/1X2/T10	2981091	10 s
PSR-SPP- 24DC/ESD/5X1/1X2/T15	2981318	15 s
PSR-SPP- 24DC/ESD/5X1/1X2/T20	2981334	20 s
PSR-SPP- 24DC/ESD/5X1/1X2/T30	2981350	30 s

PSR-RSM

Description	Activation	Type	Order No.	Pcs./Pck.
Speed and downtime monitoring, 24 V DC, two-channel, automatic control via cable adapter or two initiators	Manual* and automatic	PSR-SCP- 24DC/RSM4/4X1	29 81 53 8	1
		PSR-SPP- 24DC/RSM4/4X1	29 81 54 1	1

* With start button monitoring

PSR-SSM

Description	Activation	Type	Order No.	Pcs./Pck.
Downtime monitoring, 24 V DC, two-channel, automatic control via two standard initiators	Manual* and automatic	PSR-SCP- 24DC/SSM/2X1	29 81 56 7	1
		PSR-SPP- 24DC/SSM/2X1	29 81 57 0	1

* With start button monitoring

PSR-SDC

Description	Activation	Type	Order No.	Pcs./Pck.
Light grid, emergency stop, and safety door monitoring, 24 V DC, single and two-channel, with/without cross-circuit detection, with interface for DIN rail connector	Manual* and automatic	PSR-SCP- 24UC/SDC4/2X1/B	2981486	1
		PSR-SPP- 24UC/SDC4/2X1/B	2981499	1

* With start button monitoring

PSR-URD

Description	Type	Order No.	Pcs./Pck.
Extension module with off-delay contacts, with single-channel control, 24 V DC, with interface for DIN rail connector	PSR-SCP- 24DC/URD3/4X1/2X2	2981512	1
	PSR-SPP- 24DC/URD3/4X1/2X2	2981525	1

PSR-URM

Description	Type	Order No.	Pcs./Pck.
Extension module, with single-channel control, 24 V DC, with interface for DIN rail connector	PSR-SCP- 24DC/URM4/4X1/2X2/B	2981677	1
	PSR-SPP- 24DC/URM4/4X1/2X2/B	2981680	1
Extension module, with single or two-channel control, 24 V AC/DC	PSR-SCP- 24UC/URM4/5X1/2X2	2963734	1
	PSR-SPP- 24UC/URM4/5X1/2X2	2964005	1
Extension module, with single-channel control, 24 V AC/DC	PSR-SCP- 24UC/URM4/5X1/2X2/B	2981033	1
	PSR-SPP- 24UC/URM4/5X1/2X2/B	2981046	1
Universal safety relay, with positively driven contacts, 24 V AC/DC	PSR-SCP- 24UC/URM/5X1/2X2	2963747	1
	PSR-SPP- 24UC/URM/5X1/2X2	2963970	1
120 V AC/DC	PSR-SCP-120UC/URM/5X1/2X2	2981402	1
	PSR-SPP-120UC/URM/5X1/2X2	2981415	1
Universal safety relay, with positively driven contacts 24 V AC/DC	PSR-SCF- 24UC/URM/2X21	2981363	1
	PSR-SCF-120UC/URM/2X21	2981376	1
Universal safety relay, with positively driven contacts 24 V AC/DC	PSR-SCF- 24UC/URM/4X1/2X2	2981444	1
	PSR-SPF- 24UC/URM/4X1/2X2	2981457	1
120 V AC/DC	PSR-SCF-120UC/URM/4X1/2X2	2981460	1
	PSR-SPF-120UC/URM/4X1/2X2	2981473	1

Accessories

Description	Type	Order No.	Pcs./Pck.
DIN rail connector, yellow, for PSR applications	PSR-TBUS	2890425	50
Terminating connector	PSR-TBUS-TP	2981716	50

Documentation

Description	Type	Order No.	Pcs./Pck.
"Introduction to Safety Technology" user manual	SAFETY INTRO UM E	2699202	1
Safety technology basics	INF EN DE PSR/IL SAFE	5148802	1
Overview of the Phoenix Contact safety relay range	FLY EN DE SAFETY RELAY	5106873	1

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D Revision History

Version	Date	Contents
01	05/2006	First publication of the application manual in English.

