Eaton.com/esr5

Reliable monitoring of safety devices

Powering Business Worldwide

Safe monitoring and processing

Machines and systems involve potentially hazardous motion sequences that must be protected by technical means. Safety devices such as emergency stop buttons, protective doors, light curtains and controls for safe commissioning need to be checked and monitored and, if necessary, the system must be brought to a safe operating state. This is where our ESR5 series of electronic safety relays comes in.

The ESR5 safety relays monitor signals from safety devices and provide fast and reliable shutdown in the event of an emergency. The internal logic of the safety relays monitors the wired safety circuits and activates the enabling current paths if no errors are present.

No matter how simple or complex the machine, TÜV Rheinland-approved safety products provide the necessary personal and process protection:

- Performance level (PL): up to PL e according to EN ISO 13849-1
- Safety integrity level (SIL): up to 3 according to EN 62061

Safety Technology

Control the unexpected

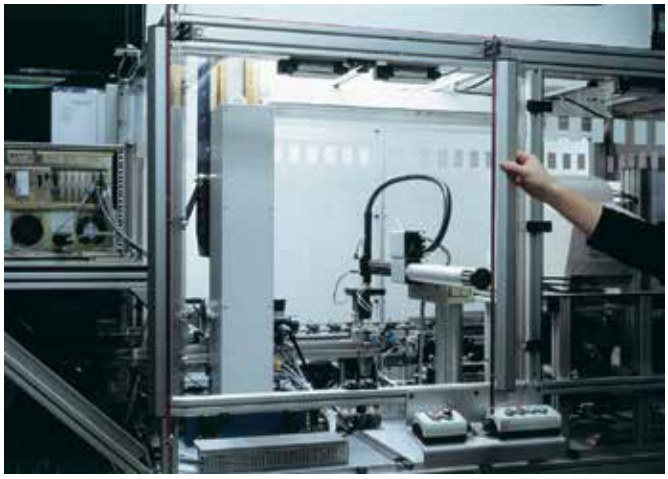
TÜVRheinland®

Functional Safety
Type Approved

FS

Safely monitored Emergency-Stop circuits

The electronic safety relays ESR from Eaton switch several enable paths for immediate or time-delayed disconnection of the energy supply as soon as the EMERGENCY-STOP button is pressed. Depending on the configuration, they detect faults such as cross-shorts, short-circuits, open circuits and bridging in safety circuitry. After successful elimination of the dangers / faults, the ESR safety relays are acknowledged and the enable paths are re-enabled.

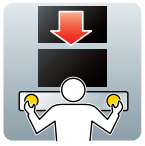


Monitoring mobile protective mechanisms

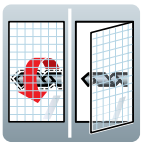
The monitoring of protective screens on machines and processing centres is another important function of the electronic safety relay ESR from Eaton. Depending on the safety level, one or two position switches signal that the protective door is in the closed position. Instead of restartmonitoring, you can also implement an automatic start with the safety relays. Thus, you reduce the cycle times in production without dispensing with safety.

Safety functions of the ESR5 range

Emergency shutdown (E-stop) – bringing hazardous motion to a safe stop using an emergency-stop device

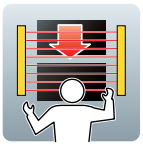


Safe operation with two-hand controls – for hazardous machine movements such as pressing, punching and shearing

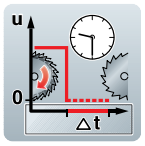


Monitoring of movable guards – reliable detection of the position of safety doors, grilles or flaps

Delayed and non-delayed contact expansions – to increase the number of release contacts



Monitoring of open hazardous areas – protection of hazardous areas with electro-sensitive protective equipment (ESPE) such as light curtains



Off-delayed shutdown – to delay the shutdown time of enabling contacts

Circuit example: using the ESR5 safety relay for the emergency-stop function

Application

The emergency-stop function is a supplementary protective measure and may not be used as the sole form of protection. According to the Machinery Regulation (EU) 2023/1230, every machine must be equipped with an emergency-stop device. The degree of risk protection provided by the emergency-stop device must be determined by means of a risk assessment.

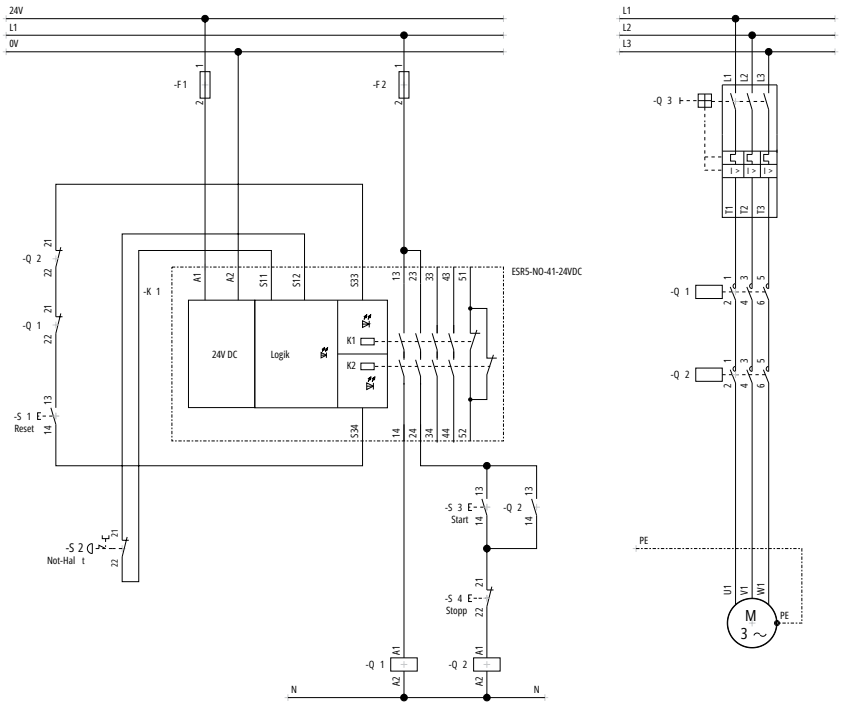
Function

For single-channel applications, an input circuit is provided to which sensors (such as an emergency-stop device) can be connected. The start response (automatic/manual) of the ESR5 is determined via a reset circuit. The shutdown level is connected to the enabling current paths and is activated when the reset button is pressed.

Technical safety evaluation

Cat.	B	1	2	3	4
PL	a	b	c	d	e
SIL	1	2	3		

Cat./PL according to EN ISO 13849-1
SIL according to EN IEC 62061



Example 1 – single-channel emergency stop with ESR5-NO-41-24VDC

Example circuit: using the ESR5 safety relay for guard monitoring

Application

Movable guards such as safety gates, grilles or flaps can be used to protect accessible hazardous areas. The position of the movable guard is detected by position switches or non-contact sensors, which are monitored and evaluated by a safe logic unit. A risk assessment must be performed to determine the required level of risk reduction.

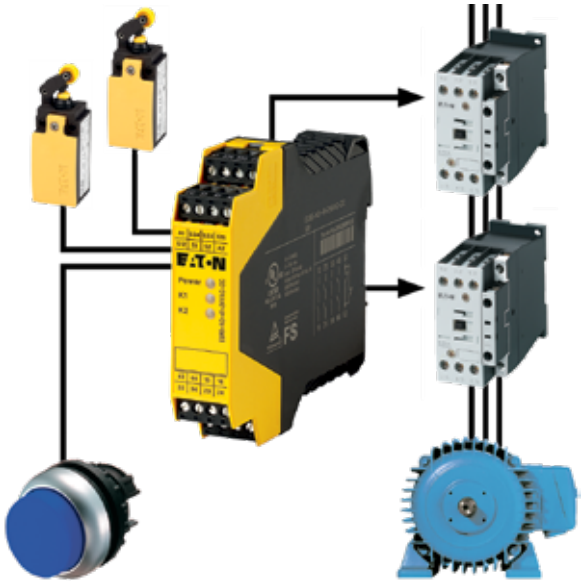
Function

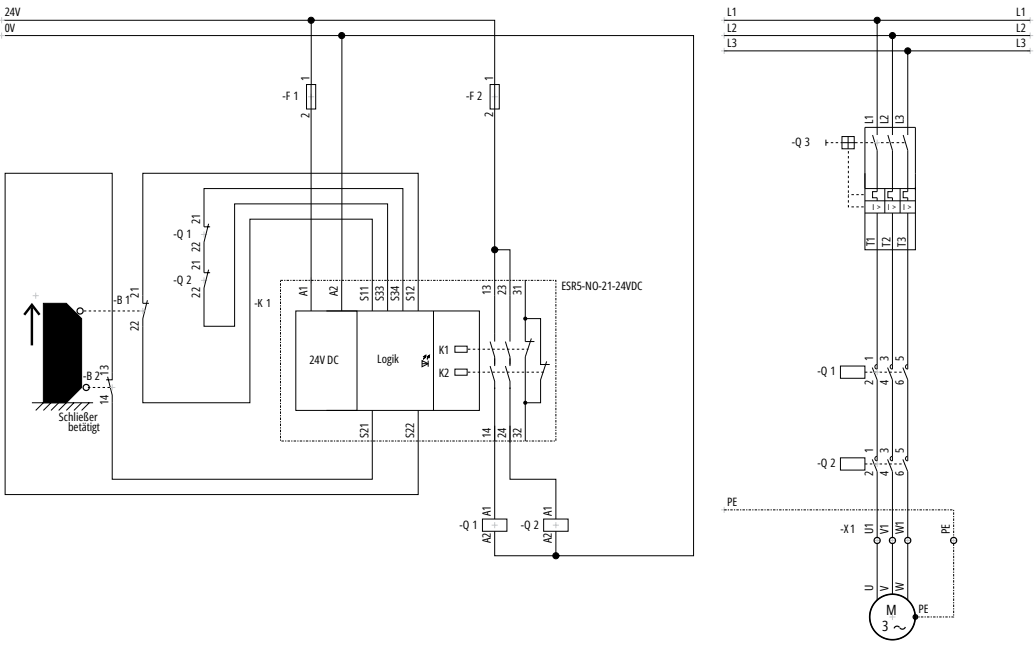
For two-channel applications, two separate input circuits are provided to monitor the sensors (such as the position switches of a locking device). After the input circuits are closed, the ESR5 can be started by pressing the reset button. This activates the enabling and signaling current paths and switches on the connected actuators. The safety relay diagnoses possible fault conditions via the positively driven auxiliary contacts of the actuators.

Sicherheitstechnische Bewertung

Cat.	B	1	2	3	4
PL	a	b	c	d	e
SIL	1	2	3		

Cat./PL according to EN ISO 13849-1
SIL according to EN IEC 62061





Example 2 – two-channel safety guard monitoring with ESR5-NO-21-24VDC

Data at a glance

	Image	Part no.	Article no.	Emergency-stop	Safety-door monitoring	Two-hand control	Light curtain/OSSD	Contact expansion	Feedback loop	Reset button monitoring	Cross-circuit detection	Single-channel	Two-channel	Enabling current paths, non-delayed	Off-delayed	Enabling current paths, delayed, delay in s	Signal current paths, non-delayed	Feedback current paths	Category/PL according to EN ISO 13849	SIL according to EN 62061	Input voltage
Enclosure width: 22.5 mm		ESR5-NO-41-24VDC	EP-401060	✓	✓	-	-	-	✓	-	-	✓	-	4	-	-	1	-	Cat. 1 / PL c	SIL 1	24 V DC
		ESR5-NO-21-24VDC	EP-401061	✓	✓	-	-	-	✓	-	✓	-	✓	2	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V DC
		ESR5-NO-31-24VDC	EP-401062	✓	✓	-	-	-	✓	-	✓	-	✓	3	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V DC
		ESR5-NOS-31-230VAC	153152	✓	✓	-	-	-	✓	✓	-	✓	-	3	-	-	1	-	Cat. 1 / PL c	SIL 1	230 V
		ESR5-NO-31-UC	191796	✓	✓	-	✓	-	✓	✓	✓	✓	✓	3	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V - 230 V AC/DC
		ESR5-NV3-30	118705	✓	✓	-	✓	-	✓	✓	✓	✓	✓	2	✓	2/0.1-30	-	-	Cat. 4 / PL e	SIL 3	24 V DC
		ESR5-NZ-21-24VAC-DC	118703	-	✓	✓	-	-	✓	-	✓	-	✓	2	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V AC/DC
		ESR5-NE-51-24VDC	EP-401063	-	-	-	-	✓	-	-	-	✓	✓	5	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V DC
		ESR5-VE3-42	118706	-	-	-	-	✓	-	-	-	✓	-	-	✓	4/0.3-3	1	-	Cat. 3 / PL d	SIL 2	24 V DC
		ESR5-NO-31-230VAC	119380	✓	✓	-	-	-	✓	✓	✓	✓	✓	3	-	-	1	-	Cat. 4 / PL e	SIL 3	230 V AC
		ESR5-BWS-31-24VDC	EP-401064	✓	✓	-	✓	-	✓	✓	✓	✓	✓	3	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V DC
Enclosure width: 45 mm		ESR5-NV3-300	171858	✓	✓	-	✓	-	✓	✓	✓	✓	✓	3	-	-	1	-	Cat. 4 / PL e	SIL 3	24 V DC

Safety Manual for machines and systems according to EN ISO 13849-1 and IEC 62061

Our Safety Manual provides an easy introduction to the extensive field of safety technology. The Eaton Safety Manual gives you an overview of the most important aspects of directives, standards and regulations that must be considered when using safety equipment on machines. The safety-related content of this manual has been checked by TÜV Rheinland Industrie Service GmbH. The Safety Manual uses circuit examples to show how to achieve functional safety with electrical, electronic and programmable components and systems in safety-related applications.

Furthermore, the Safety Manual also contains a description of the mode of operation of each example circuit and a clear presentation of how it can be evaluated. The calculated characteristics are valid for the safety-related switchgear used and under the assumptions made in safety applications.

Simply register at **Eaton.com/shb** to access or download the Safety Manual free of charge.

The safety-related characteristics of our products are available a **Eaton.com/safety**

Cost-effective monitoring with the ESR5 safety relay

- Multiple safety switching contacts, with up to 5 enabling and 2 signaling current paths
- Immediate (stop category 0) or delayed (stop category 1) stop
- Easy duplication by means of contact expansion modules
- Space-saving width of only 22.5 mm
- Pluggable screw terminals for quick and error-free replacement
- Operating voltage ranging from 24 V DC to 230 V AC for use in a variety of applications
- Suitable for global use due to UL, cUL and TÜV Rheinland certifications

Eaton is an intelligent power management company dedicated to improving the quality of life and protecting the environment for people everywhere. We are guided by our commitment to do business right, to operate sustainably and to help our customers manage power – today and well into the future. By capitalizing on the global growth trends of electrification and digitalization, we're accelerating the planet's transition to renewable energy, helping to solve the world's most urgent power management challenges, and doing what's best for our stakeholders and all of society.

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