

TYPE 4 SAFETY PROTECTION DEVICE

FOR SAFETY LIGHT CURTAINS/BARRIERS



### MAIN FEATURES

- For safety light curtains and access control barriers, emergency stop, door switch
- Safety Integrity Level (SIL) 3 according to IEC/EN 61508
- Claimed Level (SIL CL) 3 according to IEC/EN 62061
- Performance Level (PL) e and category 4 according to EN/ISO 13849-1
- Safety category 4 according to EN 954-1
- Certified TÜV, CE and UL
- Output: 3 N.O. safety contacts / 1 N.C. monitoring contact
- Manual or automatic restart
- LED indicator for channel 1, 2 and power supply
- 22.5 mm wide, DIN-rail-mountable housing

### APPLICATION AREA

The safety relay can be used to monitor electrosensitive protective equipment with monitored active switching output (OSSD) in accordance with EN 61496 as well as emergency stop and safety door locking mechanisms.

Depending on the external wiring, up to category 4, PL e according to EN ISO 13849-1 or SILCL 3 according to EN 62061 can be achieved.

The safety relay is equipped with three enabling current paths that drop out without delay corresponding to stop category 0 according to EN 60204-1.

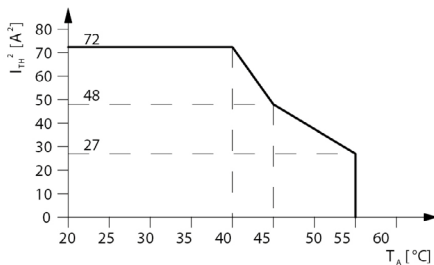


Figure 1 Derating curve

### TECHNICAL DATA

#### INPUT DATA

Nominal input voltage $U_N$	24 V DC
Input voltage range (factor)	0.85 ... 1.1
Typical input current	70 mA DC
Voltage at input/start and feedback circuit	approx. 24 V DC
Typical response time	110 ms (manual start) / 125 ms (automatic start)
Typical release time	10 ms
Recovery time	1 s
Operating voltage display	Green LED
Status display	Green LED
Protective circuit	Fuse PTC resistor

#### OUTPUT DATA

Contact type	3 enabling current paths / 1 signaling current path
Contact material	AgSnO <sub>2</sub> , + 0.2 µm Au
Minimum switching voltage	15 V AC/DC
Maximum switching voltage	250 V AC/DC
Limiting continuous current	6 A
Maximum inrush current	6 A
Inrush current, minimum	25 mA
Sq. Total current	72 A <sup>2</sup> ( $I_{TH}^2 = I_1^2 + I_2^2 + I_3^2$ ) (see derating curve)
Interrupting rating (ohmic load) max.	144 W (24 V DC, $\tau = 0$ ms) 288 W (48 V DC, $\tau = 0$ ms) 77 W (110 V DC, $\tau = 0$ ms) 88 W (220 V DC, $\tau = 0$ ms) 1500 VA (250 V AC, $\tau = 0$ ms)
Maximum interrupting rating (inductive load)	48 W (24 V DC, $\tau = 40$ ms) 40 W (48 V DC, $\tau = 40$ ms) 35 W (110 V DC, $\tau = 40$ ms) 33 W (220 V DC, $\tau = 40$ ms)

**TECHNICAL DATA**

Switching capacity min.	0.4 W
Mechanical service life	Approx. $10^7$ cycles
Switching capacity (360/h cycles)	6 A (24 V DC) / 5 A (230 V AC)
Switching capacity (3600/h cycles)	3 A (24 V (DC13)) / 3 A (230 V (AC 15))
Output fuse	10 A gL/gG NEOZED (N/O contact)

**GENERAL DATA**

Relay type	Electromechanically forcibly guided, dust-proof relay
Nominal operating mode	100% operating factor
Degree of protection	IP 20
Min. degree of protection of inst. location	IP 54
Mounting position	any
Mounting type	DIN rail mounting
Air and creepage distances between the power circuits	DIN EN 50178/VDE 0160
Rated insulation voltage	250 V
Rated surge voltage / insulation	4 kV / basic insulation (safe isolation, reinforced insulation, and 6 kV between A1- A2 / logic / enabling and signaling current paths)
Pollution degree	2
Surge voltage category	III

**DIMENSIONS**

W x H x D	22.5 x 99 x 114.5 mm
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**CONNECTION DATA**

Conductor cross section, solid	0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Conductor cross section, stranded	0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Conductor cross section AWG / kcmil	24 ... 12
Stripping length	7 mm

**SCREW CONNECTION****AMBIENT CONDITIONS**

Ambient temperature (operation)	-20°C ... 55 °C
Ambient temperature (storage / transport)	-40°C ... 70 °C
Max. permissible relative humidity (operation)	75 %
Max. permissible humidity (storage / transport)	75 %

**CERTIFICATIONS / APPROVALS**

Approvals	TÜV, UL, CE
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**SAFETY DATA**

Stop category according to IEC 60204	0
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**SAFETY PARAMETERS FOR IEC 61508 - HIGH DEMAND**

SIL	3
PFH <sub>d</sub>	$5.56 \times 10^{-10}$
Demand rate	12 months
Proof test interval	240 months

**SAFETY PARAMETERS FOR IEC 61508 - LOW DEMAND**

SIL	3
MTTF <sub>d</sub>	17913 years
PFD <sub>avg</sub>	$1.50 \times 10^{-4}$
Proof test interval	75 months

**SAFETY CHARACTERISTIC DATA ACCORDING TO EN ISO 13849**

Category	4
Performance level	e
CCF	Passed

**STRUCTURE AND OPERATION (BLOCK DIAGRAM)**

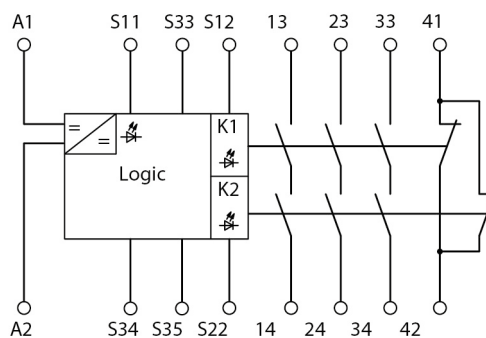


Figure 2 Block diagram

DESIGNATION	EXPLANATION
A1, A2	Supply voltage connection (+24 V DC, GND)
S11, S12, S22	Input circuit
S33, S34, S35	Start circuit
13 / 14	Undelayed enabling current path 1
23 / 24	Undelayed enabling current path 2
33 / 34	Undelayed enabling current path 3
41 / 42	Signaling current path

PART NUMBER	PART REFERENCE
605-000-786	YRB-4EML-31S

**SAFETY NOTES**



**WARNING: Risk of electric shock**

During operation, parts of electrical switching devices carry hazardous voltages. Before working on the switching device, disconnect the power. Please observe the safety regulations of electrical engineering and industrial safety and liability associations! Disregarding these safety regulations may result in death, serious personal injury or damage to equipment. Startup, mounting, modifications, and upgrades should only be carried out by a skilled electrical engineer!



**WARNING: Risk of automatic machine restart!**

For emergency stop applications, the machine must be prevented from restarting automatically by a higher-level control system. Protective covers must not be removed when operating electrical switching devices.



**WARNING: Danger due to faulty devices!**

The devices may be damaged following an error and correct operation can no longer be ensured. In the event of an error, replace the device immediately. Repairs to the device, especially if the housing must be opened, may only be carried out by the manufacturer or authorized persons. Otherwise the warranty is invalidated.



**NOTE: Risk of damage to equipment due to incorrect installation!**

For reliable operation, the safety relay must be installed in housing protected from dust and humidity (IP 54). Carry out wiring according to the application. Refer to the "Application examples" section for this.



**NOTE: Risk of damage to equipment due to noise emissions**

When operating relay modules the operator must meet the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4) on the contact side and, if required, take appropriate measures.

For the diagnostic description, please refer to the application manual for PSR safety relays.

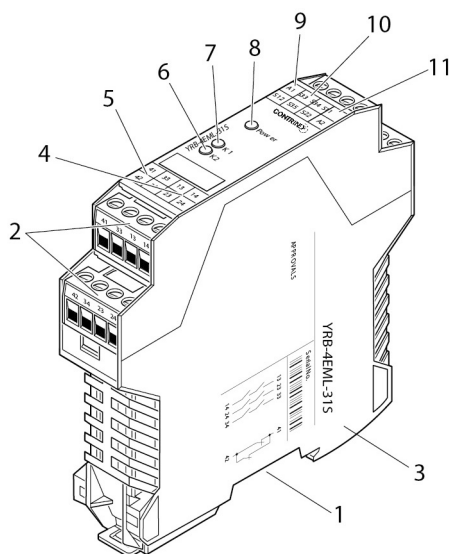


Figure 3 YRB-4EML-31S

**KEY**

DESIGNATION	EXPLANATION
1	Metal lock for mounting on the DIN rail
2	COMBICON plug-in screw terminal blocks
3	Product information on labelling
4	13/14, 23/24, 33/34 enabling current paths
5	41/42 signaling current path
6	LED status indicator, green - K2
7	LED status indicator, green - K1
8	LED status indicator, green - Power
9	A1, A2 - supply voltage connection
10	S33, S34, S35 - start circuit (activating circuit)
11	S11, S12, S22 input circuit

**APPLICATION EXAMPLE**

Two-channel light grid monitoring (cross-circuit detection via light grid)

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 4, PL e (EN ISO 13849-1), SILCL 3 (EN 62061)

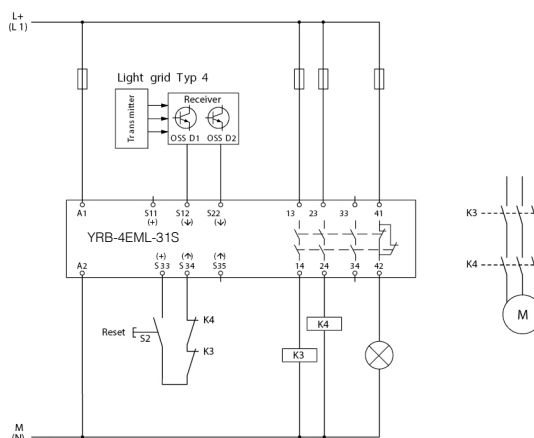


Figure 4 Two-channel light grid monitoring

**APPLICATION EXAMPLE**

Two-channel emergency stop circuit without cross-circuit detection, with monitored reset button

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 3, PL d (EN ISO 13849-1), SILCL 2 (EN 62061)

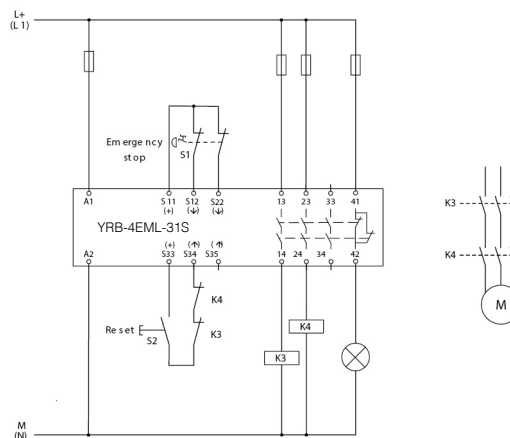


Figure 5 Two-channel emergency stop circuit without cross-circuit detection

Single-channel emergency stop monitoring

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 1, PL c (EN ISO 13849-1), SILCL 1 (EN 62061)

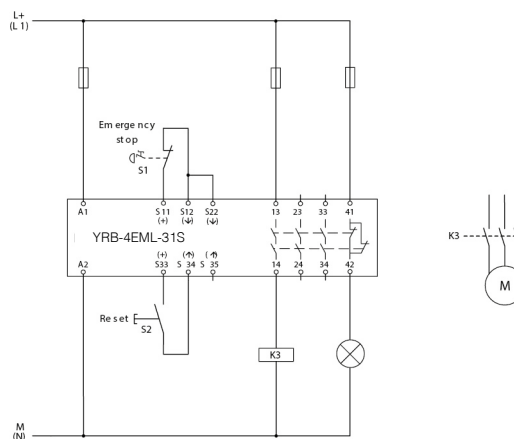


Figure 6 Single-channel emergency stop circuit with monitored reset button

Two-channel safety door monitoring without cross-circuit detection, with monitored reset button

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 3, PL d (EN ISO 13849-1), SILCL 2 (EN 62061)

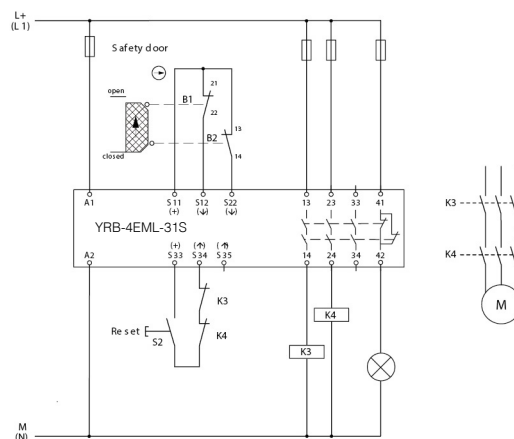


Figure 7 Two-channel safety door monitoring without cross-circuit detection



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- Performance Level (PL) e and category 4 according to EN/ISO 13849-1
- Safety category 4 according to EN 954-1
- Certified TÜV, CE and UL
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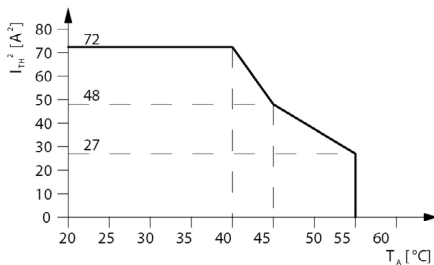


Figure 1 Derating curve

#### TECHNICAL DATA

##### INPUT DATA

Nominal input voltage U <sub>N</sub>	24 V AC/DC
Input voltage range (factor)	0.85 ... 1.1
Typical input current	150 mA AC / 70 mA DC
Voltage at input/start and feedback circuit	approx. 24 V DC
Typical response time	25 ms (manual start) / 100 ms (automatic start)
Typical release time	10 ms
Recovery time	1 s
Operating voltage display	Green LED
Status display	Green LED
Protective circuit	Fuse PTC resistor

##### OUTPUT DATA

Contact type	3 enabling current paths / 1 signaling current path
Contact material	AgSnO <sub>2</sub> , + 0.2 μm Au
Minimum switching voltage	15 V AC/DC
Maximum switching voltage	250 V AC/DC
Limiting continuous current	6 A
Maximum inrush current	6 A
Inrush current, minimum	25 mA
Sq. Total current	72 A <sup>2</sup> (I <sub>TH</sub> <sup>2</sup> = I <sub>1</sub> <sup>2</sup> + I <sub>2</sub> <sup>2</sup> + I <sub>3</sub> <sup>2</sup> ) (see derating curve)
Interrupting rating (ohmic load) max.	144 W (24 V DC, τ = 0 ms) 288 W (48 V DC, τ = 0 ms) 77 W (110 V DC, τ = 0 ms) 88 W (220 V DC, τ = 0 ms) 1500 VA (250 V AC, τ = 0 ms)
Maximum interrupting rating (inductive load)	48 W (24 V DC, τ = 40 ms) 40 W (48 V DC, τ = 40 ms) 35 W (110 V DC, τ = 40 ms) 33 W (220 V DC, τ = 40 ms)

## TECHNICAL DATA

Switching capacity min.	0.4 W
Mechanical service life	Approx. 10 <sup>7</sup> cycles
Switching capacity (360/h cycles)	6 A (24 V DC) / 5 A (230 V AC)
Switching capacity (3600/h cycles)	3 A (24 V (DC13)) / 3 A (230 V (AC 15))
Output fuse	10 A gL/gG NEOZED (N/O contact)

## GENERAL DATA

Relay type	Electromechanically forcibly guided, dust-proof relay
Nominal operating mode	100% operating factor
Degree of protection	IP 20
Min. degree of protection of inst. location	IP 54
Mounting position	any
Mounting type	DIN rail mounting
Air and creepage distances between the power circuits	DIN EN 50178/VDE 0160
Rated insulation voltage	250 V
Rated surge voltage / insulation	4 kV / basic insulation (safe isolation, reinforced insulation, and 6 kV between A1- A2 / logic / enabling and signaling current paths)
Pollution degree	2
Surge voltage category	III

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Conductor cross section AWG / kcmil	24 ... 12
Stripping length	7 mm

## SCREW CONNECTION

## AMBIENT CONDITIONS

Ambient temperature (operation)	-20°C ... 55 °C
Ambient temperature (storage / transport)	-40°C ... 70 °C
Max. permissible relative humidity (operation)	75 %
Max. permissible humidity (storage / transport)	75 %

## CERTIFICATIONS / APPROVALS

Approvals	TÜV, UL, CE
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## SAFETY DATA

Stop category according to IEC 60204	0
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## SAFETY PARAMETERS FOR IEC 61508 - HIGH DEMAND

SIL	3
PFH <sub>d</sub>	5.56 x 10 <sup>-10</sup>
Demand rate	12 months
Proof test interval	240 months

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SIL	3
MTTF <sub>d</sub>	17913 years
PFD <sub>avg</sub>	1.50 x 10 <sup>-4</sup>
Proof test interval	75 months

## SAFETY CHARACTERISTIC DATA ACCORDING TO EN ISO 13849

Category	4
Performance level	e
CCF	Passed