

CM-S4 Control Unit

Operating Instructions for CM-S4 Control Unit

These operating instructions are only valid in conjunction with the operating instructions for the relevant CM Series read heads and actuators.

Correct use

The CM Series coded magnetic safety switches are a series of technical safety devices for monitoring moveable separating safety guards. They ensure that:

- dangerous work on machines can only be carried out if the safety guards are closed.
- a stop command is triggered if a safety guard is opened while the machine is running.

Before safety switches are used, a risk assessment must be performed on the machine in accordance with:


- EN 954-1, safety-related components of controls, Annex C
- EN 1050, machine safety, risk assessment.

Correct use includes compliance with the relevant requirements for installation and operation, particularly:

- EN 954-1, safety-related components of controls
- EN 1088, interlocking devices in conjunction with moving safety guards
- EN 60204-1, electrical equipment of machines
- EN 60947-5-3 Requirements for proximity switches.

⚠ Safety precautions

The safety switch fulfills a personal protection function. Incorrect installation or manipulation can lead to severe injuries to personnel.

- ⚠ Safety switches must **not** be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective.
- ⚠ The switching operation may only be triggered by actuators specially provided for this purpose which are permanently connected to the safety guard.
- ⚠ A complete safety-oriented system generally consists of several signalling devices, sensors, control units and concepts for safe shut-off operations. The manufacturer of a machine or installation is responsible for correct and safe overall function.
- ⚠ For use and operation as per the  requirements, a power supply with the feature "for use in class 2 circuits" must be used. The devices are tested in accordance with UL 508 and are intended for DIN rail mounting in the control cabinet. They are not tested as safety components in the context of the UL definition (e.g. for potentially explosive atmospheres).

- ⚠ Door monitoring contact 23/24 for the CM-S4 control unit may not be used as a safety contact.

- ⚠ Not all faults are detected. An accumulation of undetected faults can lead to the loss of the safety function. With this application, therefore, it is necessary to ensure that only one safety gate (door) is open at a time or that the status of each safety gate is checked in suitable intervals.

Functioning

The CM Series safety switch consists of a control unit, read head and actuator and is only functional in particular combinations (see combination options)!

The read head connected to the control unit contains reed contacts which are activated by the coded magnetic actuators. The control unit converts this information and transfers the safety guard state to the control system via a safety contact.

When the protective door is being opened or closed, the control unit is checked to ensure that it is functional. In this way internal errors from the read head to the control unit output can be detected.

If an error is detected, the control unit goes into a blocked state. The safety contacts remain in the open state.

The control unit status is displayed visually by means of LED displays.

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- In the case of a monitored feedback loop, safety contact 13/14 is only switched through if feedback loop Y1/Y2 was closed before the actuator was moved to the read head's response area.
- A start button must not be incorporated into the feedback loop.
- In the case of unmonitored feedback loops, the 2-pole bridge supplied with the control unit must be connected to terminals Y1/Y2.
- When the actuator is moved out of the response area, it is only if the Reset spacing is exceeded (see configuration options table) that the system ensures that safety contact 13/14 and door monitoring contact 23/24 switch on if the actuator is again moved to switch on distance S_{a0} .
- If the actuator is moved slowly toward the read head in lateral direction of approach Z, the control unit switches over to the blocked state. To cancel the blocked state, the actuator must again be moved beyond the Reset spacing

Assembly

- ⚠ Installation must be performed by authorized personnel only.
- ⚠ The CM-S4 control unit must be assembled in a suitable operating area (switch cabinet, protective housing, at least IP 54).

The control unit is installed by clipping it to a standard 35 mm top-hat rail in accordance with EN 50022.

Electrical connection

- ⚠ Electrical connection must be performed by authorized personnel only.
- ⚠ 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.

- Terminals A1 and A2 are reverse polarity protected for connection of the power supply for all contacts (safety and door monitoring contacts).
- External contact fuses (3 AgG) for safety circuit must be fitted.
- All the output contacts must have an adequate protective circuit for capacitive and inductive loads.
- If a common power supply is used, all the inductive and capacitive loads (e.g. relay contactors) connected to the power supply must be connected to appropriate interference suppressors.
- If no read heads are connected to the plug-in terminals provided in the control unit, the bridges supplied must be inserted in accordance with the connection plan.

Setup

If the control unit does not appear to function when operating voltage is applied (green U_b LED does not light up), the unit must be returned unopened to the manufacturer.

Check whether the safety contacts are being switched (see LED display) by opening and closing the protective door.

LED displays

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Function	LED	Color	State
Operating voltage	U_b	green	On
Contacts 23/24 and 13/14 open	OUT	red	On
	OUT	green	Off
Contacts 23/24 and 13/14 closed	OUT	red	Off
	OUT	green	On
Read head x (x = 1...4)			
Actuator in response area			
• NC contact in the read head is open	Dx1	green	On
• NO contact in the read head is closed	Dx2	red	Off
Actuator not in response area			
• NC contact in the read head is closed	Dx1	green	Off
• NO contact in the read head is open	Dx2	red	On

- If the green and red LEDs light up simultaneously (e.g. D11 and D22), the relevant actuator is not fully in the response area.
- If the actuators are in the response area (or 2-pole bridges have been fitted in the control unit) for all the connected read heads, safety contact 13/14 and door monitoring contact 23/24 are switched through (the green OUT LED lights up).
- In the control unit the green LEDs are wired serially in the following sequence: D11 - D21 - D31 - D41. This means that the green LED (e.g. D41) can only light up if LEDs D11/D21/D31, which have been connected in series, also light up.
- If the actuation speed falls below the minimum speed, contacts 13/14 and 23/24 remain open.

Service and inspection

No servicing is required. In order to ensure lasting, trouble-free operation, **regular inspection** of the following is required:

- correct switching function
- secure mounting of components
- loose connections.

- ⚠ In the event of damage or wear and tear, the damaged system component must be replaced.

If the protective doors are not frequently used, the system should be subjected to a function test as part of the inspection schedule.

Liability coverage is void under the following circumstances:

- if instructions are not followed
- non-compliance with safety regulations
- installation and electrical connection not performed by authorized personnel
- non-implementation of functional checks.

UL Class 2 Addendum

The devices are evaluated according to UL 508 and are intended for Din Rail mounting in an overall industrial Control Panel Enclosure. They have not been evaluated as a safety component in general UL meaning (i.e. gas environment).

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The following applies to all wiring diagrams:

- No voltage on control unit
- Actuator not in response area

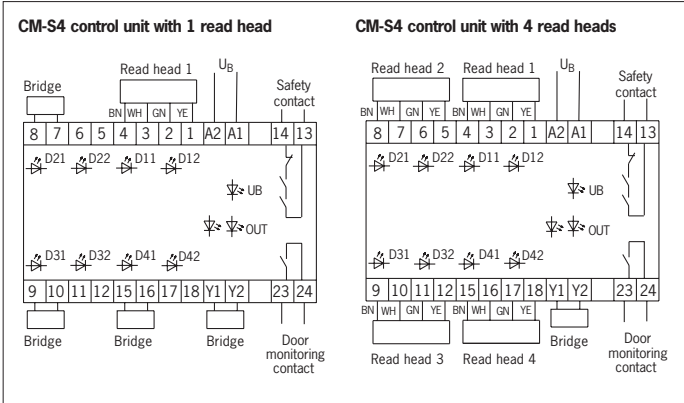


Fig. 1: Wiring diagrams

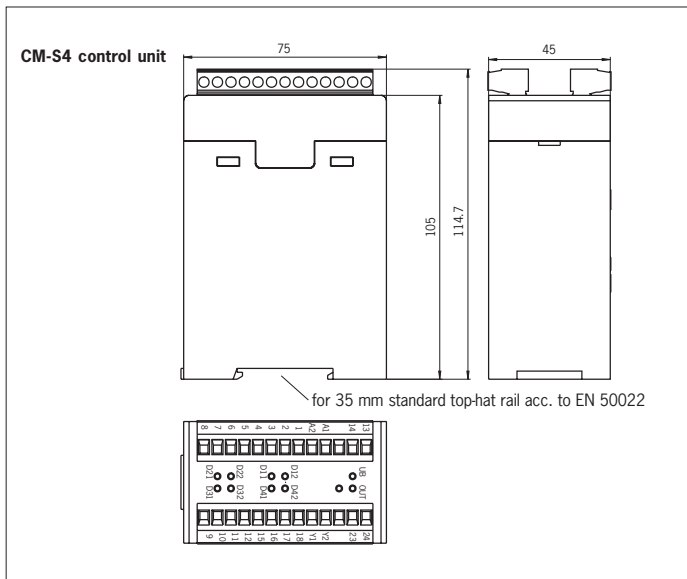


Fig. 2: Dimension drawing of CM-S4 control unit

Combination options

Design	Read head	Circuit diagram not actuated	Actuator	Minimum Switch on distance	Maximum Switch off distance	Max. Reset dist.
				S _{ao} [mm] ¹⁾	S _{sr} [mm]	S _{reset} [mm]
CM-S4 Control Unit	CM-S1 Read Head		CM-S1 Actuator	3	8	11
	CM-S2 Read Head		CM-S2 Actuator	6	13	30
	M30 Read Head		CM-S3 Actuator	6	13	16

¹⁾ There must be no ferromagnetic material in the vicinity of the read head or the actuator. All the data applies to the frontal direction of approach and a centre offset of m = 0.

²⁾ The minimal switching distance S_{reset} between read head and actuator is 1 mm. If the distance falls below 1 mm, the evaluation unit could go into fault condition.

Technical data

Parameters	Value	Unit	
Evaluation unit	CM-S4		
Housing material	PC		
Dimensions	114.7 x 75 x 45	mm	
Weight	0.24	kg	
Ambient temperature	0 ... +50	C	
Storage temperature	-25 ... +70	C	
Degree of protection to IEC 60529	Terminals IP20 / Housing IP40		
Degree of contamination	2		
Assembly	35 mm standard top-hat rail acc. to EN 50022		
Number of read heads	1 ... 4		
Connection type	Plug-in screw terminals		
Operating voltage U _B	24 10%	V AC/DC	
Internal fuse (operating voltage)	resetable fuse (PTC) 0.5 ¹⁾	A	
Switching voltage U _{max.}	250	V AC	
Typ. current consumption	100	mA	
Switching current I _{max.} at 24 V	3	A	
Switching current I _{min.} at 24 V	3	mA	
Braking capacity P _{max.}	750	VA	
External contact fuse (safety circuit) according to EN IEC 60269-1	3AgG		
Safety contacts	1		
Door monitoring contacts	1		
Usage category according to 60947-5-1	Value		Unit
		I _e ⁽²⁾	U _e ⁽²⁾
	AC-1	3A	250V
	AC-1	3A	24V
	AC-15	1A	250V
	AC-15	1A	24V
DC-13	3A	24V	
Switching load according to UL Class 2	Input 24V AC/DC		
	Output 30V AC, 24VDC		
Safety category in acc. with EN 954-1	3		
Classification	PDF-S (in acc. with IEC 60947-5-3) ³⁾		
Rated insulation voltage U _i	250		V
Vibration resistance	in accordance with IEC 60947-5-2		
Mechanical switching cycle relays	30 x 10 ⁶		
EMC compliance	in accordance with EN IEC 60947-5-3		
Approval	TÜV UL Class 2		

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⁾ Usage category I_e / U_e.

³⁾ Classification PDF-S (in accordance with EN IEC 60947-5-3 PDF-E with reed contacts wired in serial).



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Subject to technical modifications. Drawing Number 092579-04-09/07

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