

# Safety Relays ESM



# EUCHNER

More than safety.



Headquarters in Leinfelden-Echterdingen



Logistics center in Leinfelden-Echterdingen



Production location in Unterböhringen

## Internationally successful – the EUCHNER company

EUCHNER GmbH + Co. KG is a world-leading company in the area of industrial safety technology. EUCHNER has been developing and producing high-quality switching systems for mechanical and systems engineering for more than 60 years.

The medium-sized family-operated company based in Leinfelden, Germany, employs around 800 people around the world.

18 subsidiaries and other sales partners in Germany and abroad work for our international success on the market.

## Quality and innovation – the EUCHNER products

A look into the past shows EUCHNER to be a company with a great inventive spirit. We take the technological and ecological challenges of the future as an incentive for extraordinary product developments.

EUCHNER safety switches monitor safety doors on machines and installations, help to minimize dangers and risks and thereby reliably protect people and processes. Today, our products range from electromechanical and electronic components to intelligent integrated safety solutions. Safety for people, machines and products is one of our dominant themes.

We define future safety technology with the highest quality standards and reliable technology. Extraordinary solutions ensure the great satisfaction of our customers.

The product ranges are subdivided as follows:

- ▶ Transponder-coded Safety Switches
- ▶ Transponder-coded Safety Switches with guard locking
- ▶ Multifunctional Gate Box MGB
- ▶ Access management systems (Electronic-Key-System EKS)
- ▶ Electromechanical Safety Switches
- ▶ Magnetically coded Safety Switches
- ▶ Enabling Switches
- ▶ Safety Relays
- ▶ Emergency Stop Devices
- ▶ Hand-Held Pendant Stations and Handwheels
- ▶ Safety Switches with AS-Interface
- ▶ Joystick Switches
- ▶ Position Switches



## Safety relays ESM

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## General information

For machines and installations that can produce a risk for people when in operation, the EU Machinery Directive defines minimum requirements that are intended to reduce to a minimum the specific hazards and the related risks of accident.

If all sources of danger cannot be eliminated by design measures, appropriate protective measures must be taken. Using guards, such as fences or similar, it is intended to prevent personnel from entering the danger area. If users need to have access to the danger area during operation, movable guards such as safety doors, flaps, etc. are used. This is the case, for example, for loading or unloading, troubleshooting, machine setup or cleaning work.,

To safeguard this access area, safety switches with various principles of operation are used. These switches are designed to monitor the position of the guard and, when the guard is opened, to generate a signal that will safely interrupt the supply of power to the potentially hazardous parts of the installation or that will ensure that the safety circuits are safely interrupted. The EUCHNER safety relays series ESM ensure that the safety circuits are interrupted. For one thing, they safely evaluate components connected such as

- ▶ mechanical safety switches with and without guard locking,
- ▶ non-contact safety switches,
- ▶ emergency stop controls,
- ▶ electro-sensitive protective equipment, etc.,

for another, they safely shut down dangerous machine functions.

The safety relays impress with their compact mounting rail housing and their suitability for applications up to category 4/PLe in accordance with EN ISO 13849-1.

## The ESM modular principle

The majority of modules in the safety relay series ESM are installed in a housing that is only 22.5 mm wide. Various safety relays are available to which contact expansions can be added on the output side. The contact expansions can be non-time-delayed or time-delayed. The advantage of this modular principle is that only a few devices are required to be able to realize a large number of different safety evaluations.

The safety relays can be operated with various types of starting. The devices can be started manually or automatically using suitable wiring. The manual start can also monitor the start button.

Using suitable wiring, it is also possible to integrate a feedback loop such that safety-related parts of a downstream machine or installation can also be monitored.




In the ESM series the majority of the devices are available with a variety of input voltage ranges.

## Approvals

To demonstrate conformity, the Machinery Directive also includes the possibility of type examination. Although all relevant standards are taken into account during development, we have all our switchgear subjected to additional type examinations by a notified body.





Furthermore, numerous items of switchgear are listed by Underwriters Laboratories (UL). These items of switchgear can be used in countries in which this listing is required. The approval symbols on the individual pages of the catalog indicate which body tested the switchgear.

With the aid of the approval symbols listed below, you can quickly see which approvals are available for the related switchgear:




	Switches with this symbol are approved by Underwriters Laboratories (UL)
	Switches with this symbol are approved by TÜV Rheinland
	Switches with this symbol comply with the guidelines of the Eurasian Economic Union (EEU).

## Explanation of symbols

### Connection options

	Suitable for the connection of emergency stop
	Suitable for the connection of safety switches according to EN ISO 14119
	Suitable for the connection of electro-sensitive protective equipment, e.g. light grids
	Suitable for the connection of 2-hand circuits

### Fault detection

	Short circuit is detected
	Ground fault is detected
	Earth fault is detected

## Time-delay



Safety contacts switch time-delayed

## Safety category

**Cat.  
3**

Suitable up to category 3 according to EN ISO 13849-1

**Cat.  
4**

Suitable up to category 4 according to EN ISO 13849-1

## Stop category

**STOP  
0**

Immediate shutdown  
Stop category 0 according to EN 60204-1

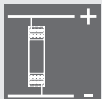
**STOP  
1**

Time-delayed shutdown  
Stop category 1 according to EN 60204-1

## Technical data



Mechanical data

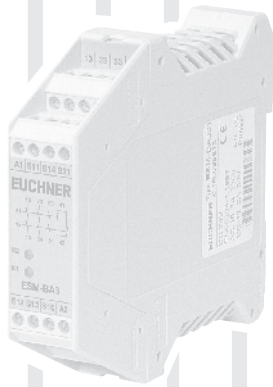


Electrical data



## Selection table for safety relays ESM

Safety relays																		
BL		Non-time-delayed category 3																
BA		Non-time-delayed category 4																
BT		Time-delayed category 3/non-time-delayed category 4																
2H		2-hand requirement level IIC according to EN 574, category 4																
Contact expansion																		
ES		Non-time-delayed category 4																
TE		Time-delayed category 4																
Category according to EN ISO 13849-1																		
K		Category according to EN ISO 13849-1																
Enable path																		
SU		Safety contacts non-time-delayed																
SV		Safety contacts time-delayed																
M		Monitored start button																
Relay start																		
A		Automatic start																
M		Start button																
U		Monitored start button																
Monitoring																		
R		Feedback loop																
Q		Short circuit monitoring																
E		Earth fault monitoring																
M		Earth fault monitoring																
Devices																		
BL	BA	BT	2H	ES	TE	K	Outputs			Start			Monitoring				Page	
●						3	2			●	●		●					8
	●					4	2			●	●	●	●	●	●	●	●	9
	●					4	3		1	●	●	●	●	●	●	●	●	10
	●					4	7		4	●	●	●	●	●	●	●	●	11
		●				4/3	2	2		●	●	●	●	●	●	●	●	12
		●				4/3	3	1		●	●	●	●	●	●	●	●	12
			●			4	2					●	●	●	●	●	●	13
				●		4	3		1						●	●	●	14
					●	3		3	1						●	●	●	15



## Safety relays ESM-BL.. and ESM-BA..



- ▶ ESM-BL.. Use up to category 3 according to EN ISO 13849-1
- ▶ ESM-BA.. Use up to category 4 according to EN ISO 13849-1
- ▶ LED status indicators
- ▶ 1-channel or 2-channel control
- ▶ Up to 7 redundant safety contacts
- ▶ Auxiliary contact (monitoring contact) optional
- ▶ Short circuit and earth fault/ground fault monitoring optional



### Relay outputs

The outputs are electrically decoupled and of redundant design.

### Connection options

By using suitable wiring, the following functions can be selected:

- ▶ Relay start with automatic start or a start button
- ▶ Monitoring of downstream relays or contactors.

On the series **ESM-BA..** safety relays, the following can additionally be selected by using suitable wiring:

- ▶ Simultaneity monitoring to monitor safety components over time
- ▶ Short circuit monitoring to detect short circuits between the connecting cables and to shut down the outputs or prevent relay starting if necessary
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connecting cables and earth or ground and to shut down the outputs or prevent relay starting if necessary.

### Auxiliary contacts

The relays in the series ESM-BA3.. and ESM-BA7... are available with electrically separate normally closed contacts as auxiliary contacts.

### Connection terminals

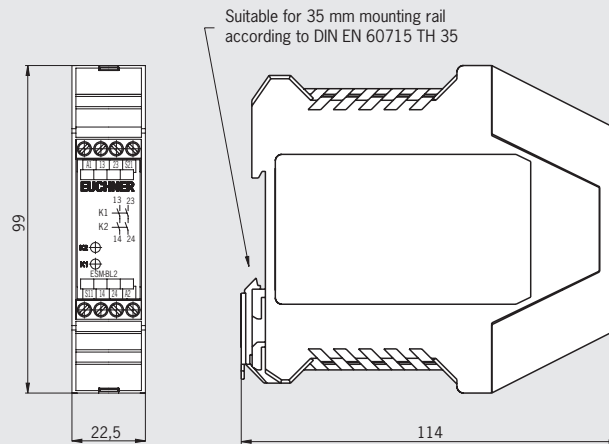
Optionally, the ESM-BA... devices are also available as version with plug-in connection terminals.

### Safety relay ESM-BL..

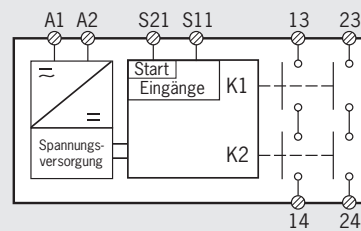


Cat. 3 STOP 0

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value		
Min. switching current at DC 24 V	20 mA		
Switching voltage, max.	DC 24 V / AC 250 V		
Utilization category * acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>
	AC-12	250 V	6 A
	AC-15	230 V	4 A
	DC-12	24 V	1.25 A
	DC-13	24 V	2 A

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	AC/DC 24 V
ESM	BL Safety relay	2 2 NO	<b>085607</b> ESM-BL201

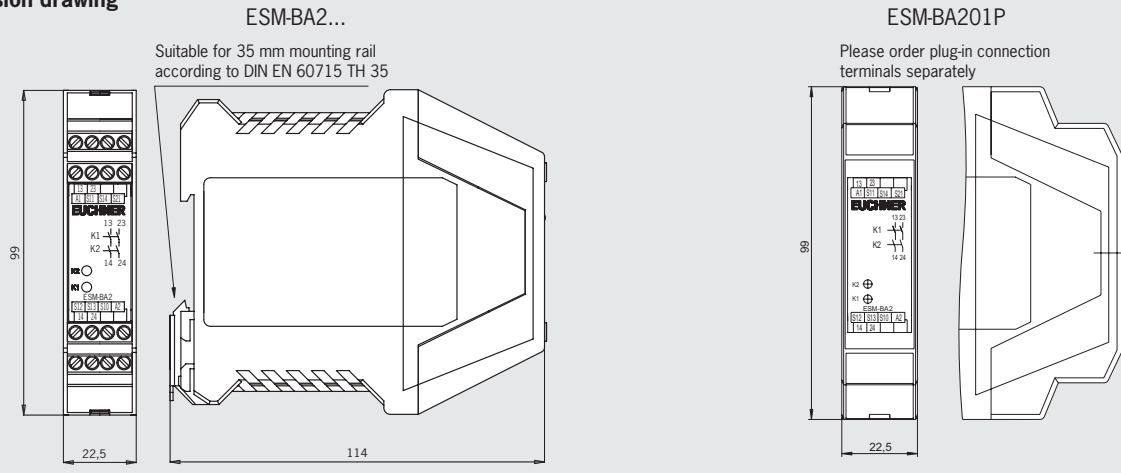


## Safety relay ESM- BA2..

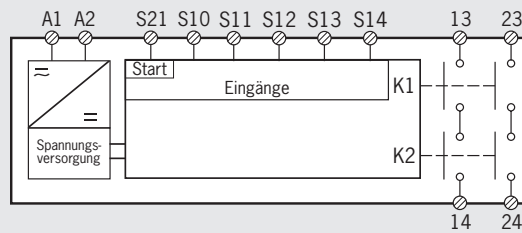


Cat. 4 STOP 0

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value		
Min. switching current at DC 24 V	20 mA		
Switching voltage, max.	DC 24 V / AC 250 V		
Utilization category * acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>
	AC-12	250 V	6 A
	AC-15	230 V	4 A
	DC-12	24 V	1.25 A
	DC-13	24 V	2 A

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	Version	AC/DC 24 V
ESM	BA Safety relay	2 2 NO	Screw terminals	<b>085610</b> ESM-BA201
			Plug-in connection terminals <sup>1)</sup>	<b>097226</b> ESM-BA201P

1) Please order plug-in connection terminals separately (see page 16)

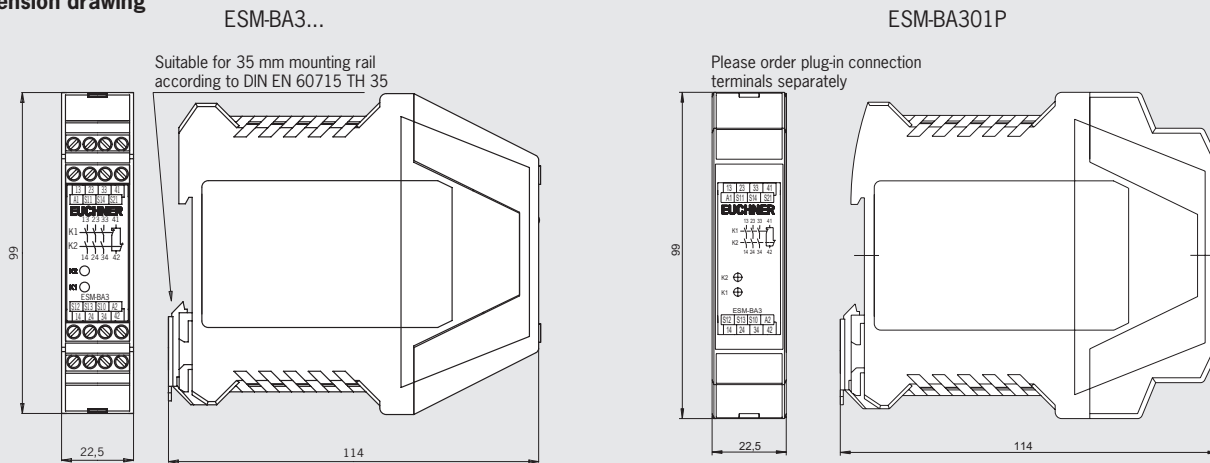


## Safety relay ESM-BA3..

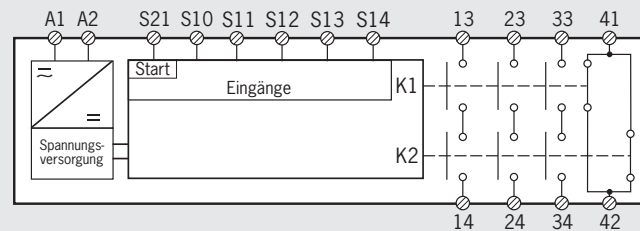


Cat. 4 STOP 0

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value		
Min. switching current at DC 24 V	5 mA		
Switching voltage, max.	DC 24 V / AC 250 V		
Utilization category * acc. to EN 60947-5-1		<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>
	AC-12	250 V	8 A
	AC-15	250 V	3 A
	DC-12	50 V	8 A
	DC-13	24 V	3 A
			<b>Σ I<sub>e</sub></b>
			15 A <sup>1)</sup>

1) If several ESM-BA3.. are closely spaced under load, the max. cumulative current at an ambient temperature of 20 °C = 9 A; at 30 °C = 3 A; at 40 °C = 1 A. If these currents are exceeded, a spacing of 5 mm between the devices must be observed.

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	Version	AC/DC 24 V	AC 115 V	AC 230 V
ESM	BA Safety relay	3 3 NO + 1 NC	Screw terminals	<b>085613</b> ESM-BA301	<b>163689</b> ESM-BA301/V50 PU = 50 pcs.	<b>087412</b> ESM-BA302
			Plug-in connection terminals <sup>1)</sup>	<b>097230</b> ESM-BA301P	-	-
					<b>087413</b> ESM-BA303	

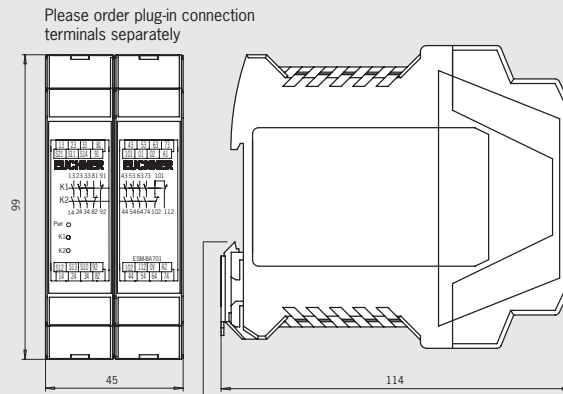
1) Please order plug-in connection terminals separately (see page 16)

## Safety relay ESM-BA7..



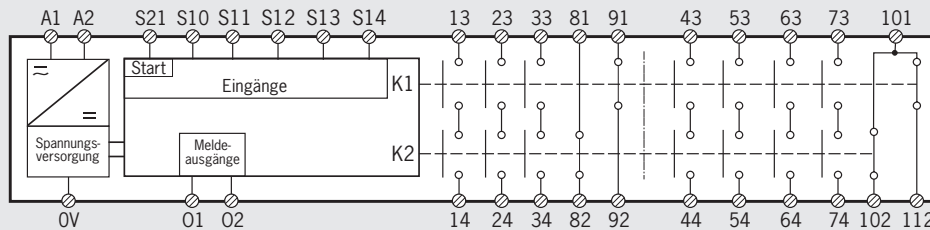
Cat. 4 STOP 0

### Dimension drawing



Suitable for 35 mm mounting rail according to DIN EN 60715 TH 35

### Block diagram



### Technical data of outputs

Parameter	Value		
Min. switching current at DC 24 V	5 mA		
Switching voltage, max.	DC 50 V / AC 250 V		
Utilization category * acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>
	AC-12	250 V	8 A
	AC-15	250 V	3 A
	DC-12	50 V	8 A
	DC-13	24 V	3 A

1) With a housing distance of 10 mm. 20 A closely spaced at 40 °C

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	Version	AC/DC 24 V
ESM	BA Safety relay	7 7 NO + 4 NC	Plug-in connection terminals <sup>1)</sup>	<b>097225</b> ESM-BA701P

1) Please order plug-in connection terminals separately (see page 16). Two connection kits are required for devices from series ESM-BA701P.

## Safety relays time-delayed ESM-BT..



- ▶ Use up to category 4 according to EN ISO 13849-1
- ▶ LED status indicators
- ▶ 1-channel or 2-channel control
- ▶ 4 redundant safety contacts of which 1, 2 or 3 contacts time-delayed
- ▶ Delay time range 1 s–30 s
- ▶ Short circuit and earth fault/ground fault monitoring



### Relay outputs

The outputs are electrically decoupled and of redundant design.

### Connection options

By using suitable wiring, the following functions can be selected:

- ▶ Relay start with automatic start, a start button or a monitored start button
- ▶ Monitoring of downstream relays or contactors.
- ▶ Simultaneity monitoring to monitor safety components over time
- ▶ Short circuit monitoring to detect short circuits between the connecting cables and to shut down the outputs or prevent relay starting if necessary
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connecting cables and earth or ground and to shut down the outputs or prevent relay starting if necessary.

### Time-delayed shutdown

The release time for the time-delay contacts can be set as required using a potentiometer on the safety relay.

### Safety relay ESM-BT..

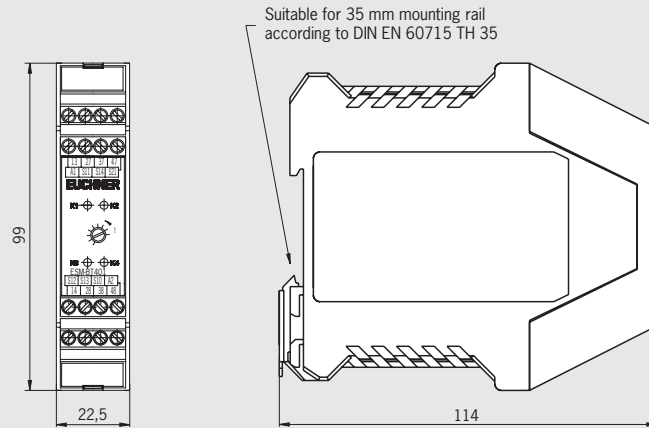


Cat. 4

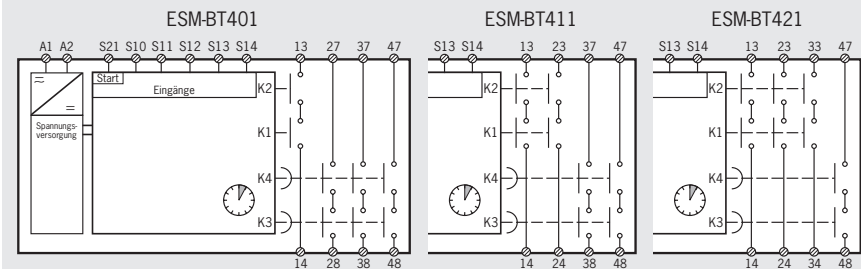
STOP 0

STOP 1

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value		
Min. switching current at DC 24 V	5 mA		
Switching voltage, max.	DC 50 V / AC 250 V		
Utilization category * acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>
	AC-12	250 V	8 A
	AC-15	250 V	3 A
	DC-12	50 V	8 A
	DC-13	24 V	3 A

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	AC/DC 24 V
ESM	BT Safety relay	<b>411</b> 2 NO non-time-delayed 2 NO time-delayed	<b>090819</b> ESM-BT411
		<b>421</b> 3 NO non-time-delayed 1 NO time-delayed	<b>090820</b> ESM-BT421

## Safety relays 2-hand ESM-2H..



- ▶ Use up to category 4 according to EN ISO 13849-1
- ▶ Requirement level III C according to EN 574
- ▶ LED status indicators
- ▶ Operation using 2-hand control
- ▶ 2 redundant safety contacts
- ▶ Short-circuit and earth fault/ground fault monitoring can be selected



### Relay outputs

The outputs are electrically decoupled and of redundant design.

### Connection

- ▶ Two buttons each with one normally closed contact and one normally open contact that are monitored for simultaneity according to EN 574. In this way a high level of protection against tampering is provided.
- ▶ Short circuit monitoring to detect short circuits between the connecting cables and to shut down the outputs or prevent relay starting if necessary.
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connecting cables and earth or ground and to shut down the outputs or prevent relay starting if necessary.

### Connection option

By using suitable wiring, the following function can be selected:

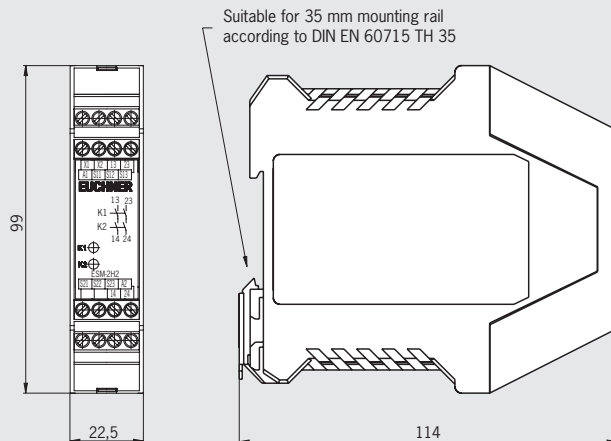
- ▶ Monitoring of downstream relays or contactors.

### Safety relay ESM-2H..

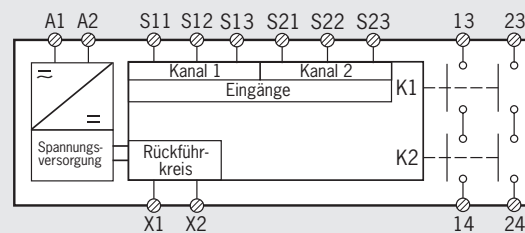


Cat. 4 STOP 0

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value			
Min. switching current at DC 24 V	20 mA			
Switching voltage, max.	DC 24 V / AC 250 V			
Utilization category * acc. to EN 60947-5-1	$U_e$	$I_e$	$\Sigma I_e$	
	AC-12	250 V	6 A	8.4 A
	AC-15	230 V	4 A	
	DC-12	24 V	1.25 A	
DC-13	24 V	2 A		

$U_e$  = switching voltage

$I_e$  = max. switching current per contact

$\Sigma I_e$  = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	AC/DC 24 V	AC 230 V
ESM	2H Safety relay	2 2 NO	085620 ESM-2H201	-

## Contact expansion ESM-ES..

- ▶ Use up to category 4 according to EN ISO 13849-1
- ▶ LED status indicators
- ▶ Control using safety relays
- ▶ 3 redundant safety contacts
- ▶ 1 monitoring contact
- ▶ Earth fault/ground fault monitoring can be selected



### Relay outputs

The outputs are electrically decoupled and of redundant design.

### Connection option

By using suitable wiring, the following function can be selected:

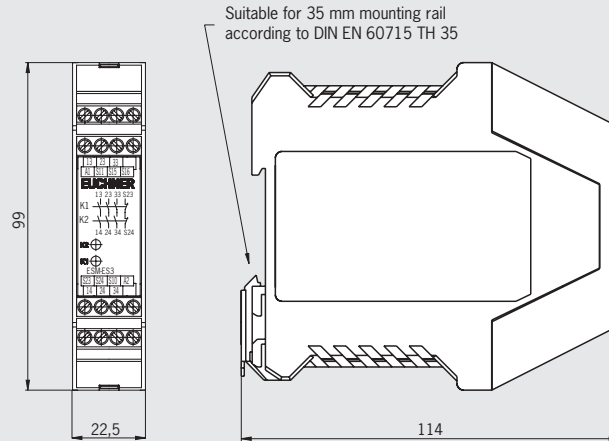
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connecting cables and earth or ground and to shut down the outputs or prevent relay starting if necessary.

## Contact expansion ESM-ES..

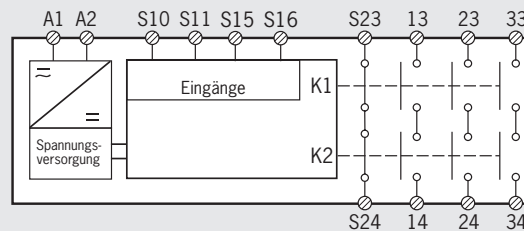


Cat. 4 STOP 0

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value			
Min. switching current at DC 24 V	5 mA			
Switching voltage, max.	DC 50 V / AC 250 V			
Utilization category * acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V	6 A	10.5 A
	AC-15	230 V	4 A	
	DC-12	24 V	1.25 A	
DC-13	24 V	2 A		

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	AC/DC 24 V
ESM	ES Contact expansion	3 3 NO + 1 NC	<b>085614</b> ESM-ES301

## Contact expansion time-delayed ESM-TE..



- ▶ Use up to category 3 according to EN ISO 13849-1
- ▶ LED status indicators
- ▶ Control using safety relays
- ▶ 3 redundant time-delayed safety contacts
- ▶ Delay time range 1 s–30 s
- ▶ Fixed time delay of 0.5 s optional
- ▶ 1 auxiliary contact
- ▶ Earth fault/ground fault monitoring can be selected



### Relay outputs

The outputs are electrically decoupled and of redundant design.

### Connection option

By using suitable wiring, the following function can be selected:

- ▶ Earth fault/ground fault monitoring to detect short circuits between the connecting cables and earth or ground and to shut down the outputs or prevent relay starting if necessary.

### Time-delayed shutdown

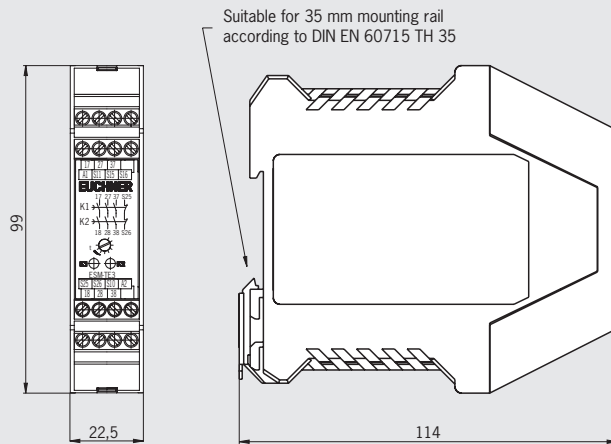
The release time for the time-delay contacts can be set as required using a potentiometer on the safety relay.

### Contact expansion ESM-TE..

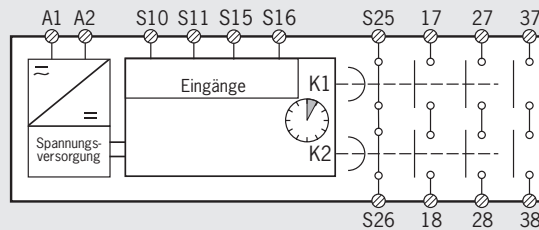


Cat. 3 STOP 1

### Dimension drawing



### Block diagram



### Technical data of outputs

Parameter	Value			
Min. switching current at DC 24 V	5 mA			
Switching voltage, max.	DC 50 V / AC 250 V			
Utilization category * acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V		6 A
	AC-15	250 V		4 A
	DC-12	24 V		1.25 A
	DC-13	24 V	2 A	10.5 A

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

\* Information about the utilization category is on page 26

### Ordering table

Series	Version	Outputs	Time-delay	AC/DC 24 V
ESM	TE Contact expansion	3 NO + 1 NC time-delayed	Adjustable 1 s ... 30 s	<b>085617</b> ESM-TE301
			Fixed 0.5 s	<b>097223</b> ESM-TE301-05S

## Accessories for safety system ESM

- ▶ Connection kit ESM...P with screw terminals or spring terminals

**Important:** One connection kit is required, depending on the device (see information on the corresponding product page). Two connection kits are required for devices from series ESM-BA701P.

### Ordering table

Designation	Description	Order no.
Connection kit ESM...P with screw terminals	Consisting of: 4 plug-in screw terminals (can be coded) 2 jumpers Coding pins	<b>097194</b> ESM-F-AK4
Connection kit ESM...P with spring terminals	Consisting of: 4 plug-in spring terminals (can be coded) 2 jumpers Coding pins	<b>097195</b> ESM-F-KK4



## Overview of safety relays ESM

### Safety relays ESM


<b>BL</b>	Non-time-delayed category 3
<b>BA</b>	Non-time-delayed category 4
<b>BT</b>	Time-delayed category 3/non-time-delayed category 4
<b>2H</b>	2-hand requirement level IIC according to EN 574, category 4


### Contact expansion ESM

<b>ES</b>	Non-time-delayed category 4
<b>TE</b>	Time-delayed category 4

Safety relays ESM						Page
BL	BA	BT	2H	ES	TE	
●						18
	●					19
		●				22
			●			23
				●		24
					●	25



Housing							
Parameter	Value					Unit	
Housing material	Polyamide PA6.6						
Dimensions	114 x 99 x 22.5 (ESM-BA7... 114 x 99 x 45)					mm	
Weight	Approx. 0.25 (ESM-BA7... approx. 0.35)					kg	
Connection	Connection terminals						
Connection terminals	0.14 ... 2.5					mm <sup>2</sup>	
Ambient temperature	<b>Safety relay</b>	<b>ESM-BL.. ESM-BA..</b>	<b>ESM-BA3..</b>	<b>ESM-BA7..</b>	<b>ESM-BT4..</b>	<b>ESM-2H2..</b>	
		-15 ... +60	-15 ... +40	-15 ... +40	-15 ... +40	-15 ... +60	°C
	<b>Contact expansion</b>	<b>ESM-ES3.. ESM-TE3...</b>					
		-15 ... +60					°C
Degree of protection acc. to EN 60529	IP20						
Degree of contamination	2						
Mounting	Mounting rail 35 mm according to DIN EN 60715 TH 35						
Mechanical life	<b>Safety relay</b>	<b>ESM-BL2.. ESM-BA2.. ESM-BA3..</b>	<b>ESM-BA7..</b>	<b>ESM-BT4..</b>	<b>ESM-2H2..</b>		
	Mechanical	1 x 10 <sup>7</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>7</sup>	operating cycles	
	Electrical	1 x 10 <sup>5</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	operating cycles	
	<b>Contact expansion</b>	<b>ESM-ES3.. ESM-TE3...</b>					
	Mechanical	1 x 10 <sup>7</sup>				operating cycles	
	Electrical	1 x 10 <sup>5</sup>				operating cycles	

Connection ESM-BL..				
Parameter	Value			Unit
Operating voltage	24 ± 10% <sup>1)</sup>			V AC/DC
Reverse polarity protection	Yes			
Rated supply frequency	50 ... 60			Hz
Power consumption	Approx. 3 VA / 1.8 W			
Control voltage for start button	18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000			m
Control current for start button	Approx. 40			mA
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T4A / F6A)			
Test voltage (control voltage/contacts)	2.5			kV
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4			kV
Rated insulation voltage	250			V
Overvoltage category acc. to DIN VDE 0110-1	3			
<b>Safety contacts</b>	<b>2 NO contacts (redundant)</b>			
Min. switching current at 24 V DC	20			mA
Switching voltage, max.	24			V DC
	250			V AC
Breaking capacity acc. to $\mathcal{U}$	6 A 250 V AC 2 A 24 V DC			
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V	6 A	12 A
	AC-15	230 V	4 A	
	DC-12	24 V	1.25 A	
	DC-13	24 V	2 A	
LED displays	2, status display for relays K1 and K2			
<b>Reliability values acc. to EN ISO 13849-1</b>				
Category	3			
Performance Level PL	d			


1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) Information about the utilization category is on page 26.

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

Connection ESM-BA2.. 			
Parameter	Value		Unit
Operating voltage	24 ± 10% <sup>1)</sup>		V AC/DC
Reverse polarity protection	Yes		
Rated supply frequency	50 ... 60		Hz
Power consumption	Approx. 3 VA / 1.8 W		
Control voltage for start button	18.6 ... 26		V DC
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000		m
Control current for start button	Approx. 40		mA
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T4A / F6A)		
Test voltage (control voltage/contacts)	2.5		kV
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4		kV
Rated insulation voltage	250		V
Overvoltage category acc. to DIN VDE 0110-1	3		
<b>Safety contacts</b>	<b>2 NO contacts (redundant)</b>		
Min. switching current at 24 V DC	20		mA
Switching voltage, max.	24		V DC
	250		V AC
Breaking capacity acc. to $\mathcal{U}$	6 A 250 V AC		
	2 A 24 V DC		
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>
	AC-12	250 V	6 A
	AC-15	230 V	4 A
	DC-12	24 V	1.25 A
	DC-13	24 V	2 A
LED displays	2, status display for relays K1 and K2		
<b>Reliability values acc. to EN ISO 13849-1</b>			
Category	4		
Performance Level PL	e		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) Information about the utilization category is on page 26.

U<sub>e</sub> = switching voltage      I<sub>e</sub> = max. switching current per contact      Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

## Connection ESM-BA3..



Parameter	Value	Unit		
Operating voltage	ESM-BA301	24 ± 10% <sup>1)</sup>		
	ESM-BA302	115 ± 10%		
	ESM-BA303	230 ± 10%		
Reverse polarity protection	On ESM-BA301			
Rated supply frequency	50 ... 60	Hz		
Power consumption	Approx. 7	VA		
Control voltage for start button	18.6 ... 26	V DC		
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000	m		
Control current for start button	Approx. 60	mA		
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T6A / F8A)			
Test voltage (control voltage/contacts)	2.5	kV		
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4	kV		
Rated insulation voltage	250	V		
Overvoltage category acc. to DIN VDE 0110-1	3			
<b>Safety contacts</b>	<b>3 NO contacts (redundant)</b>			
Cumulative current of all contacts according to $\mathcal{U}$	Max. 15	A		
Min. switching current at 24 V DC	5	mA		
Switching voltage, max.	50	V DC		
	250	V AC		
Breaking capacity acc. to $\mathcal{U}$	ESM-BA301	8 A 250 V AC / 2 A 24 V DC		
	ESM-BA302			
	ESM-BA303	8 A 250 V AC / 3 A 24 V DC		
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V	8 A <sup>4)</sup>	15 A <sup>3)</sup>
	AC-15	250 V	3 A	
	DC-12	50 V	8 A <sup>4)</sup>	
	DC-13	24 V	3 A	
LED displays	2, status display for relays K1 and K2			
<b>Monitoring contact</b>	<b>1 NC contact</b>			
Switching voltage, max.	24	V DC		
	250	V AC		
Breaking capacity acc. to $\mathcal{U}$	ESM-BA301	2 A 250 V AC / 1.5 A 24 V DC		
	ESM-BA302			
	ESM-BA303	2 A 250 V AC / 2 A 24 V DC		
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>		
	AC-12	250 V	2 A	
	AC-15	250 V	1.5 A	
	DC-12	50 V	2 A	
	DC-13	24 V	1.25 A	
<b>Reliability values acc. to EN ISO 13849-1</b>				
Category	4			
Performance Level PL	e			

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) Information about the utilization category is on page 26.


3) If several ESM-BA3.. are closely spaced under load, the max. cumulative current at an ambient temperature of 20 °C = 9 A; at 30 °C = 3 A; at 40 °C = 1 A. If these currents are exceeded, a spacing of 5 mm between the devices must be observed.

4) With ohm resistive load.

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

Connection ESM-BA7.. 				
Parameter	Value		Unit	
Operating voltage	24 ± 10% <sup>1)</sup>		V AC/DC	
Reverse polarity protection	Yes			
Rated supply frequency	50 ... 60		Hz	
Power consumption	Approx. 7		VA	
Control voltage for start button	18.6 ... 26		V DC	
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000		m	
Control current for start button	Approx. 100		mA	
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T6A / F8A)			
Test voltage (control voltage/contacts)	2.5		kV	
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4		kV	
Rated insulation voltage	250		V	
Overvoltage category acc. to DIN VDE 0110-1	3			
<b>Safety contacts</b>	<b>7 NO contacts (redundant)</b>			
Min. switching current at 24 V DC	5		mA	
Switching voltage, max.	50		V DC	
	250		V AC	
Breaking capacity acc. to $\mathcal{U}$ (per contact)	8 A 250 V AC 2 A 24 V DC			
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V	8 A	35 A <sup>3)</sup>
	AC-15	250 V	3 A	
	DC-12	50 V	8 A	
	DC-13	24 V	3 A	
LED displays	2, status display for relays K1 and K2			
<b>Monitoring contacts</b>	<b>4 NC contacts</b>			
Switching voltage, max.	50		V DC	
	250		V AC	
Breaking capacity acc. to $\mathcal{U}$	2 A 250 V AC 1.5 A 24 V DC			
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>		
	AC-12	250 V	8 A	
	AC-15	250 V	3 A	
	DC-12	50 V	8 A	
	DC-13	24 V	3 A	
<b>Monitoring outputs</b>	<b>2 semiconductor outputs</b>			
Semiconductor output current	Max. 30		mA	
Semiconductor output voltage	24		V DC	
<b>Reliability values acc. to EN ISO 13849-1</b>				
Category	4			
Performance Level PL	e			

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) Information about the utilization category is on page 26.

3) With a housing distance of 10 mm. 20 A closely spaced at 40 °C.

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)



## Connection ESM-BT4..



Parameter	Value	Unit		
Operating voltage	24 ± 10% <sup>1)</sup>	V AC/DC		
Reverse polarity protection	Yes			
Rated supply frequency	50 ... 60	Hz		
Power consumption	Approx. 4.6	W		
Delay time range	1 ... 30	s		
Control voltage for start button	18.6 ... 26	V DC		
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000	m		
Control current for start button	Approx. 190	mA		
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T6A / F8A)			
Test voltage (control voltage/contacts)	2.5	kV		
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4	kV		
Rated insulation voltage	250	V		
Overtoltage category acc. to DIN VDE 0110-1	3			
<b>Safety contacts</b>	<b>4 NO contacts (redundant)</b>			
Cumulative current of all contacts according to $\mathcal{U}$	Max. 15	A		
Min. switching current at 24 V DC	5	mA		
Switching voltage, max.	50	V DC		
	250	V AC		
Breaking capacity acc. to $\mathcal{U}$ (per contact)	6 A 250 V AC			
	2 A 24 V DC			
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V	8 A <sup>4)</sup>	15 A <sup>3)</sup>
	AC-15	250 V	3 A	
	DC-12	50 V	8 A <sup>4)</sup>	
DC-13	24 V	3 A		
LED displays	4, status display for relays K1 to K4			
<b>Reliability values acc. to EN ISO 13849-1</b>				
Category	4 (non-time-delayed) / 3 (time-delayed)			
Performance Level PL	e			

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) Information about the utilization category is on page 26.


3) With a housing distance of 5 mm. 9 A closely spaced at 40 °C.

4) With ohm resistive load.

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

Connection ESM-2H2.. 				
Parameter	Value		Unit	
Operating voltage	24 ± 10% <sup>1)</sup>		V AC/DC	
Reverse polarity protection	Yes			
Rated supply frequency	50 ... 60		Hz	
Power consumption	Approx. 4		VA	
Control voltage on start buttons S12 - S13 and S22 - S23	18.6 ... 26		V DC	
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000		m	
Control current for both buttons	Each 20		mA	
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T4A / F6A)			
Test voltage (control voltage/contacts)	2.5		kV	
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4		kV	
Rated insulation voltage	250		V	
Overvoltage category acc. to DIN VDE 0110-1	3			
<b>Safety contacts</b>	<b>2 NO contacts (redundant)</b>			
Synchronization time	Max. 0.5		s	
Release time for the safety relay (response time)	Max. 20		ms	
Min. switching current at 24 V DC	20		mA	
Switching voltage, max.	24		V DC	
	250		V AC	
Breaking capacity acc. to $\mathcal{U}$	6 A 250 V AC			
	2 A 24 V DC			
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<b>U<sub>e</sub></b>	<b>I<sub>e</sub></b>	<b>Σ I<sub>e</sub></b>	
	AC-12	250 V	6 A <sup>3)</sup>	8.4 A
	AC-15	230 V	4 A	
	DC-12	24 V	1.25 A <sup>3)</sup>	
DC-13	24 V	2 A		
LED displays	2, status display for relays K1 and K2			
<b>Reliability values acc. to EN ISO 13849-1</b>				
Category	4			
Performance Level PL	e			

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) Information about the utilization category is on page 26.

3) With ohm resistive load.

U<sub>e</sub> = switching voltage

I<sub>e</sub> = max. switching current per contact

Σ I<sub>e</sub> = max. switching current of all safety contacts (cumulative current)

## Connection ESM-ES3..



Parameter	Value	Unit																	
Operating voltage	24 ± 10% <sup>1)</sup>	V AC/DC																	
Reverse polarity protection	Yes																		
Rated supply frequency	50 ... 60	Hz																	
Power consumption	Approx. 4 VA / 2 W																		
Control voltage at inputs	18.6 ... 26	V DC																	
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000	m																	
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T4A / F6A)																		
Test voltage (control voltage/contacts)	2.5	kV																	
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4	kV																	
Rated insulation voltage	250	V																	
Overvoltage category acc. to DIN VDE 0110-1	3																		
Cumulative current of all contacts according to $\Sigma I_e$	Max. 10.5	A																	
<b>Safety contacts</b>	<b>3 NO contacts (redundant)</b>																		
Min. switching current at 24 V DC	20	mA																	
Switching voltage, max.	50	V DC																	
	250	V AC																	
Breaking capacity acc. to $\Sigma I_e$ (per contact)	6 A 250 V AC 2 A 24 V DC																		
Utilization category <sup>2)</sup> acc. to EN 60947-5-1	<table border="1"> <thead> <tr> <th></th> <th><math>U_e</math></th> <th><math>I_e</math></th> <th><math>\Sigma I_e</math></th> </tr> </thead> <tbody> <tr> <td>AC-12</td> <td>250 V</td> <td>6 A <sup>3)</sup></td> <td rowspan="4">10.5 A</td> </tr> <tr> <td>AC-15</td> <td>230 V</td> <td>4 A</td> </tr> <tr> <td>DC-12</td> <td>24 V</td> <td>1.25 A <sup>3)</sup></td> </tr> <tr> <td>DC-13</td> <td>24 V</td> <td>2 A</td> </tr> </tbody> </table>		$U_e$	$I_e$	$\Sigma I_e$	AC-12	250 V	6 A <sup>3)</sup>	10.5 A	AC-15	230 V	4 A	DC-12	24 V	1.25 A <sup>3)</sup>	DC-13	24 V	2 A	
	$U_e$	$I_e$	$\Sigma I_e$																
AC-12	250 V	6 A <sup>3)</sup>	10.5 A																
AC-15	230 V	4 A																	
DC-12	24 V	1.25 A <sup>3)</sup>																	
DC-13	24 V	2 A																	
LED displays	2, status display for relays K1 and K2																		
<b>Auxiliary contact</b>	<b>1 NC contact</b>																		
Continuous current, max.	500 <sup>4)</sup>	mA																	
Switching voltage, max.	24	V AC/DC																	
<b>Reliability values acc. to EN ISO 13849-1</b>																			
Category	4																		
Performance Level PL	e																		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.


2) Information about the utilization category is on page 26.

3) With ohm resistive load.

4) As monitoring contact for safety relay.

$U_e$  = switching voltage       $I_e$  = max. switching current per contact       $\Sigma I_e$  = max. switching current of all safety contacts (cumulative current)



Connection ESM-TE3.. 			
Parameter	Value		Unit
Operating voltage	24 ± 10% <sup>1)</sup>		V AC/DC
Reverse polarity protection	Yes		
Rated supply frequency	50 ... 60		Hz
Power consumption	Approx. 4		VA
Delay time range	1 ... 30		s
Fixed time delay ESM-TE301-05S	0.5 <sup>2)</sup>		s
Control voltage at inputs	18.6 ... 26		V DC
Control cable length (cross-section 0.75 mm <sup>2</sup> )	Max. 1,000		m
External contact fuse (safety circuit) acc. to EN IEC 60269-1	10 A gG (T4A / F6A)		
Test voltage (control voltage/contacts)	2.5		kV
Rated impulse withstand voltage, leakage path and air gaps acc. to DIN VDE 0110-1	4		kV
Rated insulation voltage	250		V
Overvoltage category acc. to DIN VDE 0110-1	3		
Cumulative current of all contacts according to $\text{I}_{\Sigma}$	Max. 10.5		A
<b>Safety contacts</b>	<b>3 NO contacts (redundant)</b>		
Min. switching current at 24 V DC	20		mA
Switching voltage, max.	50		V DC
	250		V AC
Breaking capacity acc. to $\text{I}_{\Sigma}$ (per contact)	6 A 250 V AC 2 A 24 V DC		
Utilization category <sup>3)</sup> acc. to EN 60947-5-1		<b><math>U_e</math></b>	<b><math>I_e</math></b>
	AC-12	250 V	6 A <sup>4)</sup>
	AC-15	250 V	4 A
	DC-12	24 V	1.25 A <sup>4)</sup>
	DC-13	24 V	2 A
LED displays	2, status display for relays K1 and K2		
<b>Auxiliary contact</b>	<b>1 NC contact</b>		
Continuous current, max.	500 <sup>5)</sup>		mA
Switching voltage, max.	24		V DC
<b>Reliability values acc. to EN ISO 13849-1</b>			
Category	3		
Performance Level PL	d		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according to EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) On ESM-TE301-05S the potentiometer is not required.

3) Information about the utilization category is on page 26.

4) With ohm resistive load.

5) As monitoring contact for safety relay.

$U_e$  = switching voltage

$I_e$  = max. switching current per contact

$\Sigma I_e$  = max. switching current of all safety contacts (cumulative current)

## Glossary

### Feedback loop

Components connected downstream of the safety relay can be monitored for correct function. For this purpose, normally closed contacts on these components are integrated into the feedback loop on the relay.

### Relay start

After a relay has switched off due to a request from a safety component connected, the relay must be re-started. On this topic please pay attention to section 5.2.2 of EN ISO 13849-1:2015.

#### ► Automatic start

The relay switches on automatically as soon as the safety component connected changes back to the safe state.

#### ► Manual start

The relay is started by actuating a button. First, the safe state of the safety components connected must be re-established.

#### ► Monitored manual start

The relay is started by actuating a button. The button is monitored for jamming or possible tampering. Before the relay is started, the safe state of the safety components connected must be re-established.

### Single-channel safety circuit

A single positively driven contact in the safety component is connected to the relay. This connection is suitable for category 1 or 2 according to EN ISO 13849-1.

### Dual-channel safety circuit

Two contacts, of which at least one is a positively driven contact, are connected to the relay. This connection is suitable for category 3 or 4 according to EN ISO 13849-1.

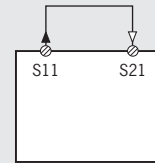
### Utilization category according to EN 60947-5-1 (extract)

Voltage type	Utilization category	Typical applications
AC	AC-12	Controlling ohm resistive load and semiconductor load in input circuits of optocouplers
	AC-15	Controlling electromagnetic load (> 72 VA)
DC	DC-12	Controlling ohm resistive load and semiconductor load in input circuits of optocouplers
	DC-13	Controlling electromagnetic loads with economy resistors in the circuit

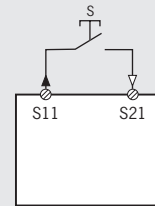
## Connection examples for safety relays ESM

### Safety relay ESM-BL..

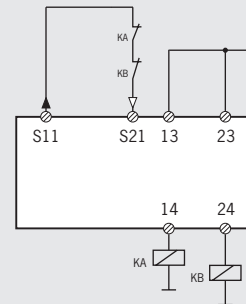
Automatic start without integration of the feedback loop



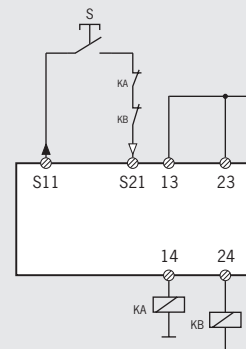
Manual start without integration of the feedback loop



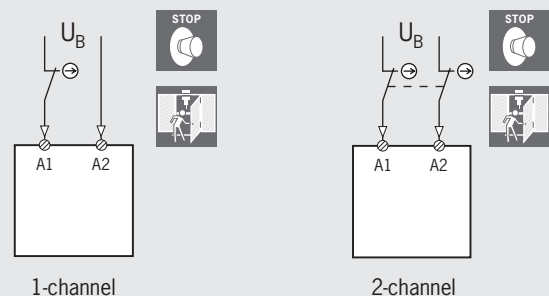
Automatic start with integration of the feedback loop



Manual start with integration of the feedback loop

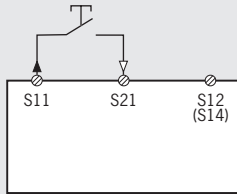


Emergency stop/safety circuit

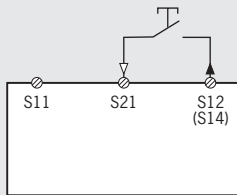


## Safety relays ESM-BA../ESM-BT..

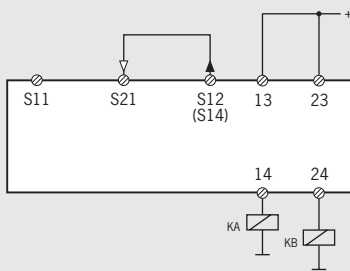
Monitored start without integration of the feedback loop



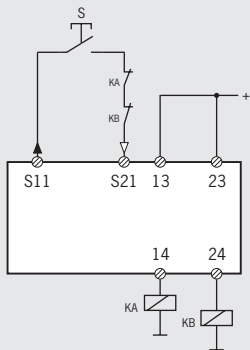
Un-monitored start without integration of the feedback loop



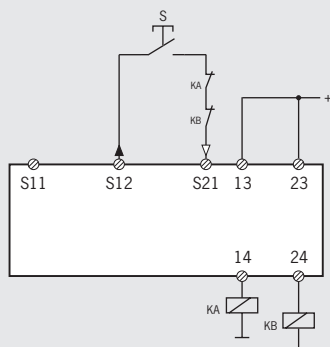
Automatic start without integration of the feedback loop



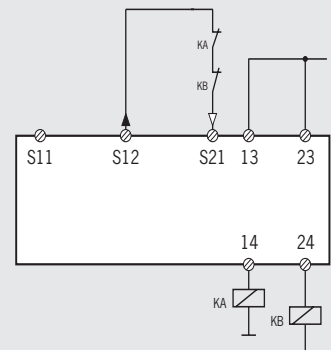
Monitored start with integration of the feedback loop



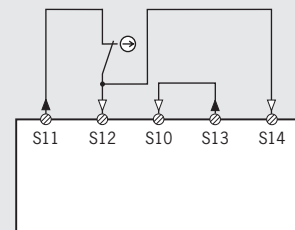
Un-monitored start with integration of the feedback loop



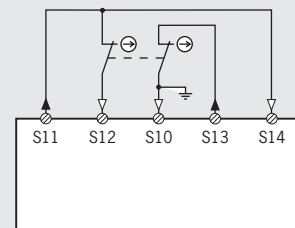
Automatic start with integration of the feedback loop



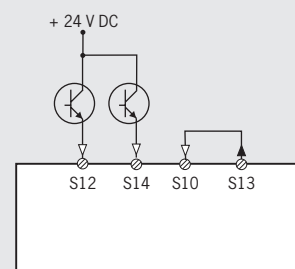
1-channel emergency stop/safety circuit



2-channel emergency stop/safety circuit with ground fault/short circuit detection

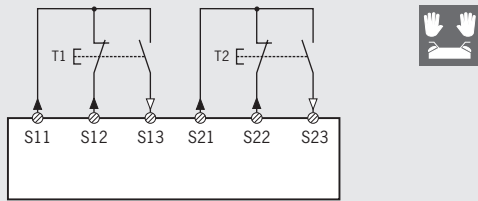


2-channel emergency stop/safety circuit with connection for MGB, CES-AR and light curtains

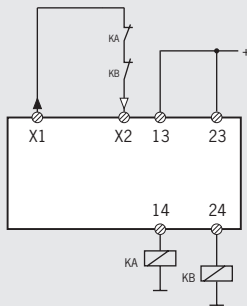


## Safety relay ESM-2H2..

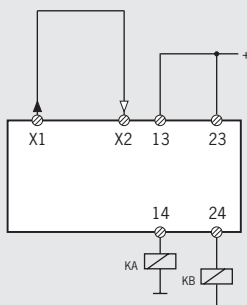
Monitoring a 2-hand control



With integration of the feedback loop

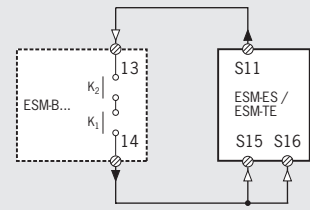


Without integration of the feedback loop

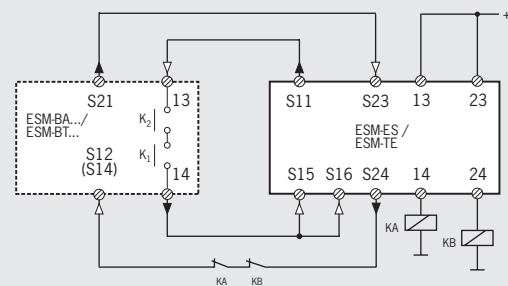


## Safety contact expansion ESM-ES../ESM-TE..

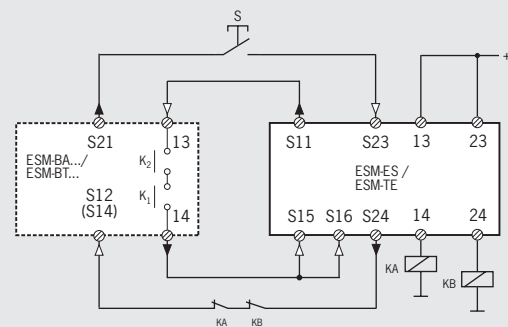
Connection of the contact expansion



Connection of the contact expansion with automatic start and with integration of the feedback loop



Connection of the contact expansion with manual start and with integration of the feedback loop



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ESM-BA302	087412	10
ESM-BA303	087413	10
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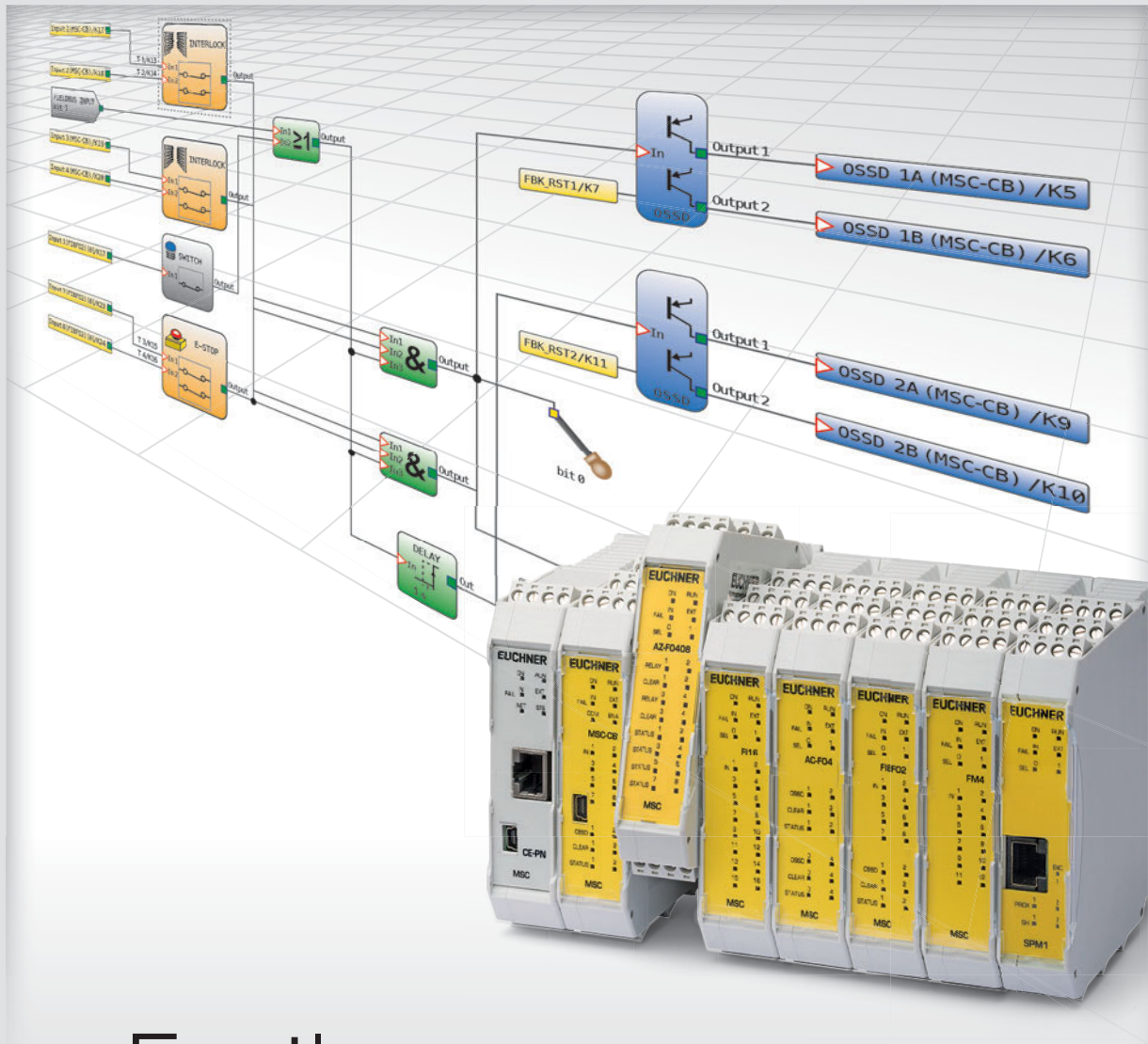
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# Easily programmable.

The small safe control system **MSC**

**EUCHNER**

More than safety.

# The small safe control system **MSC**

The MSC is a universal, freely programmable, modular safety system for the safeguarding of machines and manufacturing equipment. It is suitable for almost all safety-related tasks and can monitor numerous safety-related devices. Programming is easily and conveniently on a PC using the software "EUCHNER Safety Designer". Even with only the base unit MSC-CB it is possible to realize a large number of safety applications with up to 8 inputs and 2 outputs, and that with a housing width of only 22.5 mm.

## ■ Can be expanded easily and specifically

Depending on the requirements, the MSC offers a broad range of expansion modules with which the base unit MSC-CB can be expanded almost without limit. The different input and output expansions can be connected to the base unit with the aid of an expansion connector. Various fieldbus modules can be integrated for straightforward connection to a machine control. The function of the fieldbus can be specifically defined in the programming. In this way the control system can be used in a read-only role, or to provide control. All common fieldbuses are available to suit the related control system.

## ■ Rapid and targeted diagnostics

The MSC offers a range of types of diagnostics. The LED indication on the front of all modules provides a straightforward, quick diagnostic feature. In addition it is possible to access directly the program in the base unit with the aid of the software EUCHNER Safety Designer so that the switching state of the inputs and outputs or the logic functions can be checked in detail. Initial setup is significantly simplified in this manner.

## ■ Equipped for an emergency

Each base unit has an internal memory in which the program and all related settings are saved. As an option it is also possible to use a separate memory module in the device. A copy of the actual program is automatically saved on this card. It is then possible to replace quickly a faulty device in an emergency, without a PC.

## ■ Protection in compliance with standards

The small safe control system MSC offers a high degree of safety. Category 4 and Performance Level e (PL e) in accordance with EN ISO 13849-1 are met by the base unit and all expansion modules.

## ■ Clear software

The easy to use and free of charge software "EUCHNER Safety Designer" provides an excellent overview of the logic functions programmed like e-stop, interlock, footswitch. A dedicated module is available for almost every safe device, in this way it is possible to differentiate between the emergency stop and an interlock at a glance.



# The base unit **MSC-CB**

## ► Freely programmable small safe control system

Suitable as a standalone solution for many safety-related tasks and can be expanded almost without limit.

## ► 8 single-channel/4 dual-channel inputs

For all common safety-related sensors like safety switches (interlocking and guard locking), light curtains, enabling switches, emergency stop etc.

## ► 2 control inputs

For the connection of start buttons or contactor feedback monitoring.

## ► 2 safe outputs (PL e, category 4)

According to the programming for safety-related shutdown of hazardous machine movements.

## ► 2 monitoring outputs

Can be used as required for all tasks outside safety engineering.

## ► PC connection for the software "EUCHNER Safety Designer"

For programming and detailed diagnostics.

## ► Optional memory module for configuration

Redundant memory should replacement be necessary.

## ► Compact housing with width of only 22.5 mm

Saves valuable space in the control cabinet.

## ► Straightforward diagnostics via LED displays

For continuous monitoring of the input and output states.

## ► Plug-in terminals

For convenient wiring and for quick replacement.



# The expansion modules for the **MSC**

▶ **MSC-CE-FI8-121291**

Input expansion with  
8 safe inputs



▶ **MSC-CE-FI16-121292**

Input expansion with  
16 safe inputs

▶ **MSC-CE-AC-FI8FO2-121290**

Input and output expansion with  
8 safe inputs  
2 safe semiconductor outputs  
2 monitoring outputs



▶ **MSC-CE-FM4-121293**

Input expansion with  
4 pressure sensitive mat inputs



▶ **MSC-CE-AC-FO2-121294**

Output expansion with  
2 safe semiconductor outputs



▶ **MSC-CE-AC-FO4-121295**

Output expansion with  
4 safe semiconductor outputs

▶ **MSC-CE-AZ-FO4-121298**

Output expansion with  
4 safe relay outputs



▶ **MSC-CE-AZ-FO4O8-121299**

Output expansion with  
4 safe relay outputs  
8 monitoring outputs

▶ **MSC-CE-SPM0-121300**

2 Proximity switch



▶ **MSC-CE-SPM1H-121301**

2 Proximity switch

**MSC-CE-SPM2H-121304**

1 or 2 HTL encoder

▶ **MSC-CE-PN-121315**

PROFINET fieldbus



▶ **MSC-CE-PR-121310**

PROFINET fieldbus

▶ **MSC-CE-CO-121312**

CANopen fieldbus

▶ **MSC-CE-US-121316**

USB connection

▶ **MSC-CE-SPM1TB-122721**

2 Proximity switch

**MSC-CE-SPM2TB-122722**

1 or 2 TTL encoder

▶ **MSC-CE-SPM1S-121303**

2 Proximity switch

**MSC-CE-SPM2S-121306**

1 or 2 sin/cos encoder



▶ **MSC-CE-EC-121313**

EtherCAT fieldbus

▶ **MSC-CE-MR-122716**

Modbus RTU fieldbus

▶ **MSC-CE-CI1-121317**

Decentralized 1-channel  
communication module

▶ **MSC-CE-EI-121314**

EtherNET /IP fieldbus

▶ **MSC-CE-MT-122717**

Modbus TECP/IP fieldbus

▶ **MSC-CE-CI2-121318**

Decentralized 2-channel  
communication module

▶ **MSC-CE-DN-121311**

DeviceNet fieldbus

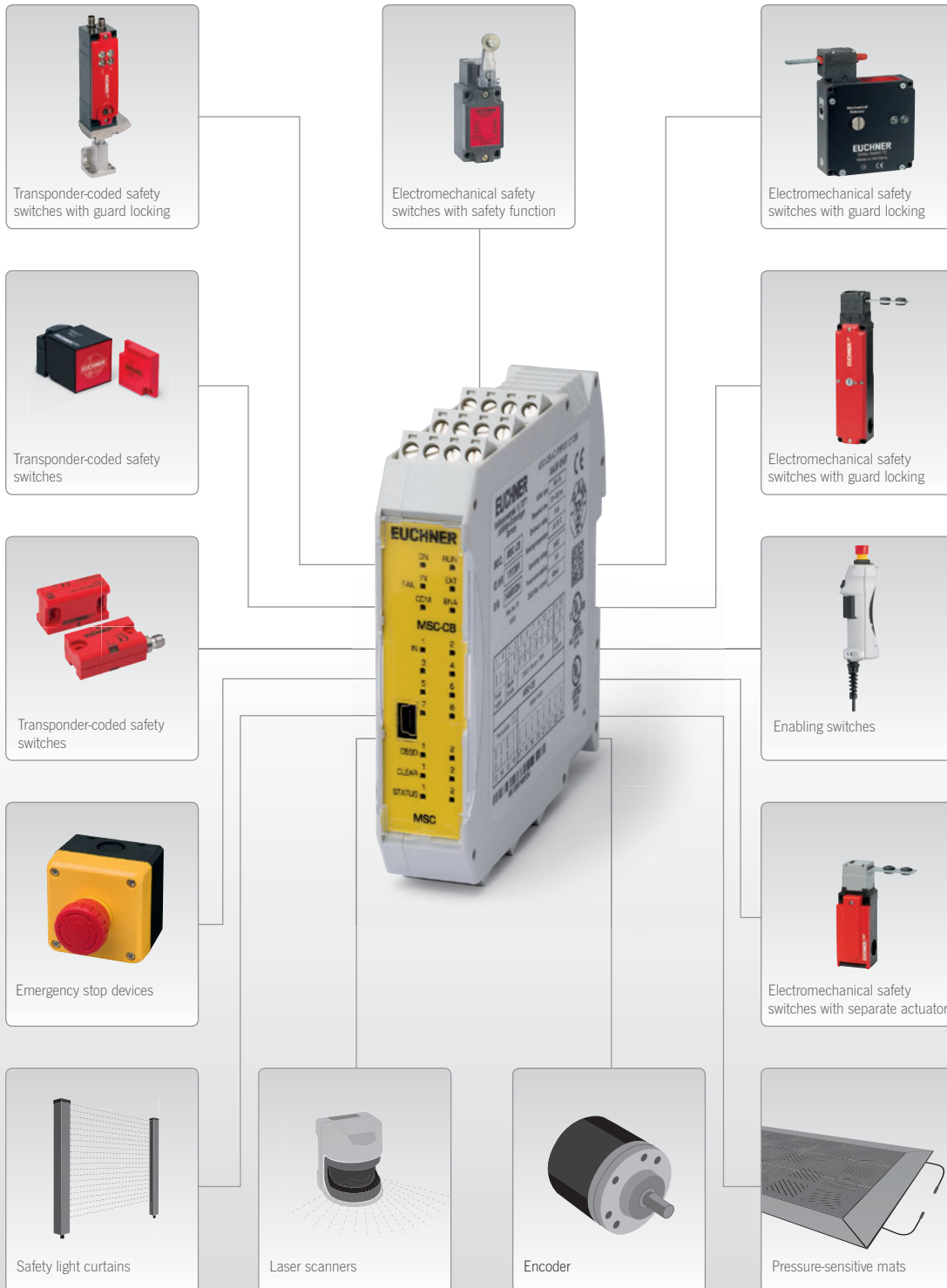
▶ **MSC-CE-EI2-122718**

EtherNET /IP 2-PORT fieldbus



## Versatile connection options

Almost every available safety device can be connected to the safe control system MSC. From conventional emergency stop devices, to safety switches with contacts or OSSD outputs, safety light curtains etc. the options are diverse. Both wear-free semiconductor outputs and relay outputs are available on the output side.



# Technical data MSC-CB and expansion modules



Parameter	Value			Unit
	min.	typ.	max.	
Dimensions	114.5 x 108 x 22.5			mm
Degree of protection	IP20			
Mounting	Mounting rail 35 mm according to EN60715			
Connection (plug-in terminals)	0,5	–	2,5	mm <sup>2</sup>
Ambient temperature	-10	–	55	°C
Operating voltage $U_b$ (PELV) EN 60204-1	DC 24 ± 20 %			V
Power consumption	Max. 3			W
<b>Digital inputs*</b>				
	Up to 16; semiconductor inputs, p-switching according to EN61131-2			
<b>Feedback loop inputs*</b>				
	Up to 4; external device monitoring (EDM), automatic, manual operation			
<b>Pulse outputs*</b>				
	Up to 8			
- Test pulses	200			µs
<b>Monitoring outputs*</b>				
	Up to 8, semiconductor outputs, p-switching			
- Max. load	Max. 100			mA
<b>Safety outputs*</b>				
	Up to 4; semiconductor outputs, p-switching, short circuit-proof			
- Max. load	Max. 400			mA
- HIGH	$U_b - 0.75$	–	$U_b$	V
- LOW	0	–	2	V
- Test pulses	–	100	–	µs
<b>Relay outputs*</b>				
	Up to 4			
- Switching current	0.02	–	6	A
- Utilization Category to EN 60947-5-1	AC-15 240V 3A / DC 13 24V 1A			
<b>Reliability values according to EN ISO 13849-1</b>				
Category		4		
Performance Level		PL e		
Mission time		20		years
<b>Speed monitoring modules</b>				
Interface	TTL (SPMxTB), HTL (SPMxH), sin/cos (SPMxS)			
Connection	RJ45			
Rated insulated voltage	250			V
Rated impuls voltage	4			kV
Max. number	Up to 2			
Max. frequency	500 (HTL : 300)			kHz
Adjustable threshold range	1 Hz – 450 kHz			
<b>Proximity switch</b>				
Type	PNP/NPN - 3/4-wires			
Max. number	2			
Max. frequency	5			kHz
adjustable threshold range	1 Hz – 4 kHz			
Max. number of axes	2			
Stand-Still/overspeed frequency gap	>10			Hz

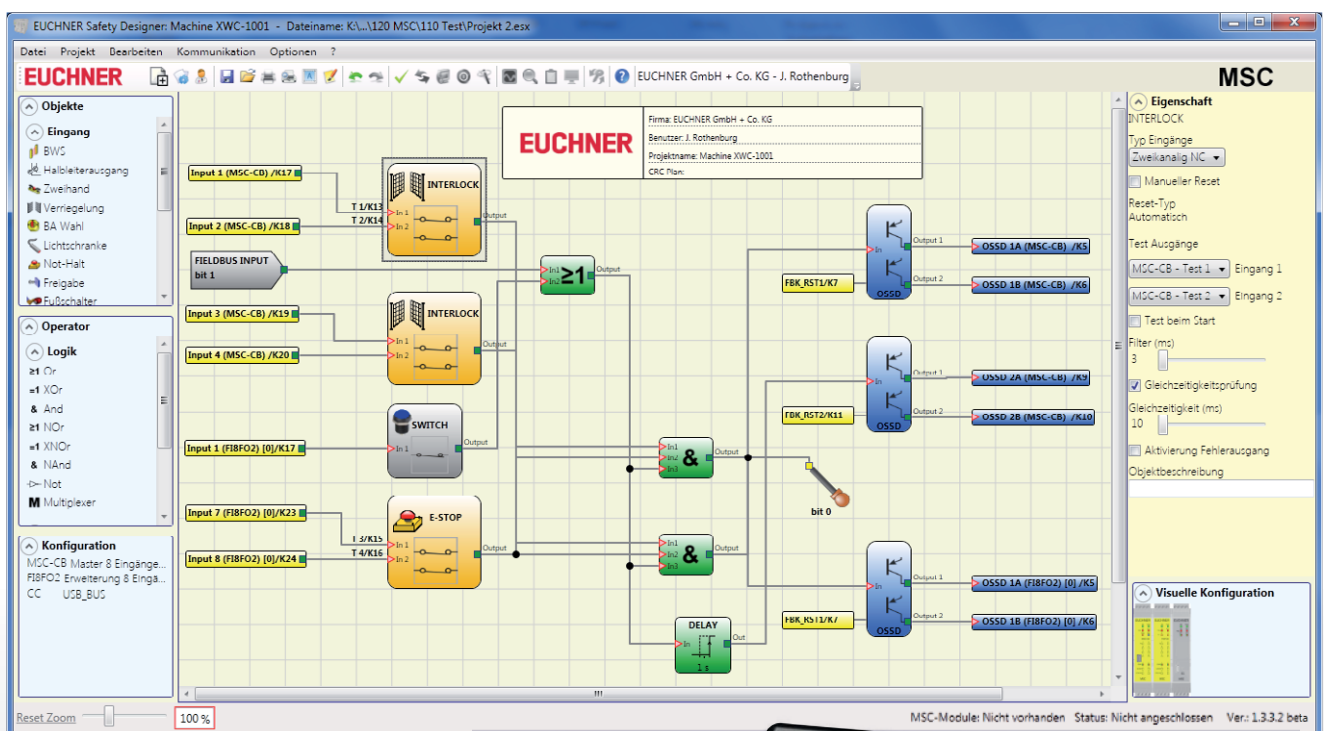
\* per module

# The programming interface "EUCHNER Safety Designer"

The software "EUCHNER Safety Designer" provides a graphic configuration interface for programming the small safe control system MSC. This software has a clear layout and is easy and intuitive to operate. A large number of different safety functions (e.g. e-stop, interlock, footswitch) as well as various logic operators (e.g. 1 out of N, AND, OR, INVERTER) are available for the configuration. With these features even complex applications can be generated easily. The parameter settings are immediately visible on clicking a module. It is not necessary to open any additional windows. This feature provides a quick overview and makes work easier.

To setup the system the programming software on a PC is connected directly to the base unit MSC-CB via a USB cable. This saves time during setup and makes troubleshooting easier.

The programs prepared are protected by different access levels. In this way inadvertent changes, incorrect operation or changes to the system configuration are effectively prevented. It is of course possible to change the language.



## The advantages of MSC at a glance

- Easy to program and multifunctional in use
- Compact housing for all modules saves space in the control cabinet
- Various diagnostics features – can be read easily on the front, in detail in the software
- Maximum safety (PL e, category 4)
- Connection of a large number of safety-related devices
- Low wiring effort
- Clear programming interface
- Can be expanded easily and quickly

## Ordering table

Item	Description	Terminal set*	Order no.
MSC-CB-AC-FI8FO2-121289	Base unit, 8 safe inputs, 2 safe outputs	Six contacts	121289
MSC-CE-AC-FI8FO2-121290	Expansion unit, 8 safe inputs, 2 safe outputs	Six contacts	121290
MSC-CE-FI8-121291	Expansion device, 8 safe inputs	Four contacts	121291
MSC-CE-FI16-121292	Expansion device, 16 safe inputs	Six contacts	121292
MSC-CE-FM4-121293	Expansion device, 4 pressure-sensitive mats	Six contacts	121293
MSC-CE-AC-FO2-121294	Expansion device, 2 safe outputs	Four contacts	121294
MSC-CE-AC-FO4-121295	Expansion device, 4 safe outputs	Six contacts	121295
MSC-CE-AZ-FO4-121298	Expansion device, 4 safe relay outputs	Four contacts	121298
MSC-CE-AZ-FO408-121299	Expansion device, 4 safe relay outputs	Six contacts	121299
MSC-CE-PR-121310	Expansion device, PROFIBUS fieldbus	Two contacts	121310
MSC-CE-DN-121311	Expansion device, DeviceNET fieldbus	Two contacts	121311
MSC-CE-CO-121312	Expansion device, CANopen fieldbus	Two contacts	121312
MSC-CE-EC-121313	Expansion device, EtherCAT fieldbus	Two contacts	121313
MSC-CE-EI-121314	Expansion device, EtherNET/IP fieldbus	Two contacts	121314
MSC-CE-PN-121315	Expansion device, PROFINET fieldbus	Two contacts	121315
MSC-CE-US-121316	Expansion device, USB connection	Two contacts	121316
MSC-CE-SPM0-121300	Expansion device, 2 Proximity switch	Four contacts	121300
MSC-CE-SPM1H-121301	Expansion device, 2 Proximity switch, 1 HTL encoder	Four contacts	121301
MSC-CE-SPM1TB-122721	Expansion device, 2 Proximity switch, 1 TTL encoder	Four contacts	122721
MSC-CE-SPM1S-121303	Expansion device, 2 Proximity switch, 1 sin/cos encoder	Four contacts	121303
MSC-CE-SPM2H-121304	Expansion device, 2 Proximity switch, 2 HTL encoder	Four contacts	121304
MSC-CE-SPM2TB-122722	Expansion device, 2 Proximity switch, 2 TTL encoder	Four contacts	122722
MSC-CE-SPM2S-121306	Expansion device, 2 Proximity switch, 2 sin/cos encoder	Four contacts	121306
MSC-CE-CI1-121317	Decentralized 1-channel communication module	Four contacts	121317
MSC-CE-CI2-121318	Decentralized 2-channel communication module	Four contacts	121318
MSC-CE-MR-122716	Expansion device, Modbus RTU fieldbus	Two contacts	122716
MSC-CE-MT-122717	Expansion device, Modbus TECP/IP fieldbus	Two contacts	122717
MSC-CE-EI2-122718	Expansion device, EtherNET /IP 2-PORT fieldbus	Two contacts	122718
AC-PL-B-121308**	Expansion connector	-	121308
MSC-MA1-121309	Memory module card	-	121309
AC-SC-02-V04-121319	Terminal set 2 contacts screw terminals	-	121319
AC-SC-04-V04-121320	Terminal set 4 contacts screw terminals	-	121320
AC-SC-06-V04-121321	Terminal set 6 contacts screw terminals	-	121321
C-USB-2.0-A-01,8-MINB-121322	USB cable	-	121322

\*) Please order separate! \*\*) To expand the base unit MSC-CB an expansion connector must be ordered. One expansion connector is included with all expansion modules.

The software "EUCHNER Safety Designer" is included on CD with each base unit MSC-CB (121289).

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