ELMON

Sicherheitsschaltgerät / Safety Relais / Relais de sécurité

ASO Safety Solutions

ELMON rail 35-32 ELMON rail 35-82

1. Contents

We reserve the right to make technical and operationally relevant changes to the products and devices described in this documentation at any time and without prior notice.

2. General safety regulations and protective measures

- The manufacturer and users of the plant / machine on which the protection is being used are responsible for implementing and following all applicable safety regulations and rules.
- When used in conjunction with the higher-order controller, the protection guarantees functional safety, but not the safety of the entire plant / machine. The safety of the entire plant / machine must, therefore, be assessed in accordance with machinery directive 2006/42/EC or appropriate product norm before using the device.
- The operating manual must always be available at the place of installation of the protection.
  They must be read thoroughly and observed by all persons involved in the operation, maintenance and servicing of the protection.
- The protection must only be installed and commissioned by professionals familiar with these operating instructions and the applicable operational safety and accident prevention regulations.
  All of the instructions provided in these operating instructions must be observed and followed.
  All electrical work must only be performed by skilled electricians.
- All relevant electrical engineering and Employer's Liability Insurance Association safety regulations must be observed.
- During work on the switching unit, it is to be switched to zero potential, checked to ensure that it is at zero potential and protected against being restarted.
- If the potential-free contacts of the relay outputs are supplied externally with a dangerous voltage, make certain that these outputs are also switched off during work on the switching unit.
- The switching unit does not contain any components that require servicing by the user.
  Unauthorised conversions and repairs made to the switching unit will void all guarantees and the manufacturer’s liability.
- The protection system is to be professionally inspected at appropriate intervals and be documented in such a way that it is comprehensible at all times.

Safety advice

- The switching unit enables operation at 230 V (115 V for ELMON rail 35-82) or at 24 V. Connecting the operating voltage to the wrong terminals can destroy the switching unit.
- The switching unit is to be installed in a switching cabinet.
- Do not install in the immediate vicinity of strong sources of heat.
- For capacitive and inductive loads, ensure adequate protective circuits.

For the design of the safety system to conform to engineer standards acc. to EN ISO 13849-1:2008 category 2, the safety system must be tested prior to each dangerous movement of the plant / machine. Without testing, the operation or wiring of the ELMON rail 35 safety relay does not satisfy these safety requirements.

The manufacturer assumes no liability in the event of non-observance or intentional abuse.

3. General

The ELMON rail 35 switching unit, designed with two channels, is used for evaluating safety contact mats and for safeguarding locations where there is a risk of crushing and cutting through the use of safety contact edges and safety bumpers (sensors).

Two separate sensor circuits can be connected to the ELMON rail 35 switching unit, whereby each acts on one switching output.

The ELMON rail 35 switching unit is intended for use on plants/machines that make a test signal available through a primary controller prior to each dangerous movement and appropriately evaluate the reaction of the switching unit. In combination with this, the switching unit satisfies safety category 2 acc. to EN ISO 13849-1:2008 *"Safety-related parts of control systems"*.

Monitoring of the standby current is made possible by an integrated terminating resistor in the sensor circuit. If the specified standby current is flowing, the corresponding output relay is activated and the switching contact is closed. If a sensor is actuated or a sensor circuit is interrupted, the respective relay switching contact opens. The monitoring state of the sensors and the applied operating voltage are indicated by LEDs.

Channels 1 and 2 are implemented independent of one another internally. As a result, they react both to a test as well as to a release independent of one another. Only contacts Z1, Z2 affect both channels and reset the error lock of both channels (manual reset).

4. Proper use

The ELMON rail 35 switching unit can only fulfil its safety-related task if used properly.

Proper use of the switching unit is the use as protection in combination with safety contact mats, safety bumpers or safety contact edges.

Any uses above and beyond these uses constitute improper use. The manufacturer assumes no liability for damages arising from improper use.

The device may only be used in special applications with the manufacturer’s express consent.

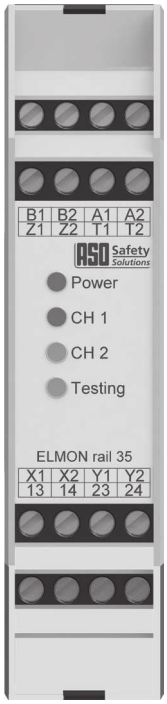
5. Mechanical mounting

The compact and easy-to-install switching unit is to be professionally mounted on a 35 mm DIN-mounting rail in a dust- and moisture-protected switching cabinet or housing with a protection class of at least IP54.

The switching unit may be mounted in any orientation.

Do not install the switching unit in the immediate vicinity of strong sources of heat.

6. Device overview



6.1 Signal indicators

LED ***Power*** **green**
Supply voltage

LED ***CH1*** **yellow/red**
Sensor 1 activated **yellow**
Sensor circuit 1 interrupted **red**

LED ***CH2*** **yellow/red**
Sensor 2 activated **yellow**
Sensor circuit 2 interrupted **red**

LED ***Testing*** **orange**
Test active

6.2 Connection terminals

A1 A2	Supply voltage 230 V 50/60 Hz (ELMON rail 35-32) Supply voltage 115 V 50/60 Hz (ELMON rail 35-82)
B1 B2	Supply voltage 24 V AC/DC
X1 X2	Connection sensor circuit CH 1
X1 X2	Connection sensor circuit CH 2
13 14	Safety-relay switching contact CH 1
23 24	Safety-relay switching contact CH 2
Z1 Z2	Input for manual reset
T1 T2	Input for test signal

6.3 Versions

Version ELMON rail 35-32

Housing, 22.5 mm wide, made of polyamide for 35 mm DIN rail mounting acc. to EN 60715.

Supply voltages 230 V 50/60 Hz and 24 V AC/DC.

Version ELMON rail 35-82

Same as version ELMON rail 35-32, but with 115 V 50/60 Hz and 24 V AC/DC supply voltage.

7. Setting the operating mode via DIP switches

DIP switches

Located underneath the opening on the right side of the housing are six DIP switches, of which only switches ***1*** and ***2*** are assigned a function. Factory settings are underlined.

S1 Test while voltage is applied (Off) / missing at ***T1 T2*** (On)

S2 Automatic reset (Off) / error lock with man. reset (On)

Automatic reset (factory setting of S2 = "Off")

Upon rectification of an actuation or fault in the sensor circuits or after a power failure, the ELMON rail 35 automatically closes relay contacts ***13 14*** or ***23 24***.
During a fault, the corresponding LEDs ***CH1*** / ***CH2*** illuminate constantly.

Error lock with manual reset (S2 = "On")

Upon rectification of a fault in the sensor circuit or after a power failure, the ELMON rail 35 does not close output terminals ***13 14*** or ***23 24*** again until contacts ***Z1*** and ***Z2,*** 500 ms after the elimination of the disruption, are bridged with a button. An automatic restart is thereby rendered impossible. Permanent bridging of contacts ***Z1 Z2*** is not possible and is detected by the test.

Actuation of the reset push-button always results in the resetting of both safety related channels!

After the sensor is again released, the corresponding LEDs ***CH1*** / ***CH2*** flash until a man. reset is performed. During a fault, the corresponding LEDs ***CH1*** / ***CH2*** illuminate constantly.

English

8. Commissioning

8.1 Prerequisites

- When supplying via terminals ***B1*** and ***B2***, the voltage must comply with the requirements for Protective Extra Low Voltage (PELV).
- Cables installed outdoors or outside of the switching cabinet must be protected appropriately.

8.2 Electrical connection

- Connect 24 V DC or AC supply voltage to terminals ***B1 B2*** or 230 V AC supply voltage (115 V ELMON rail 35-82) to terminals ***A1 A2***
- During use mains voltage it´s advisable to include a delay fuse protection of 1 A.
- Connect sensor to terminals ***X1 X2*** and ***Y1 Y2***; connect 8.2 kΩ resistor to any unused inputs.
- Connect the control circuits to be monitored to terminals ***13 14*** and ***23 24***.
- Connect the test signal supplied by the primary control to terminals ***T1 T2*** and select the waveform via DIP slide switch ***S1***.
- For error lock with manual reset: connect release button for manual reset to terminals ***Z1 Z2*** and select the function via DIP slide switch ***S2***.

The supply voltage at terminals ***B1 B2*** is not galvanically isolated from the sensor inputs.

Following successful commissioning, relay outputs ***13 14*** and ***23 24*** are closed. The actuation of a sensor results in the opening of the respective relay contact ***13 14*** or ***23 24***.

Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

8.3 Connection of multiple sensors per sensor circuit

ASO sensors must not be connected in parallel.

One or more sensors can be connected to sensor inputs ***X1 X2*** or ***Y1 Y2***. For this purpose, the individual sensors are connected in series according to figure 1.

An unused input can be bridged with an 8.2 kΩ resistor.

Safety edges SENTIR edge:
Up to five SENTIR edge may be connected in series. The maximum total length oft the SENTIR edge shall not exceed 100 m. The length of one SENTIR edge may be up to 25 m.
The total cable length oft the in series connected SENTIR edge must not exceed 25 m.

Safety bumper SENTIR bumper:
Up to five SENTIR bumper may be connected in series. The maximum total length oft the SENTIR bumper shall not exceed 15 m. The length of one SENTIR bumper may be up to 3 m.
The total cable length oft the in series connected SENTIR bumper must not exceed 25 m.

Safety contact mat SENTIR mat:
Up to ten SENTIR mat may be connected in series. The maximum total area shall not exceed 10 m^2. The maximum size of an SENTIR mat is 1350 x 2350 mm.
The total cable length oft the in series connected SENTIR mat must not exceed 25 m.

Before connecting the sensors that are connected in series, it is recommended that the resistance value of the arrangement is to be measured. The resistance must be 8.2 kΩ ± 500 Ω when the sensor is inactive and must not exceed 500 Ω when it is active.

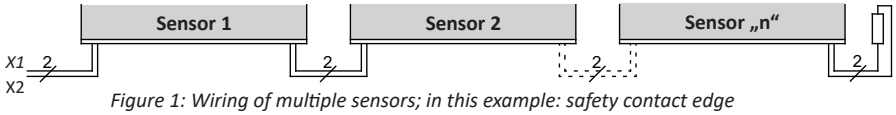


Figure 1: Wiring of multiple sensors; in this example: safety contact edge

English

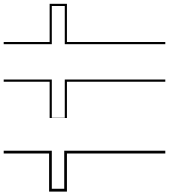
8.4 Test

For a standard-compliant design of the protection, the primary machine control must perform a test prior to each dangerous movement or during the non-dangerous phase/movement of the machine. The test is intended to ensure the proper function of the safety relay. After application of the test signal, both output terminals of the switching unit must open. This change in switching state must be evaluated by the primary machine control. If the test result is correct, the machine control then initiates the movement or the next work step. Otherwise, the control must output an error message and the power-driven work equipment (e.g. motor) must receive a switch-off signal from the machine control. If the machine control detects an error fault in the safety device, the machine control must maintain a safe state until the error is rectified.

If only one channel is used, the other may remain unmonitored during the test.

If DIP switch **S1** is in switch position "**Off**", the test is performed upon application of a voltage to terminals **T1** and **T2**; if "**On**", the test is performed if no voltage is applied.

8.5 Characteristics of the signal

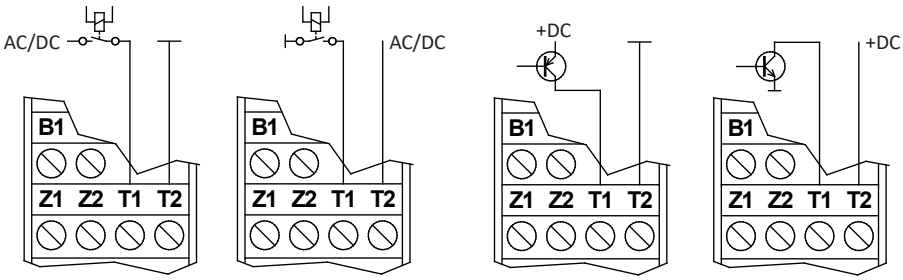


Test signal S1 Pos. "**Off**"

Test signal S1 Pos. "**On**"

Switching output (symbolic)

8.6 Connection options for the test signal



Voltage	**U_{Test}**	**12 V ... 28 V AC or DC**
Test duration	**T_{Test}**	**120 ms**

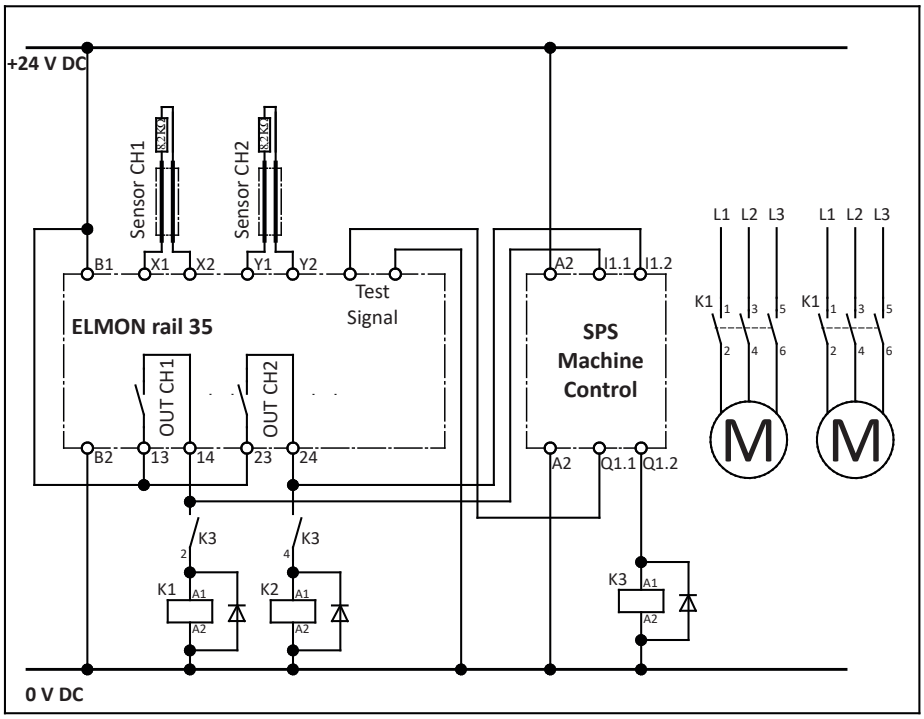
With testing by the control, the ELMON rail 35 system satisfies the Cat. 2 requirements in accordance with EN ISO 13849-1:2008 *"Safety-related parts of control systems"*.

Without testing, the operation or wiring of the ELMON rail 35 satisfies no specific safety requirements.

8.7 Example of use

Safety-related monitoring of two sensor circuits with primary PLC or machine control.

For a functional test of the protection, the PLC/machine control performs a test prior to each dangerous movement or in the non-dangerous phase/movement of the machine. If the test result is correct, the PLC/ machine control then initiates the movement or the next work step.



8.8 Functional test

The plant / machine must be tested for proper function after all of the electrical connections have been established and the supply voltage has been turned on.
To do this, activate each of the sensors in sequence and check the corresponding reactions of the switching unit.

The safety system is to be professionally inspected at appropriate intervals and be documented in such a way that it is comprehensible at all times. The requirements of the plant or machine manufacturer are to be taken into account and followed.

English

9. Error diagnosis

Only the green ***Power*** LED may illuminate if the supply voltage has been correctly connected. If one of the other LEDs illuminates, there is an error in the system which can be pinpointed using the table.

LED	Error	Error correction
LEDs are not illuminated	The supply voltage is missing, too low or has been connected incorrectly	Check connections and supply voltage: 230 V (115 V) 50/60 Hz at terminals ***A1 A2*** or 24 V AC/DC at terminals ***B1 B2.*** Tolerance range: ±10%
LED ***CH1*** or ***CH2*** constantly illuminates yellow	Sensor 1 or 2 incorrectly connected, actuated or defective	Check connections, wiring and supply lines of the respective sensor for short circuit (squeezed or brittle supply lines, etc.). Check sensor. [1]
LED ***CH1*** or ***CH2*** constantly illuminates red	Sensor 1 or 2 incorrectly connected, interrupted or defective	Check connections, wiring and supply lines of the sensor for breakage (squeezed or brittle supply lines, etc.). Check sensor. [1]
LED ***CH1*** or ***CH2*** constantly flashes yellow or red	Manual reset release not present	Check operating mode, reset push-button, wiring and supply line. [2]
Testing LED constantly illuminates orange	Faulty test	Check DIP slide switch S1. Adjust or check the test signal of the primary PLC/controller and set the DIP slide switch appropriately. [3]

[1] If the error is not in the wiring, the function of the electronics can be tested by connecting an 8.2 kΩ – resistor to the appropriate input ***X1 X2*** or ***Y1 Y2*** on the switching unit. If the electronics work perfectly after performing the test, the sensors must be checked using an ohmmeter. To do this, the connection of the sensor to the safety relay must be disconnected and connected to an ohmmeter. The resistance must be 8.2 kΩ ±500 Ω when the sensor is inactive and must not exceed 500 Ω when the sensor is active.

[2] The constant flashing indicates error lock of the switching unit and requires manual release by actuating the reset button. Evaluation of the reset button occurs dynamically; as a result, constant actuation or manipulation of the reset button will be detected by the switching unit and release of the output circuits prevented.

[3] The test of the safety system must be coordinated by the primary controller and be designed according to the technical data specified in this documentation. If the test fails in spite of appropriate settings, there is a defect in the switching unit.

10. Taking out of service and disposal

The products manufactured by ASO are intended solely for commercial use (B2B). At the end of use, the products are to be disposed of according to all local, regional and national regulations. Products can also be returned to ASO, which will then dispose of them properly.

11. Technical specifications

Supply voltage

Mains voltage		230 V AC 50/60 Hz (ELMON rail 35-32)
		115 V AC 50/60 Hz (ELMON rail 35-82)
Fuse protection		1 A delay fuse
Low voltage		24 V DC/AC ±10%

Power consumption

	P_{max}	3,5 VA 115/230 V AC
	P_{max}	1,3 VA 24 V DC/AC

Terminating resistor - sensor

nominal value	R_A	8,2 kΩ
upper switching point	R_{AO}	> 12,7 kΩ
lower switching point	R_{AU}	< 4,6 kΩ

Relay outputs

nominal current DC	DC-13 / 24 V / 1 A
nominal current AC	AC-15 / 250 V / 1 A
Mechanical life-time	$>10^5$ actuations

Saftey Relais

Fuse type	M 1 A 5 x 20 glass tube*

Safety relay switching times

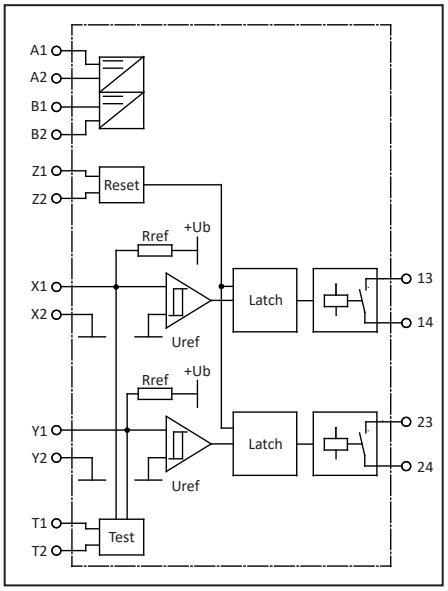
Switching off delay (response time)	< 5 ms
Switching on delay	50 ms typ

Test input voltage

Input voltage	U_{Test}	12 V ... 28 V AC/DC
Input resistance	R_{Test}	approx. 5 kΩ
Polarity of the input		arbitrary
Test run duration		120 ms typ.

Reset input

Voltage without load	U_{Reset}	12 V DC
Input resistance	R_{Reset}	ca. 10 kΩ



Simplified diagram ELMON rail 35

Housing

polyamide PA 6.6, self-extinguishing acc. to UL 94-V2

Dimensions (HxDxW)	113 x 99 x 22,5 mm

Protection class IP20

Weight 200 g

Temperature range -20 °C to +55 °C

Connection terminals

tightening torque	0,5 Nm

Connection cable cross-section

single- or fine-stranded cable 0,5-1,5 mm^2

Safety category

	EN ISO 13849-1:2015 Category 2 PL d
	MTTFd 110 years, DC 90%
(Electronic)	MTTFd 3712 years
(Electromechanics)	B10d 200000, MTTFd 114 years (Nop 17520)

*Not included in the scope of delivery

English

12. EC declaration of conformity

EG - Konformitätserklärung
EC Declaration of conformity
Déclaration de conformité CE

ASO Safety Solutions

Hiermit erklären wir, dass die nachfolgend bezeichneten Produkte der Baureihe

ELMON rail 35-32*
ELMON rail 35-82

Sicherheitsschaltgerät zur Kombination mit Schaltleisten, Schaltmatten und Schaltpuffern zur Vermeidung von Gefahren an Quetsch- und Scherstellen,

aufgrund ihrer Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung, den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der nachfolgenden EG-Richtlinien und Normen entspricht:

2006/42/EG
2014/35/EU
EN ISO 13849-1:2008 / AC:2009
EN ISO 13849-1:2015*
EN 60947-5-1:2004+A1:2009*

EG-Baumusterprüfung*
Notified Body 0044
TÜV Nord Cert GmbH
Langemarckstraße 20
D-45141 Essen
Nr. 44 205 13031822

Alle technischen Daten für diese Produkte werden sicher aufbewahrt und werden erforderlichenfalls der behördlichen Marktaufsicht auf Anfrage zur Verfügung gestellt.

Diese Konformitätserklärung entbindet den Konstrukteur/ Hersteller der Maschine nicht von seiner Pflicht, die Konformität der gesamten Maschine, an der dieses Produkt angebracht wird, entsprechend der EG-Maschinen-richtlinie sicherzustellen.

Hersteller und Dokumentationsbevollmächtigter

ASO GmbH
Hansastr. 52
D-59557 Lippstadt
Lippstadt, 04.07.2018

We hereby declare that the following products of the model range

ELMON rail 35-32*
ELMON rail 35-82

Safety relay to be used in combination with safety contact edges, safety contact mats and safety contact bumpers for preventing dangers at locations where there is a risk of crushing and cutting,

satisfies the relevant essential health and safety requirements of the EC directives and standards listed below on account of its design and construction, as does the version brought to market by us:

2006/42/EC
2014/35/EU
EN ISO 13849-1:2008 / AC:2009
EN ISO 13849-1:2015*
EN 60947-5-1:2004+A1:2009*

EC type-examination*
Notified Body 0044
TÜV Nord Cert GmbH
Langemarckstraße 20
D-45141 Essen
Nr. 44 205 13031822

All technical data for these products are securely stored and, if necessary, made available to regulatory market surveillance upon request.

This declaration of conformity does not relieve the designer / manufacturer of the machine from his obligation to ensure that the conformity of the entire machine to which this product is attached satisfies the corresponding EC directive.

Manufacturer and attorney of documents

Par la présente nous déclarons que les produits suivants de la série

ELMON rail 35-32*
ELMON rail 35-82

Relais de sécurité pour la combinaison de barres palpeuses, tapis de sécurité et bumpers dans le but d'éviter les risques d'écrasement et de cisaillement,

de par sa conception et sa construction, ainsi que dans les modèles mis en circulation par nos soins, répondent aux exigences de base pour la sécurité et la santé des directives et normes CE suivantes:

2006/42/CE
2014/35/EU
EN ISO 13849-1:2008 / AC:2009
EN ISO 13849-1:2015*
EN 60947-5-1:2004+A1:2009*

Examen CE de type*
Notified Body 0044
TÜV Nord Cert GmbH
Langemarckstraße 20
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Nr. 44 205 13031822

Toutes les données techniques relatives à ces produits seront conservées en toute sécurité et, seront mises, sur demande, à la disposition des autorités de réglementation.

Cette déclaration de conformité ne délie pas le constructeur / fabricant de la machine de son obligation d'assurer la conformité de l'ensemble de la machine à laquelle ce produit est apposé selon la directive CE.

Fabricant et agent de documentation

H. Friedrich
- Geschäftsführer - CEO - Gérant -

CE

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English