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507 Kelsey Street • Delano, MN 55328  
Phone 763-972-1040 Fax 763-972-1041  
Toll Free 888-920-0939  
Sensorsincorporated.com

### Selection table for safety relays ESM

| Safety relays                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Contact expansion              |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Category according to EN 954-1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Enable path                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Relay start                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Monitoring                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BL                             | Non-time-delay category 3                          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BA                             | Non-time-delay category 4                          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BT                             | Time-delay/non-time-delay category 4               |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2H                             | 2-hand requirement level III C according to EN 574 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ES                             | Non-time-delay category 4                          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TE                             | Time-delay category 4                              |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| K                              | Category according to EN 954-1                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SU                             | Safety contacts non-time-delay                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SV                             | Safety contacts time-delay                         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M                              | Auxiliary contacts                                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A                              | Automatic start                                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M                              | Start button                                       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| U                              | Monitored start button                             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| R                              | Feedback loop                                      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Q                              | Short circuit monitoring                           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| E                              | Earth fault monitoring                             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M                              | Ground fault monitoring                            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| Devices |    |    |    |    |    |   |    |    |   |   |   |   |   |   |   |   |      |
|---------|----|----|----|----|----|---|----|----|---|---|---|---|---|---|---|---|------|
| BL      | BA | BT | 2H | ES | TE | K | SU | SV | M | A | M | U | R | Q | E | M | Page |
| ●       |    |    |    |    |    | 3 | 2  |    |   | ● | ● |   | ● |   |   |   | 8    |
|         | ●  |    |    |    |    | 4 | 2  |    |   | ● | ● | ● | ● | ● | ● | ● | 9    |
|         | ●  |    |    |    |    | 4 | 3  |    | 1 | ● | ● | ● | ● | ● | ● | ● | 9    |
|         |    | ●  |    |    |    | 4 | 1  | 3  |   | ● | ● | ● | ● | ● | ● | ● | 10   |
|         |    | ●  |    |    |    | 4 | 2  | 2  |   | ● | ● | ● | ● | ● | ● | ● | 10   |
|         |    | ●  |    |    |    | 4 | 3  | 1  |   | ● | ● | ● | ● | ● | ● | ● | 10   |
|         |    |    | ●  |    |    | 4 | 2  |    |   |   |   | ● | ● | ● | ● | ● | 11   |
|         |    |    |    | ●  |    | 4 | 3  |    | 1 |   |   |   |   |   | ● | ● | 12   |
|         |    |    |    |    | ●  | 4 |    | 3  | 1 |   |   |   |   |   | ● | ● | 13   |



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



- ▶ ESM-BL.. up to category 3 according to EN 954-1
- ▶ ESM-BA.. up to category 4 according to EN 954-1
- ▶ LED status indicators
- ▶ 1-channel or 2-channel control
- ▶ Up to 3 redundant safety contacts
- ▶ Auxiliary 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, by using suitable wiring it is also possible to select:

- ▶ Simultaneity monitoring to monitor safety components over time
- ▶ Relay start using a monitored start button
- ▶ Short circuit monitoring to detect short circuits between the connection cables and to shut down the outputs or prevent relay starting if necessary
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

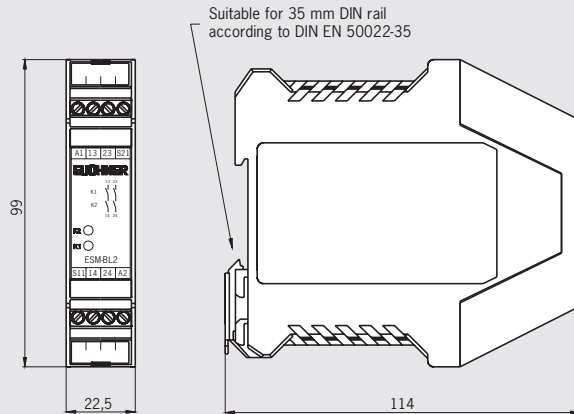
### Auxiliary contacts

On series ESM-BA3.. relays an electrically separate normally closed contact is available as an auxiliary contact

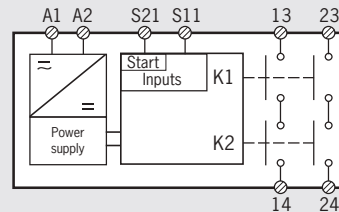
### Safety relay ESM-BL..



### Dimension drawing



### Block diagram



### Technical data outputs

| Parameter   | Value              |       |              |
|---|--------------------|-------|--------------|
| Minimum switching current at 24 V DC                    | 20 mA              |       |              |
| Maximum switching voltage                               | DC 24 V / AC 250 V |       |              |
| Utilization category *<br>according to EN IEC 60947-5-1 | $U_e$              | $I_e$ | $\Sigma I_e$ |
|   | 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          |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for information about the utilization category

### Ordering table

| Series | Version      | Outputs | AC/DC 24 V | AC 115 V  | AC 230 V  |
|--------|--------------|---------|------------|-----------|-----------|
| ESM    | BL           | 2       | 085 607    | 085 608   | 085 609   |
|        | Safety relay | 2 NO    | ESM-BL201  | ESM-BL202 | ESM-BL203 |

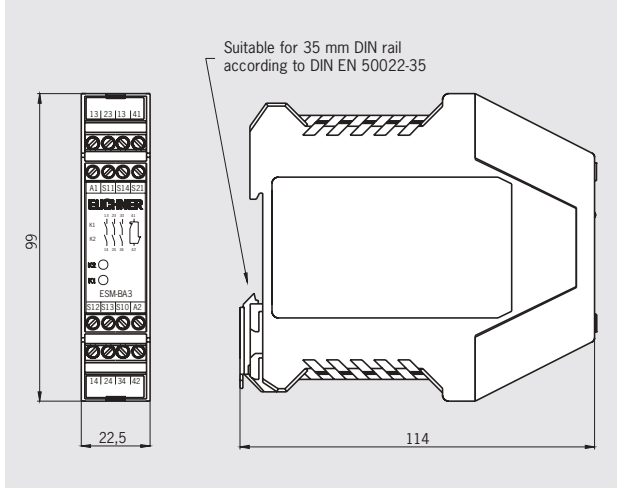
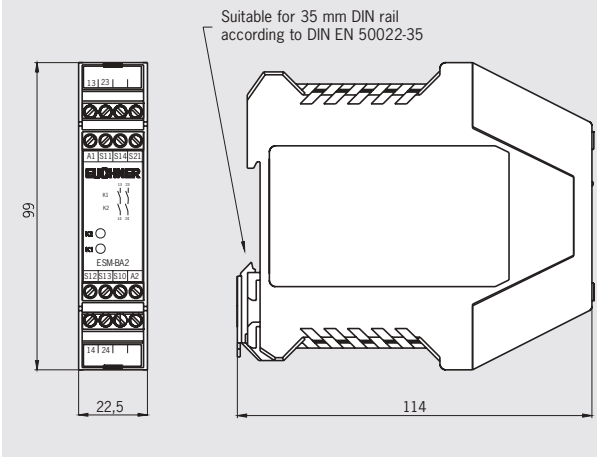


## Safety relay ESM-BA2..

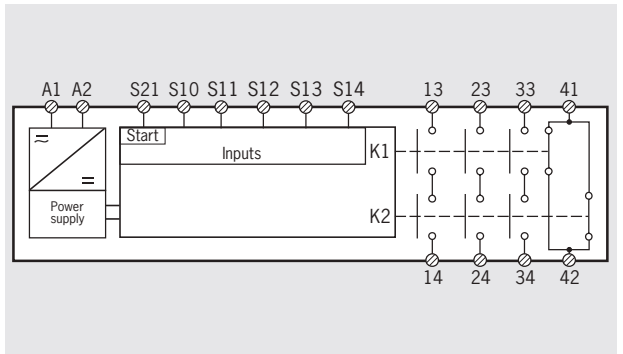
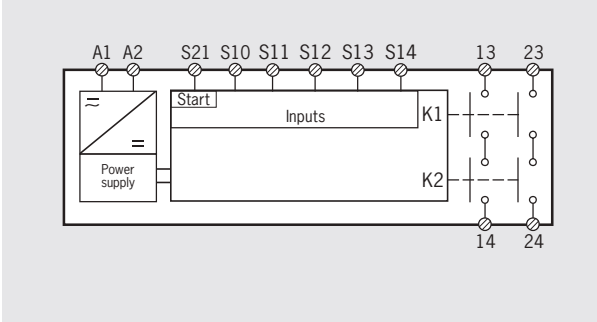
## Safety relay ESM-BA3..



### Dimension drawing



### Block diagram



### Technical data outputs

| Parameter  | Value              |       |              |
|--|--------------------|-------|--------------|
| Minimum switching current at 24 V DC                 | 20 mA              |       |              |
| Maximum switching voltage                            | DC 24 V / AC 250 V |       |              |
| Utilization category * according to EN IEC 60947-5-1 | $U_e$              | $I_e$ | $\Sigma I_e$ |
|  | 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          |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for information about the utilization category

| Parameter  | Value              |          |              |     |
|--|--------------------|----------|--------------|-----|
| Minimum switching current at 24 V DC                 | 20 mA              |          |              |     |
| Maximum switching voltage                            | DC 24 V / AC 250 V |          |              |     |
| Utilization category * according to EN IEC 60947-5-1 | $U_e$              | $I_e$    | $\Sigma I_e$ |     |
|  | AC-12              | Ue 250 V | 8 A          |     |
|  | AC-15              | Ue 250V  | 3 A          |     |
|  | DC-12              | Ue 24 V  | 2 A          |     |
|  | DC-13              | Ue 24 V  | 2 A          |     |
|  | ESM-BA302          | AC-12    | Ue 250 V     | 8 A |
|  | ESM-BA303          | AC-15    | Ue 250V      | 3 A |
|  |                    | DC-12    | Ue 50 V      | 8 A |
|  |                    | DC-13    | Ue 24 V      | 3 A |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for information about the utilization category

### Ordering table

| Series | Version            | Outputs     | AC/DC 24 V     | AC 115 V       | AC 230 V       |
|--------|--------------------|-------------|----------------|----------------|----------------|
| ESM    | BA<br>Safety relay | 2           | <b>085 610</b> | <b>085 611</b> | <b>085 612</b> |
|        |                    | 2 NO        | ESM-BA201      | ESM-BA202      | ESM-BA203      |
|        |                    | 3           | <b>085 613</b> | <b>087 412</b> | <b>087 413</b> |
|        |                    | 3 NO + 1 NC | ESM-BA301      | ESM-BA302      | ESM-BA303      |

For technical data see page 21



## Safety relay ESM-BT..

- ▶ Up to category 4 according to EN 954-1
- ▶ LED status indicators
- ▶ 1-channel or 2-channel control
- ▶ 4 redundant safety contact of which 1, 2 or 3 contacts time-delayed
- ▶ Time delay can be adjusted between 1 s and 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 connection cables and to shut down the outputs or prevent relay starting if necessary
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

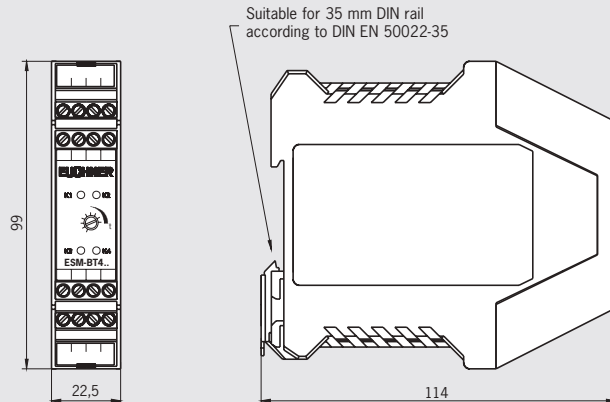
### Time-delayed shutdown

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

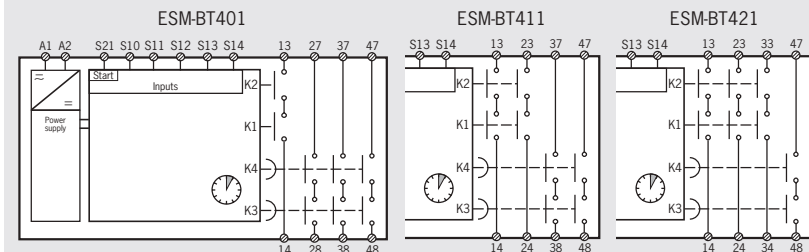
## Safety relay ESM-BT..



### Dimension drawing



### Block diagram



### Technical data outputs

| Parameter  | Value              |       |              |
|--|--------------------|-------|--------------|
| Minimum switching current at 24 V DC                 | 20 mA              |       |              |
| Maximum switching voltage                            | DC 50 V / AC 250 V |       |              |
| Utilization category *<br>according to IEC 60947-5-1 | $U_e$              | $I_e$ | $\Sigma I_e$ |
|  | AC-12              | 250 V | 8 A          |
|  | AC-15              | 250 V | 3 A          |
|  | DC-12              | 50 V  | 8 A          |
|  | DC-13              | 24 V  | 3 A          |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for information about the utilization category

### Ordering table

| Series | Version            | Outputs  | AC/DC 24 V                  |
|--------|--------------------|--|-----------------------------|
| ESM    | BT<br>Safety relay | <b>401</b><br>1 NO non-time-delay<br>3 NO time-delay | <b>090 818</b><br>ESM-BT401 |
|        |                    | <b>411</b><br>2 NO non-time-delay<br>2 NO time-delay | <b>090 819</b><br>ESM-BT411 |
|        |                    | <b>421</b><br>3 NO non-time-delay<br>1 NO time-delay | <b>090 820</b><br>ESM-BT421 |

## Safety relay ESM-2H..



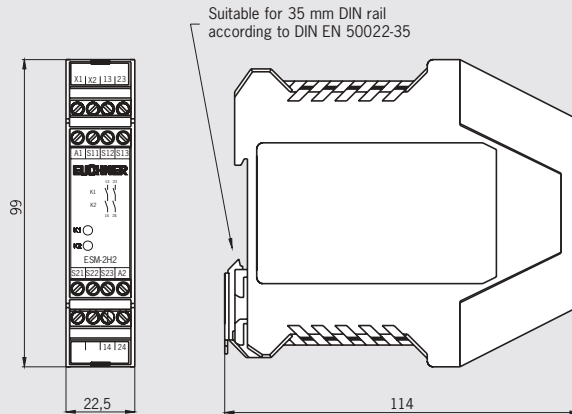
- ▶ Up to category 4 according to EN 954-1
- ▶ Requirement level IIC according to EN 574
- ▶ LED status indicators
- ▶ Operation using 2-hand control
- ▶ 2 redundant safety contacts
- ▶ Short-circuit and earth fault/ground fault monitoring can be selected

### Safety relay ESM-2H..



Cat. 4 STOP 0

### Dimension drawing



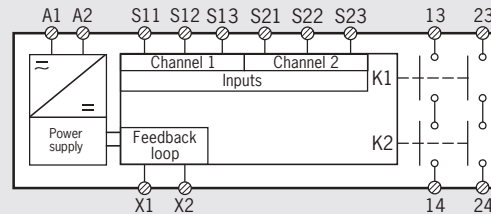
### Relay outputs

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

### Block diagram



### Connection option

By using suitable wiring the following function can be selected:

- ▶ Monitoring of downstream relays or contactors

### Technical data outputs

| Parameter                            | Value              |       |              |
|--------------------------------------|--------------------|-------|--------------|
| Minimum switching current at 24 V DC | 20 mA              |       |              |
| Maximum switching voltage            | DC 24 V / AC 250 V |       |              |
| Utilization category *               | $U_e$              | $I_e$ | $\Sigma I_e$ |
| according to EN IEC 60947-5-1        | 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          |
|                                      |                    |       | 8,4 A        |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for informaton about the utilization category

### Ordering table

| Series | Version      | Outputs | AC/DC 24 V | AC 115 V  | AC 230 V |
|--------|--------------|---------|------------|-----------|----------|
| ESM    | 2H2          | 2       | 085 620    | 098 345   |          |
|        | Safety relay | 2 NO    | ESM-2H201  | ESM-2H202 |          |

## Contact expansion ESM-ES..

- ▶ Up to category 4 according to EN 954-1
- ▶ LED status indicators
- ▶ Control using safety relays
- ▶ 3 redundant safety contacts
- ▶ 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:

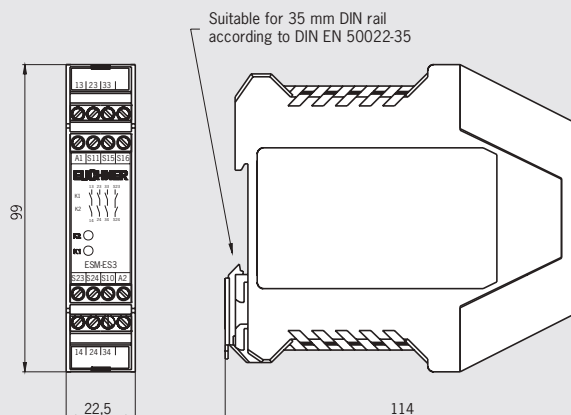
- ▶ Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

## Contact expansion ESM-ES..

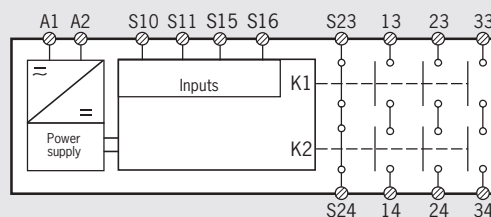


Cat. 4 STOP 0

### Dimension drawing



### Block diagram



### Technical data outputs

| Parameter   | Value              |       |              |
|---|--------------------|-------|--------------|
| Minimum switching current at 24 V DC                    | 20 mA              |       |              |
| Maximum switching voltage                               | DC 50 V / AC 250 V |       |              |
| Utilization category *<br>according to EN IEC 60947-5-1 | $U_e$              | $I_e$ | $\Sigma I_e$ |
|   | 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          |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for information about the utilization category

### Ordering table

| Series | Version                 | Outputs          | AC/DC 24 V           | AC 115 V             | AC 230 V             |
|--------|-------------------------|------------------|----------------------|----------------------|----------------------|
| ESM    | ES<br>Contact expansion | 3<br>3 NO + 1 NC | 085 614<br>ESM-ES301 | 085 615<br>ESM-ES302 | 085 616<br>ESM-ES303 |

## Contact expansion ESM-TE..

- ▶ Up to category 4 according to EN 954-1
- ▶ LED status indicators
- ▶ Control using safety relays
- ▶ 3 redundant time-delayed safety contacts
- ▶ Time delay can be adjusted between 1 s and 30 s
- ▶ 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 connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

### Time-delayed shutdown

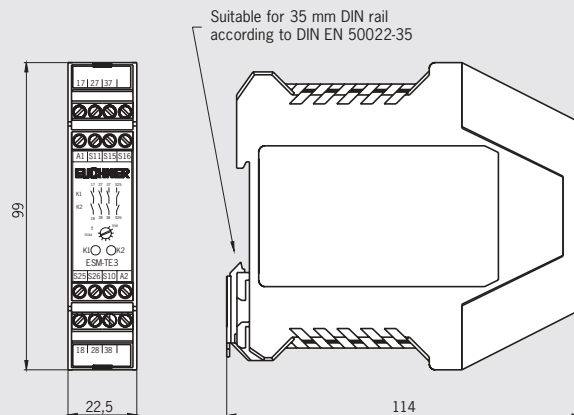
The release time for the time-delay contacts can be set as required using a potentiometer on the safety relay.

## Contact expansion ESM-TE..

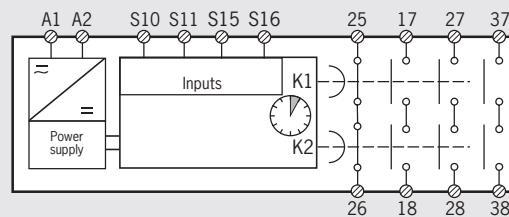


Cat. 4 STOP 1

### Dimension drawing



### Block diagram



### Technical data outputs

| Parameter                            | Value              |       |              |        |
|--------------------------------------|--------------------|-------|--------------|--------|
| Minimum switching current at 24 V DC | 20 mA              |       |              |        |
| Maximum switching voltage            | DC 50 V / AC 250 V |       |              |        |
| Utilization category *               | $U_e$              | $I_e$ | $\Sigma I_e$ |        |
| according to EN IEC 60947-5-1        | AC-12              | 250 V | 6 A          | 10,5 A |
|                                      | AC-15              | 250 V | 4 A          |        |
|                                      | DC-12              | 24 V  | 1,25 A       |        |
|                                      | DC-13              | 24 V  | 2 A          |        |

$U_e$  = Switching voltage

$I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for all safety contacts (cumulative current)

\* See page 29 for information about the utilization category

### Ordering table

| Series | Version           | Outputs                  | AC/DC 24 V | AC 115 V  | AC 230 V  |
|--------|-------------------|--------------------------|------------|-----------|-----------|
| ESM    | TE                | 3                        | 085 617    | 085 618   | 085 619   |
|        | Contact expansion | 3 NO + 1 NC time-delayed | ESM-TE301  | ESM-TE302 | ESM-TE303 |



Overview safety relays ESM

| Safety relays ESM |    |    |    |    |  |
|-------------------|----|----|----|----|--|
| BL                |    |    |    |    | Non-time-delay category 3                          |
|                   | BA |    |    |    | Non-time-delay category 4                          |
|                   |    | BT |    |    | Time-delay/non-time-delay category 4               |
|                   |    |    | 2H |    | 2-hand requirement level III C according to EN 574 |
|                   |    |    |    |    | <b>Contact expansions ESM</b>                      |
|                   |    |    |    | ES | Non-time-delay category 4                          |
|                   |    |    |    |    | TE Time-delay category 4                           |

| Safety relay ESM |    |    |    |    |    | Page |
|------------------|----|----|----|----|----|------|
| BL               | BA | BT | 2H | ES | TE |      |
| ●                |    |    |    |    |    | 22   |
|                  | ●  |    |    |    |    | 23   |
|                  |    | ●  |    |    |    | 24   |
|                  |    |    | ●  |    |    | 24   |
|                  |    |    |    | ●  |    | 25   |
|                  |    |    |    |    | ●  | 25   |

Overview modular safety system ESM-F

| Base units ESM-F |     |     |     |     |     |     |     |       |  |  |
|------------------|-----|-----|-----|-----|-----|-----|-----|-------|--|--|
| BSN              |     |     |     |     |     |     |     |       |  | Non-time-delay category 4  |
|                  | BMN |     |     |     |     |     |     |       |  | Non-time-delay category 4  |
|                  |     |     |     |     |     |     |     |       |  | <b>Input modules ESM-F</b>   |
|                  |     | ISI |     |     |     |     |     |       |  | 2-channel  |
|                  |     |     | IMI |     |     |     |     |       |  | 2-channel diverse (NC contact and NO contact)                        |
|                  |     |     |     | I3I |     |     |     |       |  | 2-channel  |
|                  |     |     |     |     | ILI |     |     |       |  | 2-channel, without short circuit/earth fault/ground fault monitoring |
|                  |     |     |     |     |     |     |     |       |  | <b>Output modules ESM-F</b>  |
|                  |     |     |     |     |     | OSN |     |       |  | Non-time-delay   |
|                  |     |     |     |     |     |     | OTN |       |  | Time-delay (adjustable)  |
|                  |     |     |     |     |     |     |     | OT05N |  | Time-delay (fixed)   |

| Modular safety system ESM-F |     |     |     |     |     |     |     |       |   | Page |
|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-------|---|------|
| BSN                         | BMN | ISI | IMI | I3I | ILI | OSN | OTN | OT05N |   |      |
| ●                           |     |     |     |     |     |     |     |       |   | 26   |
|                             | ●   |     |     |     |     |     |     |       |   | 26   |
|                             |     | ●   |     |     |     |     |     |       |   | 27   |
|                             |     |     | ●   |     |     |     |     |       |   | 27   |
|                             |     |     |     | ●   |     |     |     |       |   | 27   |
|                             |     |     |     |     | ●   |     |     |       |   | 27   |
|                             |     |     |     |     |     | ●   |     |       |   | 27   |
|                             |     |     |     |     |     |     | ●   |       |   | 28   |
|                             |     |     |     |     |     |     |     | ●     |   | 28   |
|                             |     |     |     |     |     |     |     |       | ● | 28   |



## Housing



| Parameter                                 | Value                                  |                             |                  |                     |                     | Unit             |
|---|--|-----------------------------|------------------|---------------------|---------------------|------------------|
| Housing material                          | Polyamide PA6.6                        |                             |                  |                     |                     |                  |
| Dimensions                                | 114 x 99 x 22.5                        |                             |                  |                     |                     | mm               |
| Weight                                    | Approx. 0.25                           |                             |                  |                     |                     | kg               |
| Connection type                           | Connection terminals                   |                             |                  |                     |                     |                  |
| Connection terminals                      | 0.14 ... 2.5                           |                             |                  |                     |                     | mm <sup>2</sup>  |
| Ambient temperature                       | <b>Base</b>                            | <b>ESM-BL2.. ESM-BA2..</b>  | <b>ESM-BA3..</b> | <b>ESM-BT4..</b>    | <b>ESM-2H..</b>     |                  |
|   | at U <sub>B</sub> = 24 V DC            | -15 ... 60                  | -15 ... 40       | -15 ... 40          | -15 ... 40          | °C               |
|   | at U <sub>B</sub> = 115/230 V AC       | -15 ... 40                  | -15 ... 40       | -                   | -                   | °C               |
|   | <b>Contact expansion</b>               | <b>ESM-ES3.. ESM-TE3...</b> |                  |                     |                     |                  |
|   | at U <sub>B</sub> = 24 V DC            | -15 ... 60                  |                  |                     |                     | °C               |
|   | at U <sub>B</sub> = 115/230 V AC       | -15 ... 40                  |                  |                     |                     | °C               |
| Degree of protection acc. to EN IEC 60529 | IP 20                                  |                             |                  |                     |                     |                  |
| Degree of contamination                   | 2                                      |                             |                  |                     |                     |                  |
| Mounting                                  | 35 mm DIN rail acc. to DIN EN 50022-35 |                             |                  |                     |                     |                  |
| Life                                      | <b>Base</b>                            | <b>ESM-BL2.. ESM-BA2..</b>  | <b>ESM-BA3..</b> | <b>ESM-BT4..</b>    | <b>ESM-2H..</b>     |                  |
|   | Mechanical                             | 1 x 10 <sup>7</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>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-BL2..



| Parameter   | Value                                  |                        |                      | Unit                   |
|---|--|------------------------|----------------------|------------------------|
| Operating voltage   | ESM-BL201                              | 24 ± 10% <sup>1)</sup> |                      | V AC/DC                |
|   | ESM-BL202                              | 115 ± 10%              |                      | V AC                   |
|   | ESM-BL203                              | 230 ± 10%              |                      | V AC                   |
| Reverse polarity protection   | On ESM-BL201                           |                        |                      |                        |
| Rated supply frequency  | 50 ... 60                              |                        |                      | Hz                     |
| Power consumption   | Approx. 4                              |                        |                      | VA                     |
| Control voltage for start button                                    | 18.6 ... 26                            |                        |                      | V DC                   |
| Control cable length (cross-section 0.75 mm <sup>2</sup> )          | Max. 1000                              |                        |                      | m                      |
| Control current for start button                                    | Approx. 40                             |                        |                      | mA                     |
| Contact fuses   | T4 / F6                                |                        |                      | A                      |
| Rated impulse withstand voltage                                     | 2.5                                    |                        |                      | kV                     |
| Leakage path and air gap acc. to DIN VDE 0110-1                     | 4                                      |                        |                      | kV                     |
| <b>Safety contacts</b>  | <b>2 NO contacts (redundant)</b>       |                        |                      |                        |
| Minimum switching current at 24 V DC                                | 20                                     |                        |                      | mA                     |
| Maximum switching voltage   | 24                                     |                        |                      | V DC                   |
|   | 250                                    |                        |                      | V AC                   |
| Breaking capacity acc. to   | 6 A AC 250 V<br>2 A DC 24 V            |                        |                      |                        |
| Utilization category <sup>2)</sup><br>according to EN IEC 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 indicators  | 2, status display for relays K1 and K2 |                        |                      |                        |

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

2) See page 29 for information about the utilization category.

U<sub>e</sub> = Switching voltage      I<sub>e</sub> = Maximum switching current per contact

Σ I<sub>e</sub> = Maximum switching current for all safety contacts (cumulative current)

## Connection ESM-BA2..



| Parameter   | Value                                  |                        | Unit                 |
|---|--|------------------------|----------------------|
| Operating voltage   | ESM-BA201                              | 24 ± 10% <sup>1)</sup> | V AC/DC              |
|   | ESM-BA202                              | 115 ± 10%              | V AC                 |
|   | ESM-BA203                              | 230 ± 10%              | V AC                 |
| Reverse polarity protection   | On ESM-BA201                           |                        |                      |
| Rated supply frequency  | 50 ... 60                              |                        | Hz                   |
| Power consumption   | Approx. 4                              |                        | VA                   |
| Control voltage for start button                                    | 18.6 ... 26                            |                        | V DC                 |
| Control cable length (cross-section 0.75 mm <sup>2</sup> )          | Max. 1000                              |                        | m                    |
| Control current for start button                                    | Approx. 40                             |                        | mA                   |
| Contact fuses   | T4 / F6                                |                        | A                    |
| Rated impulse withstand voltage                                     | 2.5                                    |                        | kV                   |
| Leakage path and air gap acc. to DIN VDE 0110-1                     | 4                                      |                        | kV                   |
| <b>Safety contacts</b>  | <b>2 NO contacts (redundant)</b>       |                        |                      |
| Minimum switching current at 24 V DC                                | 20                                     |                        | mA                   |
| Maximum switching voltage   | 24                                     |                        | V DC                 |
|   | 250                                    |                        | V AC                 |
| Utilization category <sup>2)</sup><br>according to EN IEC 60947-5-1 |  | <b>U<sub>e</sub></b>   | <b>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                  |
|   |  |                        | Σ I <sub>e</sub>     |
|   |  |                        | 12 A                 |
| LED indicators  | 2, status display for relays K1 and K2 |                        |                      |

## Connection ESM-BA3..



| Parameter   | Value                                  |                        | Unit                 |
|---|--|------------------------|----------------------|
| Operating voltage   | ESM-BA301                              | 24 ± 10% <sup>1)</sup> | V AC/DC              |
|   | ESM-BA302                              | 115 ± 10%              | V AC                 |
|   | ESM-BA303                              | 230 ± 10%              | V AC                 |
| Reverse polarity protection   | On ESM-BA201                           |                        |                      |
| 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. 1000                              |                        | m                    |
| Control current for start button                                    | Approx. 60                             |                        | mA                   |
| Contact fuses   | Slow-blow T6 / quick-blow F8           |                        | A                    |
| Rated impulse withstand voltage                                     | 2.5                                    |                        | kV                   |
| Leakage path and air gap acc. to DIN VDE 0110-1                     | 4                                      |                        | kV                   |
| <b>Safety contacts</b>  | <b>3 NO contacts (redundant)</b>       |                        |                      |
| Minimum switching current at 24 V DC                                | 20                                     |                        | mA                   |
| Maximum switching voltage   | 50                                     |                        | V DC                 |
|   | 250                                    |                        | V AC                 |
| Utilization category <sup>2)</sup><br>according to EN IEC 60947-5-1 | ESM-BA301                              |                        | <b>U<sub>e</sub></b> |
|   |  | AC-12                  | 250 V                |
|   |  | AC-15                  | 250 V                |
|   |  | DC-12                  | 24 V                 |
|   |  | DC-13                  | 24 V                 |
|   | ESM-BA302/303                          | AC-12                  | 250 V                |
|   |  | AC-15                  | 250 V                |
|   |  | DC-12                  | 50 V                 |
|   |  | DC-13                  | 24 V                 |
|   |  |                        |                      |
|   |  | 8 A                    |                      |
|   |  | 3 A                    |                      |
|   |  | 2 A                    |                      |
|   |  | 2 A                    |                      |
|   |  | 8 A                    |                      |
|   |  | 3 A                    |                      |
|   |  | 8 A                    |                      |
|   |  | 3 A                    |                      |
|   |  | Σ I <sub>e</sub>       |                      |
|   |  | 15 A                   |                      |
| LED indicators  | 2, status display for relays K1 and K2 |                        |                      |
| <b>Auxiliary contacts</b>   | <b>1 NC contact</b>                    |                        |                      |
| Maximum switching voltage   | 24                                     |                        | V DC                 |
|   | 250                                    |                        | V AC                 |
| Utilization category <sup>2)</sup><br>according to EN IEC 60947-5-1 |  | <b>U<sub>e</sub></b>   | <b>I<sub>e</sub></b> |
|   | AC-12                                  | 250 V                  | 2 A                  |
|   | AC-15                                  | 230 V                  | 2 A                  |
|   | DC-12                                  | 24 V                   | 1,25 A               |
|   | DC-13                                  | 24 V                   | 1,25 A               |

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

2) See page 29 for information about the utilization category.

U<sub>e</sub> = Switching voltage      I<sub>e</sub> = Maximum switching current per contact

Σ I<sub>e</sub> = Maximum switching current for 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                           | VA                   |                        |      |
| Time-delay 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. 1000                             | m                    |                        |      |
| Control current for start button                                    | Approx. 190                           | mA                   |                        |      |
| Contact fuses   | Slow-blow T6 / quick-blow F8          | A                    |                        |      |
| Rated impulse withstand voltage                                     | 2.5                                   | kV                   |                        |      |
| Leakage path and air gap acc. to DIN VDE 0110-1                     | 4                                     | kV                   |                        |      |
| <b>Safety contacts</b>  | <b>4 NO contacts (redundant)</b>      |                      |                        |      |
| Minimum switching current at 24 V DC                                | 20                                    | mA                   |                        |      |
| Maximum switching voltage   | 50                                    | V DC                 |                        |      |
|   | 250                                   | V AC                 |                        |      |
| Breaking capacity acc. to $\text{U}_{\text{b}}$                     | 8 A AC 250 V                          |                      |                        |      |
|   | 2 A DC 24 V                           |                      |                        |      |
| Utilization category <sup>2)</sup><br>according to EN IEC 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                    | 15 A |
|   | AC-15                                 | 250 V                | 3 A                    |      |
|   | DC-12                                 | 50 V                 | 8 A                    |      |
| DC-13   | 24 V                                  | 3 A                  |                        |      |
| LED indicators  | 4, status display for relays K1 to K4 |                      |                        |      |

## Connection ESM-2H..



| Parameter   | Value                                  | Unit                   |                        |       |
|---|--|------------------------|------------------------|-------|
| Operating voltage   | ESM-2H201                              | 24 ± 10% <sup>1)</sup> |                        |       |
|   | ESM-2H202                              | 115 ± 10%              |                        |       |
| Reverse polarity protection   | Yes                                    |                        |                        |       |
| Rated supply frequency  | 50 ... 60                              | Hz                     |                        |       |
| Power consumption   | Approx. 4                              | VA                     |                        |       |
| Control voltage at buttons  | 18.6 ... 26                            | V DC                   |                        |       |
| Control cable length (cross-section 0.75 mm <sup>2</sup> )          | Max. 1000                              | m                      |                        |       |
| Control current for start button                                    | Approx. 40                             | mA                     |                        |       |
| Contact fuses   | T4 / F6                                | A                      |                        |       |
| Rated impulse withstand voltage                                     | 2.5                                    | kV                     |                        |       |
| Leakage path and air gap acc. to DIN VDE 0110-1                     | 4                                      | kV                     |                        |       |
| <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                     |                        |       |
| Minimum switching current at 24 V DC                                | 20                                     | mA                     |                        |       |
| Maximum switching voltage   | 24                                     | V DC                   |                        |       |
|   | 250                                    | V AC                   |                        |       |
| Breaking capacity acc. to $\text{U}_{\text{b}}$                     | 6 A AC 250 V                           |                        |                        |       |
|   | 2 A DC 24 V                            |                        |                        |       |
| Utilization category <sup>2)</sup><br>according to EN IEC 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                    | 8,4 A |
|   | AC-15                                  | 230 V                  | 4 A                    |       |
|   | DC-12                                  | 24 V                   | 1,25 A                 |       |
| DC-13   | 24 V                                   | 2 A                    |                        |       |
| LED indicators  | 2, status display for relays K1 and K2 |                        |                        |       |

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

2) See page 29 for information about the utilization category.

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

I<sub>e</sub> = Maximum switching current per contact

Σ I<sub>e</sub> = Maximum switching current for all safety contacts (cumulative current)

## Connection ESM-ES3..



| Parameter   |           | Value                                  | Unit                           |
|---|-----------|--|--------------------------------|
| Operating voltage   | ESM-ES301 | 24 ± 10% <sup>1)</sup>                 | V AC/DC                        |
|   | ESM-ES302 | 115 ± 10%                              | V AC                           |
|   | ESM-ES303 | 230 ± 10%                              | V AC                           |
| Reverse polarity protection   |           | On ESM-ES301                           |                                |
| Rated supply frequency  |           | 50 ... 60                              | Hz                             |
| Power consumption   |           | Approx. 4                              | VA                             |
| Control voltage at inputs   |           | 18.6 ... 26                            | V DC                           |
| Control cable length (cross-section 0.75 mm <sup>2</sup> )          |           | Max. 1000                              | m                              |
| Contact fuses   |           | T4 / F6                                | A                              |
| Rated impulse withstand voltage                                     |           | 2.5                                    | kV                             |
| Leakage path and air gap acc. to DIN VDE 0110-1                     |           | 4                                      | kV                             |
| Cumulative current of all contacts acc. to $\Sigma I_e$             |           | 10.5                                   | A                              |
| <b>Safety contacts</b>  |           | <b>3 NO contacts (redundant)</b>       |                                |
| Minimum switching current at 24 V DC                                |           | 20                                     | mA                             |
| Maximum switching voltage   |           | 50                                     | V DC                           |
|   |           | 250                                    | V AC                           |
| Breaking capacity acc. to $\Sigma I_e$                              |           | 6 A AC 250 V<br>2 A DC 24 V            |                                |
| Utilization category <sup>2)</sup><br>according to EN IEC 60947-5-1 |           | <b><math>U_e</math></b>                | <b><math>I_e</math></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                            |
|   |           |  | <b><math>\Sigma I_e</math></b> |
|   |           |  | 12 A                           |
| LED indicators  |           | 2, status display for relays K1 and K2 |                                |
| <b>Auxiliary contacts</b>   |           | <b>1 NC contact</b>                    |                                |
| Continuous current max.   |           | 500                                    | mA                             |
| Maximum switching voltage   |           | 24                                     | V AC/DC                        |

## Connection ESM-TE3..



| Parameter   |           | Value                                  | Unit                           |
|---|-----------|--|--------------------------------|
| Operating voltage   | ESM-TE301 | 24 ± 10% <sup>1)</sup>                 | V AC/DC                        |
|   | ESM-TE302 | 115 ± 10%                              | V AC                           |
|   | ESM-TE303 | 230 ± 10%                              | V AC                           |
| Reverse polarity protection   |           | On ESM-TE301                           |                                |
| Rated supply frequency  |           | 50 ... 60                              | Hz                             |
| Power consumption   |           | Approx. 4                              | VA                             |
| Time-delay range  |           | 1 ... 30                               | s                              |
| Control voltage at inputs   |           | 18.6 ... 26                            | V DC                           |
| Control cable length (cross-section 0.75 mm <sup>2</sup> )          |           | Max. 1000                              | m                              |
| Contact fuses   |           | T4 / F6                                | A                              |
| Rated impulse withstand voltage                                     |           | 2.5                                    | kV                             |
| Leakage path and air gap acc. to DIN VDE 0110-1                     |           | 4                                      | kV                             |
| Cumulative current of all contacts acc. to $\Sigma I_e$             |           | 10.5                                   | A                              |
| <b>Safety contacts</b>  |           | <b>3 NO contacts (redundant)</b>       |                                |
| Minimum switching current at 24 V DC                                |           | 20                                     | mA                             |
| Maximum switching voltage   |           | 50                                     | V DC                           |
|   |           | 250                                    | V AC                           |
| Breaking capacity acc. to $\Sigma I_e$                              |           | 6 A AC 250 V<br>2 A DC 24 V            |                                |
| Utilization category <sup>2)</sup><br>according to EN IEC 60947-5-1 |           | <b><math>U_e</math></b>                | <b><math>I_e</math></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                            |
|   |           |  | <b><math>\Sigma I_e</math></b> |
|   |           |  | 10,5 A                         |
| LED indicators  |           | 2, status display for relays K1 and K2 |                                |
| <b>Auxiliary contacts</b>   |           | <b>1 NC contact</b>                    |                                |
| Continuous current max.   |           | 500                                    | mA                             |
| Maximum switching voltage   |           | 24                                     | V DC                           |

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

2) See page 29 for information about the utilization category.

$U_e$  = Switching voltage       $I_e$  = Maximum switching current per contact

$\Sigma I_e$  = Maximum switching current for 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 the relay has switched off due to a request from a safety component connected, the relay must be re-started.

#### ► Automatic start

The relay switches on automatically as soon as the safety component connected changes back to the safe state. On this topic note the information in EN 954-1, section 5.5, that renewed starting of the machine can only occur automatically if it is ensured that there can be no dangerous 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. Prior to starting the relay 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 type of connection is suitable for categories 1 or 2 according to EN 954-1.

### Dual-channel safety circuit

Two contacts of which at least one is a positively driven contact are connected to the relay. This type of connection is suitable for categories 3 or 4 according to EN 954-1.

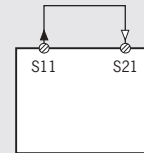
### Utilization category according to EN IEC 60947-5-1 (excerpt)

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

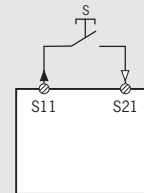
## Connection examples safety relays ESM

### Safety relay ESM-BL..

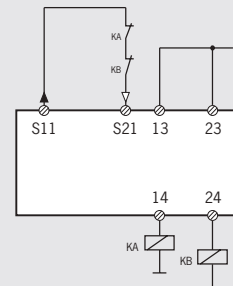
Automatic start without integration of the feedback loop



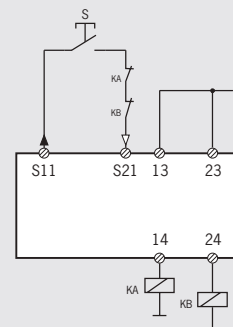
Manual start without integration of the feedback loop



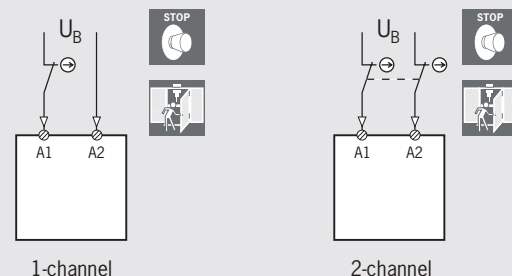
Automatic start with integration of the feedback loop



Manual start with integration of the feedback loop

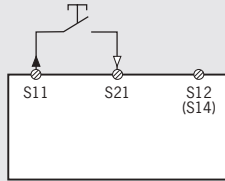


EMERGENCY STOP/safety circuit

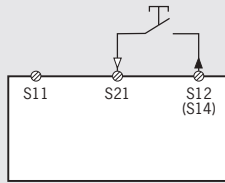


Safety relays ESM-BA../ESM-BT..

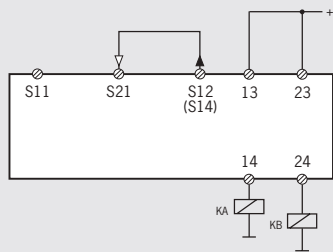
Monitored start without integration of the feedback loop



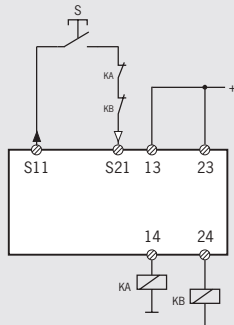
Un-monitored start without integration of the feedback loop



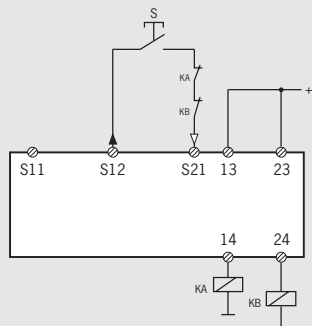
Automatic start without integration of the feedback loop



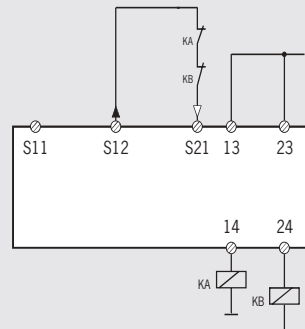
Monitored start with integration of the feedback loop



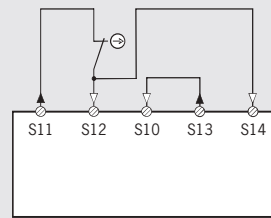
Un-monitored start with integration of the feedback loop



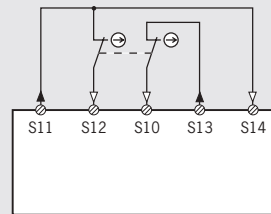
Automatic start with integration of the feedback loop



1-channel EMERGENCY STOP/safety circuit

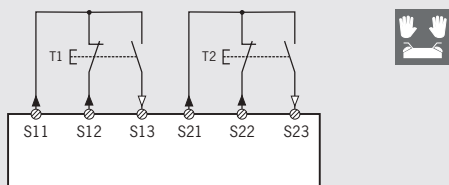


2-channel EMERGENCY STOP/safety circuit with ground fault/short circuit detection

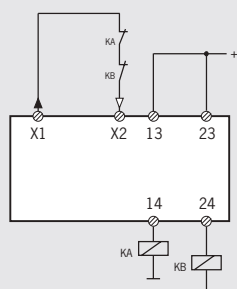


## Safety relay ESM-2H2..

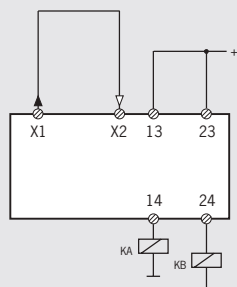
Monitoring a 2-hand control



With integration of the feedback loop

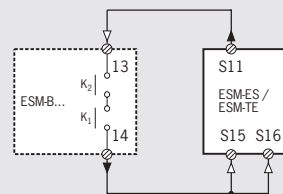


Without integration of the feedback loop

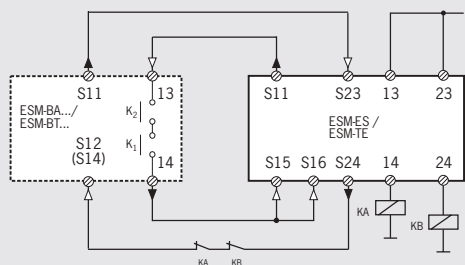


## Safety contact expansion ESM-ES../ESM-TE..

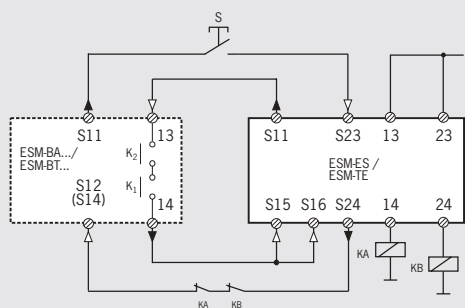
Integration of the contact expansion



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



## Connection examples safety system ESM-F

**Monitored start**

For a monitored start, a start button must be connected between the terminals SO and SI.  
The safety contacts close when the start button is actuated.

**Automatic start**

For an automatic start, a bridge must be connected between the terminals SI and SA.  
The safety contacts close immediately if all safety circuits connected are closed.

**Safety inputs on the ESM-F-BSN...**

You can connect two dual-channel safety switches (e.g. two emergency stops) to the base unit. In the lower example only one safety switch has been connected, the unused safety inputs must therefore be connected together.

**Safety inputs on the ESM-F-BMN...**

It is possible to connect two safety switches with one normally closed contact and one normally open contact (e.g. CMS from EUCHNER) to the base unit.

**Safety contacts without feedback loop**

**Safety contacts with feedback loop**

The base unit has three redundant, fault monitored safety contacts that shut down immediately if one of the safety circuits connected is interrupted or a fault occurs. To check the switching state on a connected load, the auxiliary contacts on a contactor or relay can be connected to terminals Y1 and Y2 to form a feedback loop. As supplied, the terminals Y1 and Y2 are connected together. The system can be expanded with further safety contacts using additional output modules. The function of the safety contacts and the feedback loop is the same as for the base unit.